Ordinance 19479

JULY 2021

FINAL JULY 2022

City of Snoqualmie

GENERAL SEWER PLAN

PREPARED BY RH2 ENGINEERING

Kenny Gomez, PE, Project Manager

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City of Snoqualmie General Sewer Plan

JULY 2021
FINAL JULY 2022

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CERTIFICATION

This General Sewer Plan for the City of Snoqualmie was prepared under the direction of the following registered professional engineers.

07/02/2021

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TABLES

CHARTS

FIGURES

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E | EXECUTIVE SUMMARY

PURPOSE OF THE PLAN

The City of Snoqualmie's (City) sewer system is a major infrastructure, most of which is invisible to the customers it serves. The sewer system requires qualified staff to operate and maintain an ongoing capital improvement plan to replace old components to meet the requirements mandated by federal and state laws. The primary purpose of the City's General Sewer Plan (GSP) is to identify and schedule sewer system improvements that correct existing deficiencies and ensure a safe and reliable sewer system for current and future customers.

This GSP is prepared in accordance with Washington Administrative Code (WAC) 173-240-050. For the following select improvements at the City's wastewater treatment plant, the Water Reclamation Facility (WRF), this GSP also has been prepared in accordance with WAC 173-240-060 (Engineering Report) and additional "facility plan" requirements identified in WAC 173-240-060(5) and Sections G1-2.5.1 (Engineering Reports/Facility Plans) and G1-4.1 (Engineering Report/Facility Plan) of the Washington State Department of Ecology's (Ecology) *Criteria for Sewage Works Design*:

- Activated Sludge Basins Improvements.
- Reclaimed Water Filters Replacement.

SUMMARY OF KEY ELEMENTS

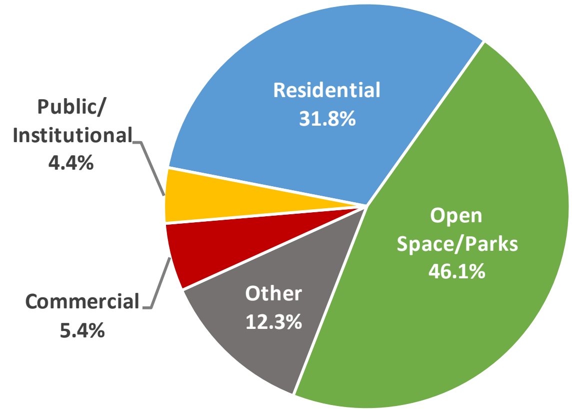
Sewer Service Area, Land Use, and Population

The City limits encompass an area of approximately 7.4 square miles. The City's Urban Growth Area (UGA) encompasses an area of 8.6 square miles. Approximately 32 percent of the land within the City's future wastewater service area is designated for residential use, while the remaining land is designated for other uses such as open space/parks, commercial use, public/institutional use, and undeveloped land. **Table ES-1** presents the land uses within the future wastewater service area. **Chapter 3** provides more information regarding the population projections and designated land use within the City's planning area.

The City's 2018 population was 13,450 people and 3,526 employees, which is expected to grow to 15,499 people and 8,103 employees in 2040. The City's residential areas largely are comprised of single-family homes, with approximately 81 percent of the housing units being single-family residences. The 2018 sewer service population is estimated at approximately 13,391 people and 3,437 employees. The City's sewer system population is expected to grow to 14,877 people and 5,023 employees in 2030 and to 15,499 people and 8,103 employees by 2040. The residential population estimate is based on an average single-family household size of 3.0 persons per household in the Snoqualmie Ridge area and 2.5 persons per household in all other areas of the City.

Table ES-1
Land Use Inside Future Wastewater Service Area

Land Use Type	Acres	% of Total
Residential	1,794	31.8%
Open Space/Parks	2,600	46.1%
Other	694	12.3%
Commercial	307	5.4%
Public/Institutional	249	4.4%
Total	**5,644**	**100%**



Snoqualmie Casino

The City currently provides sewer service to the Snoqualmie Casino (Casino), which is located inside the City's UGA and contributes significant flow and loading to the City's collection system and WRF. Wastewater flow from the Casino is monitored at a flume where the wastewater is discharged to the City's collection system, and 5-day biochemical oxygen demand (BOD_5) loading from the Casino used to be monitored as well.

In 2021, the Casino requested additional sewer service from the City to accommodate for a Casino expansion. This expansion will increase flow and loading discharged by the Casino to the City's existing sewer system. The impacts of this Casino expansion on the City's sewer system and improvements needed to provide sewer service to this Casino expansion are addressed in this GSP.

Existing Facilities and Discharge Regulations

The City's sewer system includes a gravity collection and conveyance system, 17 wastewater lift stations, force mains, the WRF, and an effluent outfall. A summary of the sewer system characteristics is provided in **Table ES-2**. **Chapter 2** describes the City's gravity collection and conveyance system, lift station, and general WRF characteristics.

Table ES-2
2018 City Sewer System Data

Description	Data
City Population	13,450
Number of Properties on Septic Systems	34
Sewer System Population	13,391
Total Connections	4,718
Sewer Planning Area - UGA (Square Miles)	8.8
Average Gallons per Capita per Day (gpcd)	81
Average Annual Flow (MGD)	1.09
Maximum Month Average Flow (MGD)	1.64
Maximum Day Flow (MGD)	2.19
Number of Lift Stations	17
Total Length of Gravity Main (Miles)	47.1
Length of 8-inch-diameter Gravity Main (Miles)	36.4
Total Length of Force Main (Miles)	10.0
WRF Permitted Maximum Month Average Flow (MGD)	2.15

Gravity Sewer Collection Piping

The City's existing sewer service area is comprised of 17 sewer drainage basins. Approximately 47.1 miles of gravity sewer piping, ranging in size from 6 to 36 inches, serves the City's sewer system customers. As shown in **Table ES-3**, most of the sewer pipe (approximately 77.3 percent) within the sewer service area is 8-inch diameter.

Table ES-3
Gravity Sewer Collection Piping Inventory – Diameter

Diameter (inches)	Total Length (feet)	Total Length (miles)	% of System
6	1,275	0.24	0.5%
8	192,357	36.43	77.3%
10	21,741	4.12	8.7%
12	8,958	1.70	3.6%
14	77	0.01	0.0%
15	12,270	2.32	4.9%
18	236	0.04	0.1%
24	32	0.01	0.0%
36	1,575	0.30	0.6%
Unknown	10,429	1.98	4.2%
Total	**248,950**	**47.15**	**100.0%**

The City also has 10.0 miles of force mains, including lift station force mains and the reclaimed water force main from the WRF. A summary of the force mains by diameter is provided in **Table ES-4**.

Table ES-4
Force Main Inventory – Diameter

Diameter (inches)	Total Length (feet)	Total Length (miles)	% of System
3	5,970	1.13	11.3%
4	7,119	1.35	13.4%
6	9,161	1.74	17.3%
8	4,396	0.83	8.3%
10	2,573	0.49	4.9%
14	7,075	1.34	13.4%
Unknown	16,667	3.16	31.5%
Total	**52,962**	**10.03**	**100.0%**

Lift Stations

The City currently owns, operates, and maintains 17 wastewater lift stations. The characteristics of the lift stations are summarized in **Table ES-5**.

Table ES-5
Lift Station Characteristics

	Lift Station		Pumps						
Lift Station Name	**Year Constructed**	**Force Main Diameter (inches)**	**No. of Pumps**	**Type**	**Manufacturer**	**Horsepower (hp)**	**TDH (feet)**	**Design Capacity (gpm)**	**Design Firm Capacity (gpm)**
Hospital Pump Station	2014	6	2	Submersible	Flygt	23	120	194 194	194
In-Plant Pump Station	2009 - Upgraded	8	2	Submersible	Flygt	25	62	1,085 1,085	1,085
Kimball Creek Pump Station (Snoqualmie Parkway)	1997 - Constructed 2012 - Pump Installed	14 and 14	3	Immersible, Two Speed	Wemco	134	134	3,475 3,475 3,475	6,950
Pump Station No. 1 (Railroad Place)	1967 - Constructed 2002 - Upgraded	10	2	Submersible	KSB	40	66	1,800 1,800	1,800
Pump Station No. 2 (Pickering Court)	1967	8	2	Wet Pit/ Dry Pit	Flygt Cornell	7.5 5	25	400 400	400
Pump Station No. 3 (Park Street)	1967 - Constructed 2010 - Upgraded	8	2	Submersible	Flygt	7.5	25	700 700	700
Pump Station No. 4 (Meadowbrook)	1967 - Constructed 2010 - Upgraded	6	2	Submersible	Flygt	5	25	200 200	200
Pump Station No. 6 (Honey Farm)	1997	4	2	Submersible	Flygt	3	1.7	100 100	100
Pump Station BP (Business Park)	1998 - Constructed 2008 - Upgraded	8	2	Submersible	KSB	36	110	750 750	750
Pump Station E (Crestview)	1998	6	2	Submersible	KSB	36	141	240 240	240
Pump Station F (Fairview)	1998	6	2	Submersible	Flygt	38	123	230 230	230
Pump Station K2 (Burke)	2004	4	2	Submersible	Flygt	23	140	80 80	80
Pump Station K3 (Muir)	1998	6	2	Submersible	KSB	28	95	215 215	215
Pump Station L (Carmichael)	2000	8	2	Submersible	KSB	36	110	500 500	500
Pump Station N6 (Whittaker)	2007	3	2	Submersible	Flygt	10	92	98 98	98
Pump Station S12A (Vaughn)	2014	4	2	Submersible	Flygt	4	57	116 116	116
Pump Station Z (Gala)	2003	3	2	Submersible	Flygt	6.5	71.5	77 77	77

TDH = total dynamic head

Wastewater Treatment and Disposal Facilities

The City's original WRF was a facultative lagoon system that was constructed in 1967. In 1997, an upgrade was completed to add a headworks facility, an oxidation ditch, two secondary clarifiers, and an ultraviolet (UV) light disinfection system. Sand filters and a chlorination system also were added to allow a portion of the effluent to be reused as Class A reclaimed water. The existing lagoons were converted to sludge stabilization lagoons to allow for long-term sludge storage. Another upgrade was completed in 2003 in which a redundant oxidation ditch was constructed.

In 2017, upgrades were made to the UV disinfection system, standby generator, supervisory control and data acquisition system, and miscellaneous equipment. In 2018 and 2019, a solids handling system was constructed that produces Class B biosolids, along with various other upgrades throughout the WRF.

Raw wastewater from the City's sewer system is processed at the WRF, resulting in treated water and digested sludge. A majority of the year, the wastewater is treated to effluent standards required to discharge to the City's Snoqualmie River outfall. During the summertime months, the wastewater is treated to Class A Reclaimed Water standards to supply the City's reclaimed water system. Class B biosolids are produced at the WRF year-round and hauled offsite by truck for permissible land application.

Descriptions of processes and further details of the WRF are presented in **Chapter 7**.

NPDES Regulations and City Permit

The City has a National Pollutant Discharge Elimination System (NPDES) waste discharge permit issued by Ecology. The permit includes effluent limits for treated water discharged to the City's Snoqualmie River outfall and limits for treated water produced for the City's reclaimed water system. In addition, the permit includes facility flow and loading design criteria for the WRF as shown in **Table ES-6**.

Table ES-6
WRF Permitted Flow and Loading Design Criteria

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	2.15 MGD
BOD_5 Influent Loading for Maximum Month	5,220 ppd
TSS Influent Loading for Maximum Month	5,220 ppd
Reclaimed Water Production MMDF	1.56 MGD

BOD_5 = 5-day biochemical oxygen demand
ppd = pounds per day

The City filed a joint reclaimed water use permit application with Ecology and the Washington State Department of Health in October 2018.

Existing Wastewater Characteristics and Flows

Flow and load values in a sewer system are used to determine the size of gravity collection piping, lift station facilities, and force main piping, and the size and type of treatment facilities needed. This information also is used to develop the sewer service provider's NPDES waste discharge permit, which is required by Ecology. **Chapter 4** presents the historical and projected WRF flow and loading rates.

The total influent flow to the WRF is made up of wastewater flow from primarily residential customers but also includes flow from a number of commercial, hospitality, and retail businesses, schools, and the Snoqualmie Valley Hospital. The historical 2012 through 2018 influent average annual flow (AAF), maximum month average flow (MMF), and maximum day flow (MDF) (including infiltration and inflow) is summarized in **Table ES-7**. The 2018 AAF was 1.09 million gallons per day (MGD).

Table ES-7
Historical WRF Influent Flow Summary

Year	Sewer System Population	Sewer System Employment	AAF (MGD)	AAF per Capita (gpcd)	MMF (MGD)	MDF (MGD)	Percent of NPDES Permit Max. Month Limit[1]	Peaking Factors MMF/AAF	MDF/AAF
2012	11,261	2,917	0.92	82	1.22	1.90	57%	1.33	2.06
2013	11,641	3,016	0.88	76	1.12	2.08	52%	1.28	2.37
2014[2]	12,071	3,115	1.24	102	1.71	2.58	80%	1.39	2.09
2015	12,791	3,213	1.12	88	1.76	4.32	82%	1.57	3.85
2016	13,051	3,312	1.19	91	1.53	2.06	71%	1.29	1.74
2017	13,151	3,410	1.21	92	1.55	3.00	72%	1.28	2.49
2018	13,391	3,437	1.09	81	1.64	2.19	76%	1.50	2.01
2012 to 2018 Average			**1.09**	**87**	**1.50**	**2.59**	---	**1.38**	**2.37**
2012 to 2018 Max.			**1.24**	**102**	**1.76**	**4.32**	---	**1.57**	**3.85**

1 = The City's WRF is permitted for a maximum month average influent flow of 2.15 MGD.
2 = The influent flows for October 8, 2014, and October 9, 2014, were removed from these analyses since there was a significant water main failure on these days that entered the sewer system.

Table ES-8 summarizes the historical 5-day biochemical oxygen demand (BOD_5), and **Table ES-9** summarizes the historical total suspended solids (TSS) loadings for 2012 through 2018 in pounds per day (ppd) and pounds per capita per day (ppcd).

Table ES-8
Historical WRF Influent BOD_5 Loading Summary

Year	Sewer System Population	Sewer System Employment	Average Annual BOD_5 (ppd)[1,2,3]	Average Annual BOD_5 per Capita (ppcd)	Max. Month Average BOD_5 (ppd)[1,2,3]	Percent of NPDES Permit Max. Month Limit[4]	BOD_5 Max. Month Average /Average Annual Peaking Factor
2012	11,261	2,917	2,023	0.180	2,450	47%	1.21
2013	11,641	3,016	1,782	0.153	2,481	48%	1.39
2014	12,071	3,115	2,702	0.224	3,523	67%	1.30
2015	12,791	3,213	3,099	0.242	4,568	88%	1.47
2016	13,051	3,312	4,158	0.319	5,243	100%	1.26
2017	13,151	3,410	3,540	0.269	4,414	85%	1.25
2018	13,391	3,437	3,023	0.226	4,891	94%	1.62
2012 to 2018 Average[5]			**2,695**	**0.216**	**3,721**	---	**1.37**
2012 to 2018 Max.[5]			**3,540**	**0.269**	**4,891**	---	**1.62**

1 = The City used an adjustment factor for reporting influent BOD_5 loadings on its daily monitoring reports during the period reported (2012 through 2018). The historical total influent BOD_5 loadings at the WRF were determined by adding this adjustment factor, which is 258 ppd, to the values on the City's discharge monitoring reports.
2 = The influent BOD_5 loading for August 7, 2013, was removed from these analyses because it was negative, which is not feasible.
3 = The influent BOD_5 loadings for October 8, 2014, and October 9, 2014, were removed from these analyses since there was a significant water main failure on these days that entered the sewer system.
4 = The City's WRF is permitted for a maximum month average influent BOD_5 loading of 5,220 ppd.
5 = Average annual and maximum month average BOD_5 loading were estimated from 2012 through 2018 data, excluding 2016. Data from 2016 was not utilized for this GSP because BOD_5 loadings for 2016 were abnormally high.

Table ES-9
Historical WRF Influent TSS Loading Summary

Year	Sewer System Population	Sewer System Employment	Average Annual TSS (ppd)[1,2]	Average Annual TSS per Capita (ppcd)	Max. Month Average TSS (ppd)[1,2]	Percent of NPDES Permit Max. Month Limit[3]	TSS Max. Month Average/ Average Annual Peaking Factor
2012	11,261	2,917	1,868	0.166	2,518	48%	1.35
2013	11,641	3,016	1,778	0.153	2,667	51%	1.50
2014	12,071	3,115	2,929	0.243	3,162	61%	1.08
2015	12,791	3,213	2,713	0.212	3,068	59%	1.13
2016	13,051	3,312	2,996	0.230	3,705	71%	1.24
2017	13,151	3,410	2,706	0.206	3,301	63%	1.22
2018	13,391	3,437	2,317	0.173	3,106	59%	1.34
2012 to 2018 Average[4]			**2,385**	**0.192**	**2,970**	---	**1.27**
2012 to 2018 Max.[4]			**2,929**	**0.243**	**3,301**	---	**1.50**

1 = The City used an adjustment factor for reporting influent TSS loadings on its daily monitoring reports during the period reported (2012 through 2018). The historical total influent TSS loadings at the WRF were determined by adding this adjustment factor, which is 215 ppd, to the values on the City's discharge monitoring reports.

2 = The influent TSS loadings for October 8, 2014, and October 9, 2014, were removed from these analyses since there was a significant water main failure on these days that entered the sewer system.

3 = The City's WRF is permitted for a maximum month average influent TSS loading of 5,220 ppd.

4 = Average annual and maximum month average TSS loading were estimated from 2012 through 2018 data, excluding 2016. Data from 2016 was not utilized for this GSP because TSS loadings for 2016 were abnormally high.

Historical Casino Wastewater Flow and Loading

The historical sewer flows for the existing Casino for 2012 through 2017 are shown in **Table ES-10**. The 2017 AAF discharged by the existing Casino was 73,289 gallons per day, which was used as the base for estimating additional wastewater flow from the proposed Casino expansion.

Table ES-10
Historical Casino Flow Data

Year	Average Annual Flow (gpd)	Max Month Flow (gpd)	MMF / AAF Peaking Factor
2012	81,252	93,024	1.14
2013	80,863	91,069	1.13
2014	78,865	86,581	1.10
2015	77,115	88,377	1.15
2016	74,480	81,014	1.09
2017	73,289	78,690	1.07
2012 to 2017 Average	**77,644**	**86,459**	**1.11**
2012 to 2017 Max.	**81,252**	**93,024**	**1.15**

The historical sewer BOD_5 loadings for the existing Casino for 2012 through 2016 are shown in **Table ES-11**. For 2012 through 2016, the average of the average annual loadings was 334 ppd and the highest BOD_5 maximum month average to average annual peaking factor was 1.35, which occurred in 2016. These values were used as the base for estimating additional wastewater BOD_5 loading from the proposed Casino expansion.

Table ES-11
Historical Casino BOD_5 Loading Data

Year	Average Annual BOD_5 Loading (ppd)	Max Month Average BOD_5 Loading (ppd)	BOD_5 Max Month Average / Average Annual Peaking Factor
2012	384	461	1.20
2013	334	435	1.30
2014	334	429	1.28
2015	295	333	1.13
2016	323	435	1.35
2012 to 2016 Average	**334**	**419**	**1.25**
2012 to 2016 Max.	**384**	**461**	**1.35**

Inflow and Infiltration

Inflow and infiltration is the combination of groundwater and surface water that enters the sewer system. The U.S. Environmental Protection Agency (EPA) published a report in May 1985, *Infiltration/Inflow, I/I Analysis and Project Certification,* that developed guidelines to help determine what amount of inflow and infiltration (I/I) is considered to be excessive and what amount can be cost-effectively removed. Inflow is considered to be non-excessive if the average daily flow during periods of heavy rainfall or spring thaw does not exceed 275 gallons per capita per day (gpcd). The peak recorded flow data in the 7 years of data analyzed for the City was 4.25 MGD. This peak inflow event equates to 332 gpcd, which is above the EPA maximum guideline of 275 gpcd. This was the only recording above the EPA threshold in the past 7 years. Conducting an inflow study to confirm these results and locate the affected collection system areas to determine if there are any cost-effective sewer rehabilitation measures to remove any excessive inflow should be considered and is further discussed in **Chapter 11**.

The determination of non-excessive infiltration was based on the national average for dry weather flow of 120 gpcd. In order for the amount of infiltration to be considered non-excessive, the average daily flow must be less than 120 gpcd. A review of the City's flow data during periods of zero to a small amount of precipitation indicate an average flow of 1.533 MGD, equating to 117 gpcd, which is just below the EPA maximum guideline of 120 gpcd.

Peaking Factors

Projected flows are used to analyze how well the existing sewer system will perform in the future and determine improvements required to maintain or improve system function. Peaking factors are needed to establish projected flow scenarios for the sewer system, which are then applied to future flow rates. **Table ES-12** shows a summary of flow and loading peaking factors at the City's WRF for the 2012 through 2018 period.

Table ES-12
WRF Flow and Loading Peaking Factors

Flow	
Max. Month Average Flow / Average Annual Flow (MMF/AAF)	1.60
Max. Day Flow / Average Annual Flow (MDF/AAF)	3.85
Peak Hour Flow / Average Annual Flow (PHF/AAF)	4.15
BOD_5	
Max. Month Average / Average Annual Loading	1.66
TSS	
Max. Month Average / Average Annual Loading	1.50

Projected Wastewater Flow

The City's sewer system is projected to add a total of 2,348 additional persons and 4,693 additional employees by 2040 using 2017 as the base year. **Table ES-13** provides a summary of the projected flows for the WRF. According to these projections, the WRF will need treatment upgrades to increase capacity prior to 2030. Capital Improvement Plan (CIP) projects to increase the treatment capacity of the WRF are included in **Chapter 11**.

Table ES-13
Projected WRF Flow

Year	Sewer System Population	Sewer System Employment	AAF (MGD)[1]	MMF (MGD)[2]	MDF (MGD)[3]	PHF (MGD)[4]	Percent of NPDES Permit Max. Month Limit[5]
2017	**13,151**	**3,410**	**1.21**	**1.55**	**3.00**	**5.00**	**72%**
2018	13,391	3,437	1.09	1.64	2.19	---	76%
2019	13,611	3,464	1.24	1.98	4.76	5.12	92%
2020	13,806	3,500	1.26	2.01	4.84	5.21	93%
2021	14,002	3,536	1.28	2.04	4.92	5.29	95%
2022	14,438	4,054	1.34	2.14	5.17	5.56	100%
2023	14,444	4,062	1.34	2.15	5.17	5.56	100%
2024	14,451	4,070	1.34	2.15	5.17	5.56	100%
2025	14,457	4,078	1.34	2.15	5.18	5.57	100%
2026	14,492	4,229	1.35	2.16	5.21	5.61	101%
2027	14,526	4,570	1.37	2.19	5.28	5.67	102%
2028	14,560	4,721	1.38	2.20	5.31	5.71	103%
2029	14,595	4,872	1.39	2.22	5.35	5.75	103%
2030 (+10 years)	**14,877**	**5,023**	**1.42**	**2.27**	**5.48**	**5.89**	**106%**
2031	15,164	5,166	1.46	2.33	5.61	6.03	108%
2032	15,451	8,018	1.59	2.55	6.14	6.60	119%
2033	15,458	8,029	1.59	2.55	6.14	6.60	119%
2034	15,465	8,040	1.59	2.55	6.14	6.61	119%
2035	15,471	8,051	1.60	2.55	6.15	6.61	119%
2036	15,477	8,062	1.60	2.55	6.15	6.62	119%
2037	15,483	8,073	1.60	2.56	6.16	6.62	119%
2038	15,489	8,083	1.60	2.56	6.16	6.63	119%
2039	15,494	8,093	1.60	2.56	6.16	6.63	119%
2040 (+20 years)	**15,499**	**8,103**	**1.60**	**2.56**	**6.17**	**6.63**	**119%**

1 = Projected AAFs were estimated by using the 2017 AAF as the baseline, adding 100 gpcd (from the Orange Book) multiplied by the projected increase in sewer population from 2017, adding 38 gped (from historical AWWC data) multiplied by the projected increase in sewer employment from 2017, and subtracting the 2018 AAF for backwash recycle at the City's NWTP (0.02 MGD).
2 = Projected MMFs were estimated by multiplying the projected AAF by the highest historic MMF/AAF peaking factor from 2012 through 2018, which was 1.60 in 2015.
3 = Projected MDFs were estimated by multiplying the projected AAF by the highest historic MDF/AAF peaking factor from 2012 through 2018, which was 3.85 in 2015.
4 = Projected PHFs were estimated by multiplying the projected AAF by 4.15.
5 = The City's WRF is permitted for a maximum month average influent flow of 2.15 MGD.

Projected Wastewater Quality

Projected BOD_5 and TSS loadings are presented in **Tables ES-14** and **ES-15**. According to these projections, the WRF will need treatment upgrades to increase BOD_5 loading capacity prior to 2030. CIP projects to increase the treatment capacity of the WRF are included in **Chapter 11**.

Table ES-14
Projected WRF Influent BOD_5 Loading

Year	Sewer System Population	Sewer System Employment	Projected Average Annual BOD_5 (ppd)	Projected Max. Month Average BOD_5 (ppd)[2]	Percent of NPDES Permit Max. Month Limit[3]
2018	**13,391**	**3,437**	**3,023**	**4,891**	**94%**
2019	13,611	3,464	3,068	5,104	98%
2020	13,806	3,500	3,109	5,172	99%
2021	14,002	3,536	3,150	5,240	100%
2022	14,438	4,054	3,263	5,428	104%
2023	14,444	4,062	3,264	5,431	104%
2024	14,451	4,070	3,266	5,434	104%
2025	14,457	4,078	3,268	5,436	104%
2026	14,492	4,229	3,282	5,461	105%
2027	14,526	4,570	3,306	5,500	105%
2028	14,560	4,721	3,321	5,524	106%
2029	14,595	4,872	3,335	5,548	106%
2030 (+10 years)	**14,877**	**5,023**	**3,399**	**5,655**	**108%**
2031	15,164	5,166	3,464	5,762	110%
2032	15,451	8,018	3,664	6,095	117%
2033	15,458	8,029	3,666	6,098	117%
2034	15,465	8,040	3,668	6,101	117%
2035	15,471	8,051	3,669	6,104	117%
2036	15,477	8,062	3,671	6,107	117%
2037	15,483	8,073	3,673	6,110	117%
2038	15,489	8,083	3,675	6,113	117%
2039	15,494	8,093	3,676	6,115	117%
2040 (+20 years)	**15,499**	**8,103**	**3,678**	**6,118**	**117%**

1 = Projected average annual BOD_5 loadings were estimated by using the 2018 average annual BOD_5 loading as the baseline and adding 0.2 ppcd (from the Orange Book) multiplied by the projected increase in sewer population from 2018 and 0.05 pped (from the Orange Book) multiplied by the projected increase in sewer employment from 2018.

2 = Projected maximum month average BOD_5 loadings were estimated by multiplying the projected average annual BOD_5 loading by the highest historic maximum month average to average annual BOD_5 loading peaking factor from 2012 through 2018 (excluding 2016), which was 1.66 in 2018.

3 = The City's WRF is permitted for a maximum month average influent BOD_5 loading of 5,220 ppd.

Table ES-15
Projected WRF Influent TSS Loading

Year	Sewer System Population	Sewer System Employment	Projected Average Annual TSS (ppd)	Projected Max. Month Average TSS (ppd)[2]	Percent of NPDES Permit Max. Month Limit[3]
2018	**13,391**	**3,437**	**2,317**	**3,106**	**59%**
2019	13,611	3,464	2,362	3,544	68%
2020	13,806	3,500	2,403	3,605	69%
2021	14,002	3,536	2,444	3,667	70%
2022	14,438	4,054	2,557	3,836	73%
2023	14,444	4,062	2,559	3,839	74%
2024	14,451	4,070	2,560	3,841	74%
2025	14,457	4,078	2,562	3,844	74%
2026	14,492	4,229	2,577	3,866	74%
2027	14,526	4,570	2,600	3,901	75%
2028	14,560	4,721	2,615	3,923	75%
2029	14,595	4,872	2,629	3,945	76%
2030 (+10 years)	**14,877**	**5,023**	**2,693**	**4,041**	**77%**
2031	15,164	5,166	2,758	4,138	79%
2032	15,451	8,018	2,958	4,438	85%
2033	15,458	8,029	2,960	4,441	85%
2034	15,465	8,040	2,962	4,443	85%
2035	15,471	8,051	2,964	4,446	85%
2036	15,477	8,062	2,965	4,449	85%
2037	15,483	8,073	2,967	4,451	85%
2038	15,489	8,083	2,969	4,454	85%
2039	15,494	8,093	2,970	4,456	85%
2040 (+20 years)	**15,499**	**8,103**	**2,972**	**4,458**	**85%**

1 = Projected average annual TSS loadings were estimated by using the 2018 average annual TSS loading as the baseline and adding 0.2 ppcd (from the Orange Book) multiplied by the projected increase in sewer population from 2018 and 0.05 pped (from the Orange Book) multiplied by the projected increase in sewer employment from 2018.
2 = Projected maximum month average TSS loadings were estimated by multiplying the projected average annual TSS loading by the highest historic maximum month average to average annual TSS loading peaking factor from 2012 through 2018 (excluding 2016), which was 1.50 in 2013.
3 = The City's WRF is permitted for a maximum month average influent TSS loading of 5,220 ppd.

Projected Wastewater Flow and Load with Casino Expansion

Table ES-16 shows the existing and projected Casino flow and BOD_5 loadings that were developed for the analyses presented in this GSP. The existing Casino flows and loadings were based on the following:

- The Casino's 2017 AAF was 73,289 gpd, which was used for the existing Casino AAF.
- The MMF and PHF were estimated using the Casino's 2017 AAF and the MMF to AAF and PHF to AAF peaking factors of 1.60 and 4.15, respectively, from **Table ES-12**.
- For 2012 through 2016, the Casino's average of the average annual loadings was 334 ppd, which was used for the existing Casino BOD_5 loading.
- The maximum month BOD_5 loading was estimated to be 556 ppd using the average annual loading of 334 ppd and the maximum month average to average annual peaking factor of 1.66 from **Table ES-12**.

The projected sewer flows and BOD_5 loadings for the proposed Casino expansion were estimated based on the following:

- The projected sewer AAF, MMF, and PHF were developed and provided by Jacobs Engineering Group Inc. (Jacobs).
- The maximum month BOD_5 loading was estimated to be 921 ppd based on the projected average annual loading provided by Jacobs in conjunction with the Casino's 2016 maximum month average to average annual peaking factor of 1.35.

Table ES-16

Existing and Projected Casino Flow and BOD_5 Loading

	Flow			BOD_5 Loading	
Scenario	**Average Annual (gpd)**	**Max Month (gpd)**	**Peak Hour (gpm)**	**Average Annual (ppd)**	**Max Month (ppd)**
Existing	73,289	117,282	211	334	556
Casino with Expansion	216,000	245,000	254	684	921

The PHF projected for the proposed Casino expansion is 254 gpm (as shown in **Table ES-16**), which was used for evaluating the City's wastewater gravity collection system capacity and lift station capacities.

The projected sewer flows and BOD_5 loadings for the proposed Casino expansion were added to the City's initial sewer flow and BOD_5 loading projections. **Tables ES-13** and **ES-14**, which display flow and loading projections, were updated to show the effect of the Casino expansion occurring in 2024 and are presented in **Tables ES-17** and **ES-18**, respectively. The evaluations of the City's WRF capacity was updated based on the projections presented in **Tables ES-17** and **ES-18**. Capital Improvement Plan (CIP) projects to increase the MMF and BOD_5 treatment capacity prior to 2030. CIP projects to increase the treatment capacity of the WRF are included in **Chapter 11**.

Table ES-17
Projected WRF Flow

Year	AAF with Expanded Casino (MGD)	MMF with Expanded Casino (MGD)	PHF with Expanded Casino (MGD)	Percent of NPDES Permit Max. Month Limit[1]
2021	1.28	2.04	5.29	95%
2022	1.34	2.14	5.56	100%
2023	1.34	2.15	5.56	100%
2024	1.48	2.28	5.63	106%
2025	1.49	2.28	5.63	106%
2030 (+10 years)	**1.56**	**2.40**	**5.95**	**112%**
2040 (+20 years)	**1.74**	**2.69**	**6.70**	**125%**

1 = The City's existing WRF is permitted for a MMF of 2.15 MGD.

Table ES-18
Projected WRF Influent BOD_5 Loading

Year	Projected Average Annual BOD_5 with Expanded Casino (ppd)	Projected Max. Month Average BOD_5 with Expanded Casino (ppd)	Percent of NPDES Permit Max. Month Limit[1]
2021	3,150	5,240	100%
2022	3,263	5,428	104%
2023	3,264	5,431	104%
2024	3,616	5,799	111%
2025	3,618	5,802	111%
2030 (+10 years)	**3,749**	**6,020**	**115%**
2040 (+20 years)	**4,028**	**6,484**	**124%**

1 = The City's existing WRF is permitted for a maximum month average influent BOD_5 loading of 5,220 ppd.

Policies and Design Criteria

The City operates and plans sewer service for the City and associated sewer service area residents and businesses according to the design criteria, laws, and policies that originate from the EPA and Ecology.

These laws, design criteria, and policies guide the City's operation and maintenance of the sewer system on a daily basis, as well as the City's plan for growth and improvements. The overall objective is to ensure that the City provides high quality sewer service at a fair and reasonable cost to its customers. They also set the standards the City must meet to ensure that the sewer system is adequate to meet existing and future flows. The system's ability to handle these flows is detailed in **Chapter 6**. The City Council adopts regulations and policies. The City's policies cannot be less stringent or in conflict with those established by federal and state governments. The City's policies take the form of ordinances, memoranda, and operational procedures, many of which are summarized in **Chapter 5**.

The City will maintain an updated sewer system plan that is coordinated with the Land Use Element of the City's *Comprehensive Plan*, so that new development will be located where sufficient sewer system capacity exists or can be efficiently and logically extended.

Summary of Improvements

A general description of improvements and an overview of the deficiencies they will resolve are presented in **Chapter 11**. Some of the improvements are necessary to resolve existing system deficiencies. The sewer system improvements were identified from the results of the collection system evaluation presented in **Chapter 6** and the WRF evaluation presented in **Chapter 7**. The sewer system improvements were sized to meet the system's projected 2040 demand conditions.

Based on the WRF evaluation, two general groups of deficiencies were identified. Improvement alternatives to resolve each deficiency in the "major" group were compared in alternatives analyses presented in **Chapter 8**. Selected improvement alternatives, along with improvements to resolve the "minor" group of deficiencies, are presented in **Chapter 9**. The minor group consists of deficiencies that necessitate normal maintenance or in-kind replacements that the City would like to include in the capital budget. The major group consists of two projects as follows: 1) deficiencies of the oxidation ditches' biological treatment and secondary clarifiers capacities due to increasing flow and loading; and a 2) deficiency of the reclaimed water filters due to age and condition. The Activated Sludge Basins Improvements CIP will not only resolve the biological treatment capacity deficiency through 2040, it is likely it also will resolve the clarifiers capacity deficiency until 2030 or beyond. Once the Activated Sludge Basins Improvements are constructed, operational data can be evaluated to make a final determination of the timing to construct a third secondary clarifier.

Collection system improvements also have been identified for the undeveloped areas in the City and its UGA to illustrate the major facilities that will be required to properly serve those areas. Additional developer-funded projects include localized sewer main improvements that are not associated with the existing overall sewer collection/interceptor system but will be necessary when the property served by the sewer system is redeveloped or expanded. The costs associated with all of these improvements shall be borne by the developers, rather than the existing sewer customers. The locations of improvements in the undeveloped areas are to be used for planning purposes only and are based on one route. The improvements shall be designed in the future to fit the specific layout of the developments. The required capacity and timing of each recommended improvement is provided for budgeting and financial projection purposes only. The actual design parameters should be evaluated at the design phase of the project, using the hydraulic model or another accepted engineering procedure. Updated population, employment, and flow data should be used when available to ensure the proposed facilities are adequately sized to handle build-out flows.

It is intended that this GSP contain an inclusive list of recommended system improvements; however, additional projects may need to be added or removed from the list as growth occurs or conditions change. The City will evaluate the capacity of the wastewater collection system and WRF as growth occurs and as development permits are received.

Project costs for the proposed improvements were estimated based on costs of similar recently constructed sewer projects in the City and around the Puget Sound area and are presented in 2019 dollars. The cost estimates include the estimated construction costs and indirect costs. The existing system improvements were prioritized by the City based on a perceived need for the improvement to be completed prior to projects with fewer deficiencies or less risk of damage due to failure of the system. The schedule for the developer-funded projects will be dependent on the timing and design of the specific development areas. A general schedule has been established for planning purposes; the schedule should be modified based on City preferences, budget, or as development fluctuates. In addition, the City retains the flexibility to reschedule, expand, or reduce the projects presented in **Table ES-19** when new information becomes available for review and analysis.

Table ES-19
Proposed CIP Implementation Schedule

CIP No.	Project Description	Size: Length (LF)	Size: Diameter (in.)	Estimated Cost (2019 $)	Schedule of Improvements – Planned Year of Project and Estimated Cost in 2019 $: 2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031 to 2040
	Sewer Main Improvements															
SM1	384th Street SE Sewer Main between SE Newton Street and SE Kimball Creek Drive [SWR20002CIP]	1,970	12"	$1,388,000			$709K	$679K								
SM2	Sewer Line Relocation at Pump Station No. 4 (Meadowbrook) [SWR18002CIP]	300	8"	$1,211,000	$1,211K											
SM3	Pump Station No. 1 to MH No. 14 (SE Newton Street) Sewer Main [SWR20001CIP]	2,070	12", 18"	$1,534,000	$1,303K					$231K						
SM4	Street Preservation Program - Sewer [PUW20002CIP and PUW16001CIP]	3,560	8", 10"	$2,144,000	$444K	$1,700K										
SM5	SR 202 Bridge Sewer Main Replacement Project Feasibility Analysis [UTL22001CIP]	---	---	$75,000		$50K	$25K									
SM6	SR 202 Bridge Sewer Main Replacement Project, [UTL22001CIP]	---	---	$1,424,000								$1,424K				
Total - Sewer Main Improvements				**$7,776,000**	**$2,958K**	**$1,750K**	**$734K**	**$679K**	**$0K**	**$231K**	**$0K**	**$1,424K**	**$0K**	**$0K**	**$0K**	**$0K**
	Lift Station Improvements															
WW1	Existing Kimball Creek Pump Station Improvements			$1,227,000		$228K	$999K									
WW2	Pump Station No. 2 (Pickering Court) Reconstruction and Force Main Replacement [SWR19001CIP]			$707,800	$235K	$473K										
WW3	Pump Station No. 1 (Railroad Place) Improvements [SWR19002CIP]			$745,800	$499K	$247K										
WW4	Pump Station No. 3 Improvements			$160,000												$160K
WW5	Pump Station No. 4 Improvements			$145,000												$145K
WW6	Pump Station No. 6 Improvements			$150,000												$150K
WW7	Pump Station BP Improvements			$160,000												$160K
WW8	Pump Station E Improvements			$160,000												$160K
WW9	Pump Station F Improvements			$145,000												$145K
WW10	Pump Station K2 Improvements			$135,000												$135K
WW11	Pump Station K3 Improvements			$160,000												$160K
WW12	Pump Station L Improvements			$165,000												$165K
WW13	Pump Station N6 Improvements			$135,000												$135K
WW14	Pump Station S12A Improvements			$200,000												$200K
WW15	Pump Station Z Improvements			$135,000												$135K
WW16	Hospital Pump Station Improvements			$145,000												$145K
WW17	Future Kimball Creek Pump Station Improvements - Phase I			$638,000							$638K					
WW18	Future Kimball Creek Pump Station Improvements - Phase II			$305,000												$305K
Total - Facility Improvements				**$5,618,600**	**$734K**	**$948K**	**$999K**	**$0K**	**$0K**	**$0K**	**$638K**	**$0K**	**$0K**	**$0K**	**$0K**	**$2,300K**
	Water Reclamation Facility Improvements															
F1	Existing Secondary Clarifier Improvements			$933,000		$159K	$774K									
F2	Centrifuge Components Replacement			$100,000					$100K							
F3	WRF Interior Road Grind and Overlay			$309,000								$309K				
F4	Non-Potable Water Pump Station Replacement			$180,000						$180K						
F5	Grit Removal System Improvements			$548,000		$32K	$31K	$243K	$243K							
F6	Reclaimed Water Filters Replacement			$3,000,000								$600K	$2,400K			
F7	Third Secondary Clarifier [SWR16004CIP]			$3,844,000												$3,844K
F8	Activated Sludge Basins Improvements			$7,860,000		$1,200K	$1,200K	$2,730K	$2,730K							
Total - Facility Improvements				**$16,774,000**	**$0K**	**$1,391K**	**$2,005K**	**$2,973K**	**$3,073K**	**$180K**	**$0K**	**$909K**	**$2,400K**	**$0K**	**$0K**	**$3,844K**
	Miscellaneous and Planning Improvements															
M1	General Sewer Plan Update			$450,000											$225K	$225K
M2	WRF Engineering Report			$300,000												$300K
M3	Sewer System Defect Investigation			$50,000												$50K
M4	Inflow and Infiltration Study			$125,000												$125K
Total - Miscellaneous Improvements				**$925,000**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$225K**	**$700K**
Total Estimated Project Costs of City-funded Improvements				**$31,093,600**	**$3,692K**	**$4,089K**	**$3,738K**	**$3,652K**	**$3,073K**	**$411K**	**$638K**	**$2,333K**	**$2,400K**	**$0K**	**$225K**	**$6,844K**
	Developer-Funded Improvements															
DF1	Pump Station BP Capacity Upgrades			$1,074,000	Timing of Project Based on Timing of Future Developments											
DF2	Pump Station S22 Construction			$1,397,000	Timing of Project Based on Timing of Future Developments											
DF3	Snoqualmie Hills West Pump Station Construction			$2,206,000	Timing of Project Based on Timing of Future Developments											
DF4	Snoqualmie Hills East Pump Station Construction			$1,092,000	Timing of Project Based on Timing of Future Developments											
DF5	Mill Site Pump Station Construction			$2,428,000	Timing of Project Based on Timing of Future Developments											
DF6	Aerobic Digester Aeration Improvements			$893,000	Timing of Project Based on Timing of Future Developments											
Total - Developer-Funded Improvements				**$9,090,000**	**Timing of Projects Based on Timing of Future Developments**											

Operation and Maintenance

Chapter 10 addresses the operation and maintenance (O&M) staff for the City's WRF and collection system. Currently, there are 7 full-time employee positions funded and assigned to the O&M of the City's sewer system.

The collection system will continue to expand with population growth, and the City will need additional staff to continue maintaining the gravity sewers, force mains, and lift stations. For O&M needs, the City may need to add one more person to achieve optimum O&M of the sewer system.

Financial Summary

The financial viability analysis performed by FCS GROUP for the GSP considers the historical financial condition, current and identified future financial and policy obligations, O&M needs, and the financial impacts of the capital projects identified in this GSP. Furthermore, this chapter provides a review of the sewer utility's current rate structure with respect to rate adequacy and customer affordability.

The City's utilities operate on a cash basis. Therefore, annual balance sheets and income statements are not prepared. In addition, financial reporting occurs on a combined utility fund basis. Individual utility financial performance history has been isolated by reviewing the City's historical revenue and expense reports. **Table ES-20** shows a summary of sewer fund resources and uses arising from cash transactions for the previous 6 years (2014 through 2019).

Table ES-20
Summary of Historical Fund Resources and Uses Arising from Cash Transactions

	2014	2015	2016	2017	2018	2019
Beginning Cash and Investments						
Reserved	$ 1,122,525	$ 1,421,641	$ 1,874,386	$ 3,432,211	$ (2,072,467)	$ 6,981,704
Revenues						
Charges for Goods and Services	$ 2,975,641	$ 3,546,472	$ 3,871,144	$ 3,953,772	$ 4,748,112	$ 5,689,869
Miscellaneous Revenues	95,372	36,540	35,449	2,460	315,030	85,954
Total Operating Revenues:	$ 3,071,013	$ 3,583,012	$ 3,906,593	$ 3,956,232	$ 5,063,142	$ 5,775,822
Expenditures						
Utilities	$ 2,300,045	$ 2,778,847	$ 2,737,442	$ 2,897,820	$ 2,892,290	$ 2,898,091
Total Operating Expenditures:	$ 2,300,045	$ 2,778,847	$ 2,737,442	$ 2,897,820	$ 2,892,290	$ 2,898,091
Excess (Deficiency) Revenues over Expenditures:	**$ 770,967**	**$ 804,165**	**$ 1,169,151**	**$ 1,058,411**	**$ 2,170,852**	**$ 2,877,731**
Other Increases in Fund Resources						
Debt Proceeds	$ -	$ 324,575	$ 59,881	$ 1,947,987	$ 18,751,475	$ -
Custodial Activities	-	-	1,399,814	-	-	-
Other Resources	47,464	259,086	-	-	-	-
Total Other Increases in Fund Resources	$ 47,464	$ 583,662	$ 1,459,694	$ 1,947,987	$ 18,751,475	$ -
Other Decreases in Fund Resources						
Capital Expenditures	$ 102,638	$ 410,348	$ 695,914	$ 4,636,452	$ 9,420,615	$ 3,119,301
Debt Service - Principal and Interest	273,619	266,112	268,966	121,837	439,708	1,166,321
Debt Service - Transfers*	-	-	-	2,271,137	1,901,533	-
Transfers-Out	143,060	181,980	106,140	105,340	106,300	107,550
Custodial Activities	-	-	-	1,376,310	-	-
Other Uses	-	76,642	-	-	-	-
Total Other Decreases in Fund Resources	$ 519,316	$ 935,082	$ 1,071,020	$ 8,511,077	$ 11,868,157	$ 4,393,172
Increase (Decrease) in Cash and Investments:	**$ 299,115**	**$ 452,745**	**$ 1,557,825**	**$ (5,504,678)**	**$ 9,054,171**	**$ (1,515,441)**
Ending Cash and Investments						
Reserved	1,421,641	1,874,386	3,432,211	(2,072,467)	6,981,704	5,466,263
O&M Coverage Ratio	133.52%	128.94%	142.71%	136.52%	175.06%	199.30%
Net Operating Income as a % of Operating Revenue	25.10%	22.44%	29.93%	26.75%	42.88%	49.82%
Debt Service Coverage Ratio**	2.82	3.02	4.35	8.69	4.94	2.47

*Debt Service - Transfers includes repayment of the City's bond anticipation notes
**Does not include Debt Service - Transfers

The sewer utility is responsible for generating sufficient revenue to meet all of its costs. The primary source of funding is derived from ongoing monthly service charges, with additional revenue coming from engineering charges and other miscellaneous revenues. Improvements to the sewer system are primarily necessary to resolve existing system deficiencies, but they also will improve operations, replace aging infrastructure, and accommodate future sewer customers. A summary of the 11-year and 21-year CIPs are shown in **Table ES-21**. As shown, each year has varied capital cost obligations depending on construction schedules and infrastructure planning needs.

Table ES-21
11-Year and 21-Year CIPs

Year	Unescalated $	Escalated $
2020	$ 2,593,287	$ 2,593,287
2021	4,252,228	4,379,795
2022	3,119,870	3,309,870
2023	3,222,340	3,521,138
2024	3,942,616	4,437,449
2025	977,922	1,133,679
2026	1,465,051	1,749,347
2027	3,360,707	4,133,245
2028	3,311,117	4,194,424
2029	855,893	1,116,746
2030	872,512	1,172,584
11-Year Total	**$ 27,973,542**	**$ 31,741,564**
2031 - 2040	16,474,629	25,567,617
21-Year Total	**$ 44,448,171**	**$ 57,309,181**

An ideal capital financing strategy would include the use of grants and low-cost loans when debt issuance is required. However, these resources are very limited and competitive in nature and do not provide a reliable source of funding for planning purposes. It is recommended that the City pursue these funding avenues but assume revenue bond financing to meet the needs which cannot be met by available cash resources. The capital financing strategy developed to fund the CIP identified in this GSP assumes the following funding resources:

- Accumulated cash reserves, which may include proceeds from previously issued bonds.
- Transfers of excess cash (over minimum balance targets) from the Operating Fund.
- General facilities charge revenues.
- Developer contributions.
- Interest earned on Capital Fund balances and other miscellaneous capital resources.

The cash resources described above are anticipated to fund 63.80 percent of the 11-year CIP and 54.86 percent of the 21-year CIP. The remaining funding is assumed to come from developer contributions and general facilities charges. **Table ES-22** presents the 11-year and 21-year capital financing strategy.

Table ES-22
11-Year and 21-Year Capital Financing Strategy

Year	Capital Expenditures Escalated	Funding Source			Total Financial Resources
		General Facilities Charges	Developer Contributions	Cash Funding	
2020	**$ 2,593,287**	$ -	$ -	$ 2,593,287	**$ 2,593,287**
2021	**4,379,795**	-	514,537	3,865,258	**4,379,795**
2022	**3,309,870**	2,782,629	527,241	-	**3,309,870**
2023	**3,521,138**	554,389	1,229,056	1,737,694	**3,521,138**
2024	**4,437,449**	-	1,265,927	3,171,522	**4,437,449**
2025	**1,133,679**	-	-	1,133,679	**1,133,679**
2026	**1,749,347**	625,974	-	1,123,373	**1,749,347**
2027	**4,133,245**	1,289,506	180,388	2,663,351	**4,133,245**
2028	**4,194,424**	664,096	-	3,530,328	**4,194,424**
2029	**1,116,746**	684,019	-	432,728	**1,116,746**
2030	**1,172,584**	1,172,584	-	-	**1,172,584**
Subtotal	**$ 31,741,564**	**$ 7,773,196**	**$ 3,717,148**	**$ 20,251,220**	**$ 31,741,564**
2031 - 2040	**25,567,617**	14,377,280	-	11,190,337	**25,567,617**
Total	**$ 57,309,181**	**$ 22,150,475**	**$ 3,717,148**	**$ 31,441,557**	**$ 57,309,181**

The financial forecast is primarily based upon the City's budget through 2022 and takes into consideration other key factors and assumptions needed to develop a complete portrait of the City's annual sewer utility financial obligations. Key revenue and expense factors used to develop the financial forecast include growth, revenue sources, general facilities charge revenue, O&M expenses, existing debt, and transfers to capital. **Table ES-23** summarizes the annual revenue requirements based on the forecast of revenues, expenditures, fund balances, and fiscal policies. The City's financial forecast indicates that revenues sufficiently cover expenses of the sewer utility throughout the forecast.

Table ES-23
11-Year Financial Forecast

Revenue Requirement	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Revenues											
Rate Revenues Under Existing Rates	$ 5,807,532	$ 6,007,787	$ 6,247,675	$ 6,247,675	$ 6,247,675	$ 6,247,675	$ 6,287,657	$ 6,367,620	$ 6,407,601	$ 6,447,583	$ 6,567,527
Non-Rate Revenues	38,150	30,046	31,804	33,948	36,445	38,612	39,813	41,077	42,384	44,401	45,050
Total Revenues	**$ 5,845,682**	**$ 6,037,833**	**$ 6,279,479**	**$ 6,281,624**	**$ 6,284,121**	**$ 6,286,288**	**$ 6,327,470**	**$ 6,408,697**	**$ 6,449,985**	**$ 6,491,983**	**$ 6,612,577**
Expenses											
Cash Operating Expenses	$ 2,864,953	$ 2,868,359	$ 2,934,916	$ 3,166,709	$ 3,131,902	$ 3,246,468	$ 3,377,704	$ 3,515,537	$ 3,983,565	$ 3,770,940	$ 3,939,251
Existing Debt Service	1,261,996	1,259,078	1,262,521	1,227,116	1,226,900	1,227,521	1,228,666	1,228,995	1,067,969	1,067,156	1,068,078
New Debt Service	-	-	-	-	-	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-	-	-	-	-	-	-
Total Expenses	**$ 4,126,949**	**$ 4,127,437**	**$ 4,197,437**	**$ 4,393,825**	**$ 4,358,802**	**$ 4,473,989**	**$ 4,606,371**	**$ 4,744,533**	**$ 5,051,534**	**$ 4,838,096**	**$ 5,007,328**
Total Surplus (Deficiency)	**$ 1,718,733**	**$ 1,910,396**	**$ 2,082,042**	**$ 1,887,799**	**$ 1,925,319**	**$ 1,812,299**	**$ 1,721,099**	**$ 1,664,164**	**$ 1,398,451**	**$ 1,653,888**	**$ 1,605,249**
Annual Rate Adjustment	**0.00%**	**0.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**
Cumulative Annual Rate Adjustment	**0.00%**	**0.00%**	**2.00%**	**4.04%**	**6.12%**	**8.24%**	**10.41%**	**12.62%**	**14.87%**	**17.17%**	**19.51%**
Rate Revenues After Rate Increase	$ 5,807,532	$ 6,007,787	$ 6,372,629	$ 6,500,081	$ 6,630,083	$ 6,762,685	$ 6,942,081	$ 7,170,974	$ 7,360,320	$ 7,554,371	$ 7,848,803
Additional Taxes from Rate Increase	-	-	4,813	9,723	14,730	19,838	25,208	30,945	36,699	42,633	49,355
Net Cash Flow After Rate Increase	**$ 1,718,733**	**$ 1,910,396**	**$ 2,202,182**	**$ 2,130,482**	**$ 2,292,996**	**$ 2,307,470**	**$ 2,350,315**	**$ 2,436,573**	**$ 2,314,471**	**$ 2,718,042**	**$ 2,837,170**
Coverage After Rate Increases	2.7	2.9	6.1	3.1	3.2	3.2	3.9	4.5	4.4	4.8	6.4

The City's current rate structure consists of a fixed monthly charge based on customer class, with high-strength sewer commercial customers paying more than low-strength customers. The financial forecast includes inflation-level annual rate increases of 2.00 percent throughout the study period. **Table ES-24** shows the projected rates with increases applied uniformly to all rate components in all classes.

Table ES-24
Proposed Schedule of Rates

Monthly Rates	Existing	Proposed									
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Monthly Fixed	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**
Residential	$ 78.99	$ 78.99	$ 80.57	$ 82.18	$ 83.82	$ 85.50	$ 87.21	$ 88.96	$ 90.73	$ 92.55	$ 94.40
Multifamily (per unit)	62.87	62.87	64.13	65.41	66.72	68.05	69.41	70.80	72.22	73.66	75.14
Commercial											
Low Strength	97.92	97.92	99.88	101.88	103.91	105.99	108.11	110.27	112.48	114.73	117.02
High Strength	121.72	121.72	124.15	126.64	129.17	131.75	134.39	137.08	139.82	142.61	145.47
Volume Charge	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**
Commercial (> 600 cf per month)											
Low Strength	$ 7.09	$ 7.09	$ 7.23	$ 7.38	$ 7.52	$ 7.67	$ 7.83	$ 7.98	$ 8.14	$ 8.31	$ 8.47
High Strength	9.64	9.64	9.83	10.03	10.23	10.43	10.64	10.86	11.07	11.29	11.52

The results of this analysis indicate that the sewer utility's existing rates are sufficient to cover all existing and forecasted financial obligations. However, best practice in utility rate-setting is to adopt inflation-level annual rate increases to avoid future rate spikes. Beginning in 2022, annual rate increases of 2.00 percent through 2030 should provide for continued financial viability while maintaining affordable rates.

1 | INTRODUCTION

SEWER SYSTEM OWNERSHIP AND MANAGEMENT

The City of Snoqualmie (City), located in central King County, is a municipal corporation that provides wastewater collection and treatment, among other municipal services. The City owns, operates, and maintains the sewer system (refer to **Overview of Existing System**). Ownership information, including the owner's authorized representative, is as follows.

Physical Address:
City of Snoqualmie
38624 SE River Street
Snoqualmie, WA 98065

Mailing Address:
City of Snoqualmie
P.O. Box 987
Snoqualmie, WA 98065

Authorized Representative Name and Phone Number: Mayor Katherine Ross, (425) 888-5307

Operation and management of the sewer system is provided by the Utilities Division of the City's Parks and Public Works Department.

OVERVIEW OF EXISTING SYSTEM

The City's sewer system is comprised of 1 treatment plant, 17 sewer lift stations, and approximately 57.2 miles of gravity and force main pipes. The City provided wastewater collection and treatment to an estimated 13,391 people in 2018, compared to the City's population of 13,450. Currently, 34 properties within the City limits are using on-site septic systems. As of 2018, the City's number of wastewater service customer connections was approximately 4,718. The City's sewer planning area is the same as its Urban Growth Area (UGA).

The wastewater treatment plant is identified as the Water Reclamation Facility (WRF) and consists of a headworks, oxidation ditches, secondary clarifiers, sand filters (for reclaimed water production), ultraviolet light (UV) disinfection system, separate river and reclaimed water discharges, and a solids handling facility (for Class B biosolids production) that includes a rotary drum thickener, aerobic digesters, centrifuges, and a truck bay to load biosolids for hauling offsite. The WRF is permitted for a maximum month average flow (MMF) of 2.15 million gallons per day (MGD).

A summary of the City's sewer system data is provided in **Table 1-1**.

Table 1-1
2018 City Sewer System Data

Description	Data
City Population	13,450
Number of Properties on Septic Systems	34
Sewer System Population	13,391
Total Connections	4,718
Sewer Planning Area - UGA (Square Miles)	8.8
Average Gallons per Capita per Day (gpcd)	81
Average Annual Flow (MGD)	1.09
Maximum Month Average Flow (MGD)	1.64
Maximum Day Flow (MGD)	2.19
Number of Lift Stations	17
Total Length of Gravity Main (Miles)	47.1
Length of 8-inch-diameter Gravity Main (Miles)	36.4
Total Length of Force Main (Miles)	10.0
WRF Permitted Maximum Month Average Flow (MGD)	2.15

AUTHORIZATION AND PURPOSE

The City authorized RH2 Engineering, Inc., (RH2) to prepare a General Sewer Plan (GSP) in accordance with Washington Administrative Code (WAC) 173-240-050. The previous GSP (2012 GSP) was prepared by Gray & Osborne, Inc. for the City in 2012 and was approved by the Washington State Department of Ecology (Ecology) in 2015. For select WRF improvements identified, this GSP also has been prepared in accordance with WAC 173-240-060 (Engineering Report) and additional "facility plan" requirements identified in WAC 173-240-060 (5) and Sections G1-2.5.1 (Engineering Reports/Facility Plans) and G1-4.1 (Engineering Report/Facility Plan) of Ecology's *Criteria for Sewage Works Design* (commonly known as the Orange Book).

This GSP does not include the City's reclaimed water distribution system and associated requirements. The 2015 *Reclaimed Water Reuse Plan* includes this system. Content in this GSP related to the City's supply of reclaimed water is limited to describing existing components at the WRF used for production and supply of reclaimed water, presenting water quality requirements from the City's National Pollutant Discharge Elimination System (NPDES) permit, and proposing equipment replacement improvements for the reclaimed water filters.

The purpose of this updated GSP is as follows:

- To update the City's GSP for consistency with the future population and employment growth projections from the City's Community Development Department, Planning Division.
- To evaluate existing sewer flow and loading data and project future flows and loadings.
- To analyze the existing sewer system to determine if it meets minimum requirements mandated by Ecology and the City's own policies and design criteria.

- To determine the overall reliability and vulnerability of the existing wastewater lift stations.
- To evaluate the existing WRF to determine if the treatment facility meets the City's NPDES permit requirements.
- To identify sewer system improvements that will resolve existing system deficiencies and accommodate future needs of the system.
- To identify WRF improvements that will resolve existing system deficiencies and accommodate future wastewater treatment needs. This GSP has been prepared and submitted for approval as an engineering report (meeting additional "facility plan" requirements) for the following WRF improvements.
    - Activated Sludge Basins Improvements
    - Reclaimed Water Filters Replacement
- To prepare a schedule of improvements that meets the goals of the City's financial program.

PREVIOUS PLANNING EFFORTS

The following documents provide a history of the planning efforts involving the City's sewer system.

2003 *Quadrant Corporation Snoqualmie Ridge II Wastewater Collection Facilities Project Report*

2007 *Snoqualmie Ridge Division Sewer Capacity Analysis Letter Report*

2012 *General Sewer Plan*

2015 *Snoqualmie Water Reclamation Facility Improvements Engineering Report*

2015 *Reclaimed Water Reuse Plan*

2017 *Design Criteria for Solids Handling System Improvements Technical Memorandum*

SUMMARY OF PLAN CONTENTS

A brief summary of the content of the chapters in this GSP is as follows:

- **Chapter 1** introduces the reader to the City's sewer system, the objectives of the GSP, and the GSP organization.
- **Chapter 2** presents the sewer service area and describes the existing sewer system.
- **Chapter 3** presents related plans, land use, and population characteristics.
- **Chapter 4** identifies existing wastewater flow and loading rates and projects future flow and loading rates.
- **Chapter 5** presents the City's operational policies and design criteria.
- **Chapter 6** discusses the wastewater collection analyses and deficiencies.
- **Chapter 7** discusses the WRF analyses and deficiencies.

- **Chapter 8** compares the alternatives for select WRF improvements.
- **Chapter 9** presents the recommended improvements for the WRF to address existing and projected deficiencies.
- **Chapter 10** discusses the City's operations and maintenance program.
- **Chapter 11** presents the proposed wastewater collection system and WRF improvements, their estimated costs, and a schedule for implementation.
- **Chapter 12** summarizes the financial status of the sewer utility and presents a plan for funding the sewer improvements.

LIST OF ABBREVIATIONS

The abbreviations listed in **Table 1-2** are used throughout this GSP.

Table 1-2
Abbreviations

Abbreviation	Description
AACE	Association of Cost Engineers
AAF	Average Annual Flow
AC	asbestos cement
BOD_5	5-day Biochemical Oxygen Demand
BRB	Boundary Review Board
CIP	Capital Improvement Plan
CERB	Community Economic Revitalization Board
City	City of Snoqualmie
County	King County
CPI	Consumer Price Index
DC	Direct Current
DI	ductile iron
DMR	Daily Monitoring Report
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERU	Equivalent Residential Unit
F.O.G.	Fats, Oils, and Grease
fps	feet per second
FTE	Full-Time Equivalent
GFC	General Facilities Charge
GMA	Growth Management Act
gpad	gallons per acre per day
gpcd	gallons per capita per day
gpd	gallons per day
gped	gallons per employee per day
gpm	gallons per minute
GSP	General Sewer Plan
HDPE	high-density polyethylene
hp	horsepower
IACC	Infrastructure Assistance Coordinating Council
I/I	Inflow and Infiltration
KCC	King County Code
kW	kilowatt
LF	linear feet
LID	Local Improvement District
MCC	Motor Control Center
MDF	Maximum Day Flow
MG	Million Gallons
MGD	Million Gallons per Day
mg/L	milligrams per liter
MMF	Maximum Month Average Flow

Table 1-2
Abbreviations (Continued)

Abbreviation	Description
MSDS	Material Safety Data Sheets
MUTCD	Manual on Uniform Traffic Control Devices
NPDES	National Pollutant Discharge Elimination System
OFM	Office of Financial Management
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
PAA	Potential Annexation Area
PHF	Peak Hour Flow
PIF	Peak Instantaneous Flow
ppcd	pounds per capita per day
ppd	pounds per day
psi	pounds per square inch
PVC	polyvinyl chloride
PWTF	Public Works Trust Fund
RCW	Revised Code of Washington
SCADA	Supervisory Control and Data Acquisition
SEPA	State Environmental Policy Act
State	State of Washington
TAZ	Transportation Analysis Zone
TSS	Total Suspended Solids
TTO	total toxic organic compounds
UGA	Urban Growth Area
USGS	United States Geological Survey
VFD	Variable Frequency Drive
ULID	Utility Local Improvement District
UV	Ultraviolet Light
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
WRF	Water Reclamation Facility

2 | SEWER SYSTEM DESCRIPTION AND DISCHARGE REGULATIONS

INTRODUCTION

This chapter describes the City of Snoqualmie's (City) sewer service area, wastewater collection and treatment system, lift stations, and discharge and disposal regulations and permits. Included in this chapter is a brief overview of the City's topography, geology, and climate to provide a better understanding of the physical characteristics of the City. A brief description of the City's water system facilities also is presented.

Analysis of the existing sewer system is presented in **Chapter 4**. The results of the evaluation and analyses of the existing sewer system are presented in **Chapter 6**. Evaluation of the existing treatment facility is presented in **Chapter 7**. Improvements to address treatment facility deficiencies are presented in **Chapters 8** and **9**.

SEWER SERVICE AREA

History

The City was incorporated in 1903. The City is located in the western foothills of the Cascade mountains, in central King County, approximately 25 miles east of the City of Seattle. The City is located mostly north of Interstate 90. The City of North Bend borders the City to the southeast, and the unincorporated community of Fall City is located to the northwest. The City has experienced significant population growth in the last decade, with an estimated population of 10,670 residents in 2010, and an estimated population of 13,450 residents in 2018.

The City's sewer collection system was originally constructed in the 1960s. The system originally consisted of concrete gravity sewer pipes, lift stations, and force mains conveying wastewater to a treatment facility with two aerated lagoons located on the site of the City's current Water Reclamation Facility (WRF). Since development of Snoqualmie Ridge began in the mid-1990s, the system has been expanded significantly with additional collection system piping, new lift stations and force mains, and upgrades to the WRF. Since its construction in 1997, the WRF has been expanded to increase capacity and produce Class B biosolids (treated wastewater sludge that may be used as fertilizer with some restrictions). The WRF is permitted to treat a maximum month average flow of 2.15 million gallons per day (MGD) and discharges treated secondary effluent to the Snoqualmie River (River). The WRF also produces Class A reclaimed water (treated wastewater that may be used for landscape irrigation of open access areas), which is pumped to Eagle Lake for irrigation of the TPC Snoqualmie Ridge Golf Course (Golf Course) and several City customers. An aerial view of the WRF is shown in **Figure 2-1**, which also identifies the general location of the outfall for the secondary effluent discharge to the River.

Figure 2-1

Water Reclamation Facility Aerial

The customers currently served by the City's sewer system are primarily residential, but also include a number of commercial, hospitality, and retail businesses, schools, and the Snoqualmie Valley Hospital. **Figure 2-2** shows the extents of the sewer collection system.

Geology

The geology within the City limits and Urban Growth Area (UGA) is diverse. The City's service area is located within the foothills of the Cascade Mountains, and its geology is influenced by bedrock, folding, faulting, and deposition during continental glaciations and non-glacial periods.

Bedrock in the area consists of intrusive igneous, volcanic, and continental and marine sedimentary units. Bedrock crops out near Snoqualmie Falls, on the flanks of Rattlesnake Mountain, and as an isolated island protruding from the valley floor. Snoqualmie Falls is created by the current course of the Snoqualmie River flowing over resistant volcanic bedrock. Areas with bedrock at the surface are not susceptible to liquefaction.

Several faults (active and dormant) have been mapped within the sewer service area. These faults include several strands of the Rattlesnake Mountain Fault, the Lake Alice Fault, the Tokul Creek Fault, the Griffin Creek Fault, and the Snoqualmie Valley Fault. Faulting has led to the formation of the Snoqualmie Basin, which is a structural depression that has been filled with a thick sequence of younger (Quaternary Period – 2.6 million years old to present) deposits that continues to this day.

Unconsolidated sediments found at ground surface and in the subsurface under the sewer service area are lumped into sediments deposited during non-glacial and glacial periods over the last 185,000 years. From youngest to oldest, these deposits include young non-glacial deposits (present to 13,000 years ago), deposits of the Vashon Stade of the Fraser Glaciation (13,000 to 15,000 years ago), deposits of the Olympia non-glacial period (15,000 to 60,000 years ago), deposits of the Possession Glaciation (60,000 to 80,000 years ago), deposits of the Whidbey non-glacial period (80,000 to 125,000 years ago), and finally deposits of the Double Bluff Glaciation (125,000 to 185,000 years ago). Unconsolidated sediments older than the Double Bluff Glaciation are not broken out due to the lack of outcrop at the surface.

The valley floor adjacent to the Snoqualmie River and its tributaries is composed of alluvium and peat sediments. The valley floor sediments have a moderate to high liquefaction susceptibility. During an earthquake, liquefaction can cause uneven settling of these sediments, which has the potential to damage sewer system infrastructure.

The upland areas, such as Snoqualmie Ridge, typically consist of Vashon Glacial Till, overlying Vashon Advance Outwash, overlying Olympia Beds, overlying deposits of the Possession Glaciation, which are often exposed in the ravines due to erosion. These sediments typically have a low to very low liquefaction susceptibility. Older unconsolidated units are primarily only found in the subsurface and do not crop out.

Near the end of the Vashon Stade of the Fraser Glaciation, the continental glacier was retreating to the north, but it still blocked the flow of water out of the Strait of Juan de Fuca. During this period a large lake, named Glacial Lake Snoqualmie, formed in the area[1]. The far north portion of the service area to the east of the Snoqualmie River includes the Tokul Delta. The Tokul Delta is composed of a thick sequence of Vashon Recessional Outwash sediments that were deposited by recessional outwash rivers flowing along the base of the foothills adjacent to the glacial ice as they built a delta into Glacial Lake Snoqualmie.

Numerous landslide deposits have been mapped within the City's service area. Landslides often originate on the margins of the uplands, with movement oriented toward the bottom of ravines or toward the valley floor. Landslide deposits, if still active, have the potential to impact wastewater system infrastructure.

Topography

The topography of the area served by the City varies greatly in elevation. The lowest areas served are in the downtown area, located near the Snoqualmie River, with elevations around 400 feet above mean sea level. The highest elevations served, at over 1,100 feet, are on the Snoqualmie Ridge in the southwest corner of the collection system, near the Snoqualmie Valley Hospital. Elevation contours within the City limits and surrounding UGA are shown in **Figure 2-3**. The existing system is located within the Snoqualmie-Skykomish Watershed.

Climate

The mean average monthly temperature in Snoqualmie ranges from approximately 40 degrees Fahrenheit in December to approximately 65 degrees Fahrenheit in July and August. The mean

[1] Booth, Derek B. (1990). Surficial Geologic Map of the Skykomish and Snoqualmie Rivers Area. USGS Miscellaneous Investigations Series Map I-1745.

high monthly temperature ranges from approximately 45 degrees Fahrenheit in December to approximately 76 degrees Fahrenheit in August. The mean low monthly temperature ranges from approximately 34 degrees Fahrenheit in December to approximately 54 degrees Fahrenheit in July.

Precipitation occurs year-round, with an average total annual precipitation of approximately 62 inches. The largest average volumes of precipitation occur in November (approximately 10 inches), January (approximately 9 inches), and December (approximately 8.5 inches).

Water Bodies and Floodplains

The Snoqualmie River is the largest surface water body in the City. The WRF's secondary effluent outfall is located in this water body and it receives treated effluent from the WRF. The 268-foot Snoqualmie Falls is located inside the City limits, just downstream of the WRF outfall. Other water bodies include Lake Borst (southeast of the WRF and north of the Snoqualmie River), the Meadowbrook Slough in the eastern portion of the City limits, and numerous smaller ponds and creeks.

A significant portion of the City, consisting of the downtown area and the eastern portion of the City limits, is located within the 100-year floodplain. This general area also is designated as a seismic hazard area. Furthermore, there are several small wetlands and riparian areas associated with the streams that run through the City. These sensitive areas and steep slopes limit the buildable area.

City Limits, Urban Growth Area, and Sewer Service Area Boundary

The City limits encompass an area of approximately 7.4 square miles, while the City's UGA encompasses an area of 8.6 square miles. The majority of the developed area within the City limits is currently served by the City's existing sewer system. Currently, 34 properties within the City limits are on septic systems with drain fields. Additionally, there are four residential properties and the Snoqualmie Casino that currently are served by the City's existing sewer system but are not within the City limits. The City's sewer planning area (i.e. future sewer service area) includes the City's UGA and the area in the City limits outside the UGA, which is located south of Interstate 90 (as shown in **Figure 2-6**).

EXISTING SEWER FACILITIES

The City owns, operates, and maintains the wastewater system, which includes a gravity collection and conveyance system, 17 wastewater lift stations, force mains, the water reclamation facility, and an effluent outfall.

Sewer Drainage Basins

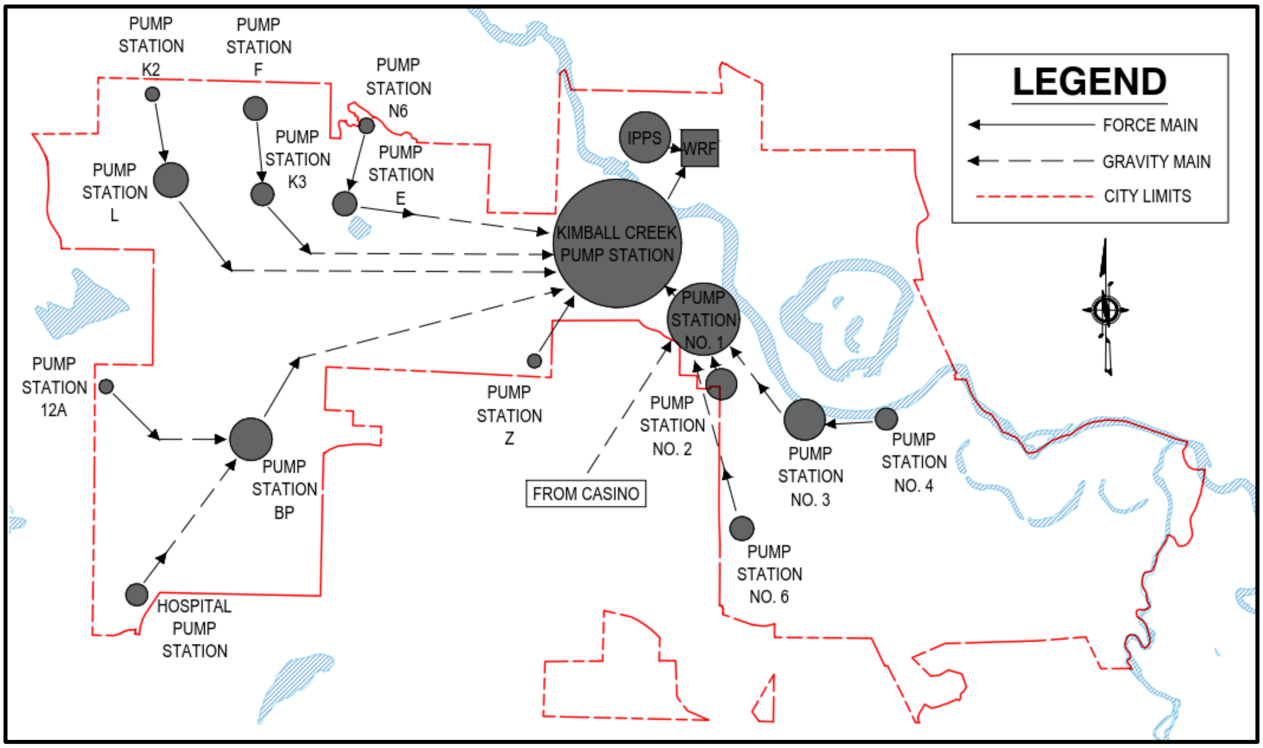
The City's existing sewer service area is comprised of 17 sewer drainage basins, as shown in **Figure 2-3**.

In general, the sanitary sewer system conveys wastewater to the City's WRF through a number of lift stations. The wastewater from the City's historic area that lays in the eastern part of the

City is conveyed by Pump Station No. 1 to the Kimball Creek Pump Station (KCPS), which then conveys wastewater to the City's WRF. The wastewater from the City's Snoqualmie Ridge area that lays in the western part of the City also is conveyed to the WRF by KCPS. Wastewater collected in the City north of the Snoqualmie River flows via gravity to the WRF, where it is pumped by the In-Plant Pump Station (IPPS) to the headworks. **Figure 2-4** shows a schematic representation of the general location and flow path for each of the 17 sewer drainage basins.

Figure 2-4

Sewer Drainage Basins Schematic



Gravity Sewer Collection Piping

The City has 47.1 miles of gravity sewer piping, including collection sewers and interceptors and treated effluent sewers from the WRF. A majority of the system is 8-inch-diameter gravity main, totaling 36.4 miles. The predominant material used in the system, accounting for approximately 65 percent of gravity piping, is polyvinyl chloride (PVC). Gravity mains generally were constructed either in the 1960s during initial system construction, or in the 1990s or later after development began on Snoqualmie Ridge. Minimal sewer main construction occurred in the 1970s and 1980s.

Table 2-1 summarizes the sewer system pipe by diameter, **Table 2-2** summarizes the pipe by material, and **Table 2-3** summarizes the pipe by installation year. **Figure 2-2** illustrates pipe sizes and locations. **Figure 2-5A** illustrates pipe material, and **Figure 2-5B** illustrates pipe age.

Table 2-1
Gravity Sewer Collection Piping Inventory – Diameter

Diameter (inches)	Total Length (feet)	Total Length (miles)	% of System
6	1,275	0.24	0.5%
8	192,357	36.43	77.3%
10	21,741	4.12	8.7%
12	8,958	1.70	3.6%
14	77	0.01	0.0%
15	12,270	2.32	4.9%
18	236	0.04	0.1%
24	32	0.01	0.0%
36	1,575	0.30	0.6%
Unknown	10,429	1.98	4.2%
Total	**248,950**	**47.15**	**100.0%**

Table 2-2
Gravity Sewer Collection Piping Inventory – Material

Material	Total Length (feet)	Total Length (miles)	% of System
Cast Iron	3	0.00	0.0%
Clay	144	0.03	0.1%
Concrete	35,214	6.67	14.1%
Ductile Iron	8,653	1.64	3.5%
PVC	162,847	30.84	65.4%
Unknown	42,089	7.97	16.9%
Total	**248,950**	**47.15**	**100.0%**

Table 2-3
Gravity Sewer Collection Piping Inventory – Installation Year

Year Installed	Total Length (feet)	Total Length (miles)	% of System
Unknown	60,917	11.54	24.5%
1960s	29,593	5.60	11.9%
1970s	1,445	0.27	0.6%
1980s	12,523	2.37	5.0%
1990s	77,791	14.73	31.2%
2000s	50,293	9.53	20.2%
2010s	16,388	3.10	6.6%
Total	**248,950**	**47.15**	**100.0%**

Force Mains

The City has 10 miles of force mains, including lift station force mains and the reclaimed water force main from the WRF. **Table 2-4** summarizes the force mains by diameter, **Table 2-5** summarizes the force mains by material, and **Table 2-6** summarizes the force mains by installation year. **Figure 2-2** illustrates main sizes and locations. **Figure 2-5A** illustrates main material, and **Figure 2-5B** illustrates main age.

Table 2-4
Force Main Inventory – Diameter

Diameter (inches)	Total Length (feet)	Total Length (miles)	% of System
3	5,970	1.13	11.3%
4	7,119	1.35	13.4%
6	9,161	1.74	17.3%
8	4,396	0.83	8.3%
10	2,573	0.49	4.9%
14	7,075	1.34	13.4%
Unknown	16,667	3.16	31.5%
Total	**52,962**	**10.03**	**100.0%**

Table 2-5
Force Main Inventory – Material

Material	Total Length (feet)	Total Length (miles)	% of System
Cast Iron	18	0.00	0.0%
Ductile Iron	8,613	1.63	16.3%
HDPE	16,574	3.14	31.3%
PVC	4,824	0.91	9.1%
Steel	2,214	0.42	4.2%
Unknown	20,719	3.92	39.1%
Total	**52,962**	**10.03**	**100.0%**

HDPE = High-density polyethylene

Table 2-6
Force Main Inventory – Installation Year

Year Installed	Total Length (feet)	Total Length (miles)	% of System
Unknown	30,424	5.76	57.4%
1960s	1,629	0.31	3.1%
1970s	2,214	0.42	4.2%
1990s	12,234	2.32	23.1%
2000s	6,461	1.22	12.2%
Total	**52,962**	**10.03**	**100.0%**

Lift Stations

The City currently owns, operates, and maintains 17 wastewater lift stations. The characteristics of the lift stations are summarized in **Table 2-7**, and a description of each lift station follows.

Table 2-7
Lift Station Characteristics

	Lift Station			Pumps					
Lift Station Name	**Year Constructed**	**Force Main Diameter (inches)**	**No. of Pumps**	**Type**	**Manufacturer**	**Horsepower (hp)**	**TDH (feet)**	**Design Capacity (gpm)**	**Design Firm Capacity (gpm)**
Hospital Pump Station	2014	6	2	Submersible	Flygt	23	120	194 194	194
In-Plant Pump Station	2009 - Upgraded	8	2	Submersible	Flygt	25	62	1,085 1,085	1,085
Kimball Creek Pump Station (Snoqualmie Parkway)	1997 - Constructed 2012 - Pump Installed	14 and 14	3	Immersible, Two Speed	Wemco	134	134	3,475 3,475 3,475	6,950
Pump Station No. 1 (Railroad Place)	1967 - Constructed 2002 - Upgraded	10	2	Submersible	KSB	40	66	1,800 1,800	1,800
Pump Station No. 2 (Pickering Court)	1967	8	2	Wet Pit/ Dry Pit	Flygt Cornell	7.5 5	25	400 400	400
Pump Station No. 3 (Park Street)	1967 - Constructed 2010 - Upgraded	8	2	Submersible	Flygt	7.5	25	700 700	700
Pump Station No. 4 (Meadowbrook)	1967 - Constructed 2010 - Upgraded	6	2	Submersible	Flygt	5	25	200 200	200
Pump Station No. 6 (Honey Farm)	1997	4	2	Submersible	Flygt	3	1.7	100 100	100
Pump Station BP (Business Park)	1998 - Constructed 2008 - Upgraded	8	2	Submersible	KSB	36	110	750 750	750
Pump Station E (Crestview)	1998	6	2	Submersible	KSB	36	141	240 240	240
Pump Station F (Fairview)	1998	6	2	Submersible	Flygt	38	123	230 230	230
Pump Station K2 (Burke)	2004	4	2	Submersible	Flygt	23	140	80 80	80
Pump Station K3 (Muir)	1998	6	2	Submersible	KSB	28	95	215 215	215
Pump Station L (Carmichael)	2000	8	2	Submersible	KSB	36	110	500 500	500
Pump Station N6 (Whittaker)	2007	3	2	Submersible	Flygt	10	92	98 98	98
Pump Station S12A (Vaughn)	2014	4	2	Submersible	Flygt	4	57	116 116	116
Pump Station Z (Gala)	2003	3	2	Submersible	Flygt	6.5	71.5	77 77	77

TDH = total dynamic head

Hospital Pump Station

Hospital Pump Station

The Hospital Pump Station was constructed in 2014 and is equipped with two 23 horsepower (hp) Flygt submersible pumps. The station has a design capacity of 194 gallons per minute (gpm). The Hospital Pump Station collects wastewater from a small basin in the southwestern portion of the system and conveys it to the gravity collection system tributary to Pump Station BP. Backup power is provided by a generator. The pump station is connected by radio to the City's telemetry system.

In-Plant Pump Station

The IPPS, last upgraded in July 2009, pumps wastewater from the gravity collection system north of the Snoqualmie River, including wastewater generated inside the WRF, to the WRF headworks. The IPPS is equipped with two 25 hp Flygt submersible pumps that discharge into an 8-inch-diameter force main.

In-Plant Pump Station

Kimball Creek Pump Station (Snoqualmie Parkway)

Constructed in 1997, KCPS is equipped with three 134 hp Wemco submersible pumps and has a design firm pumping capacity of 6,950 gpm. The third pump was installed in 2012. All wastewater from the collection system south of the Snoqualmie River is pumped to the WRF headworks by KCPS, which has two parallel 14-inch-diameter force mains, each equipped with a magnetic flow meter. The KCPS has a 450 kilowatt (kW) diesel generator on site for backup power and is connected by a cell network to the City's telemetry system.

Kimball Creek Pump Station

Pump Station No. 1 (Railroad Place)

Pump Station No. 1, originally constructed in 1967 with a wet well/dry well configuration, was upgraded in 2002 and converted to utilize two 40 hp KSB submersible pumps that discharge into a 10-inch-diameter force main. The design capacity of Pump Station No. 1 is 1,800 gpm. All wastewater from the eastern portion of the system drains to Pump Station No. 1, which then conveys this wastewater to KCPS. The pump station building has two stories, with a Bioxide (used for odor control) storage tank on the first floor, and the control room on the second floor above the 100-year floodplain elevation. Pump Station No. 1 has an on-site 80 kW natural gas backup power generator, a magnetic flow meter, and a cellular link to the City's telemetry system.

Pump Station No. 1

Pump Station No. 2 (Pickering Court)

Pump Station No. 2

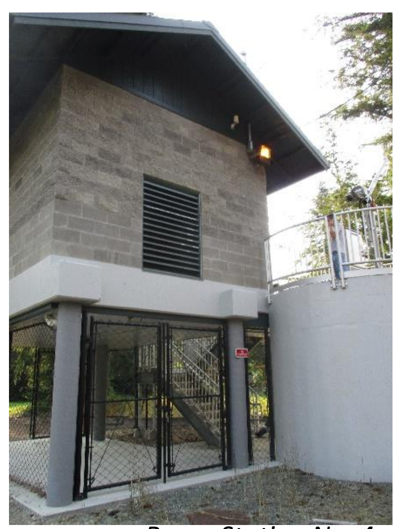
Pump Station No. 2 was constructed in 1967 with a wet well/dry well configuration and is still operated in this configuration. The station collects wastewater from a small basin in the eastern portion of the system and pumps it to the gravity collection system tributary to Pump Station No. 1. One of the original two Cornell 5 hp pumps has been replaced with a Flygt pump. The pump station had an original design capacity of 400 gpm and discharges to an 8-inch-diameter force main. Pump Station No. 2 does not have backup power but does have a backup screwsucker pump with fuel tank. The station is connected by a cell network to the City's telemetry system.

Pump Station No. 3 (Park Street)

Pump Station No. 3

Originally constructed in 1967, Pump Station No. 3 was most recently upgraded in 2010. Pump Station No. 3 collects wastewater from Pump Station No. 4 and a significant gravity basin in the eastern portion of the system, bounded to the north by SE River Street, and conveys this wastewater to the gravity collection system tributary to Pump Station No. 1. Similar to Pump Station No. 1, Pump Station No. 3 originally was constructed in a wet well/dry well configuration and was converted to utilize two 7.5 hp Flygt submersible pumps during the upgrade. The pump station has a design capacity of 700 gpm and discharges to an 8-inch-diameter force main. As part of the upgrade, the station was elevated above the floodplain, a 25 kW natural gas generator was installed for backup power, a pig launching port was added to the force main, and the station was connected by radio to the City's telemetry system.

Pump Station No. 4 (Meadowbrook)

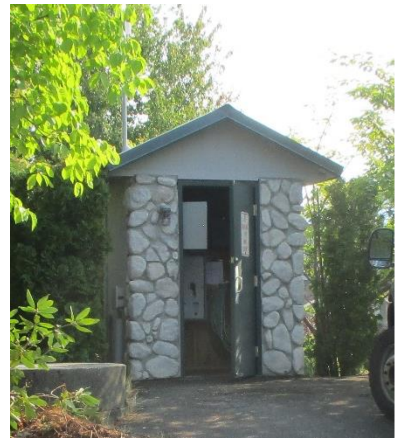


Pump Station No. 4

Similar to Pump Station No. 1 and Pump Station No. 3, Pump Station No. 4 originally was constructed in 1967 in a wet well/dry well configuration and was converted to utilize two 5 hp Flygt submersible pumps during a 2010 upgrade. The pump station has a design capacity of 200 gpm and discharges to a 6-inch-diameter force main. The station collects wastewater from the City's easternmost gravity basin and pumps it to the gravity collection system tributary to Pump Station No. 3. The station received similar upgrades to Pump Station No. 3 during its 2010 upgrade: 1) a 25 kW natural gas generator was installed for backup power; 2) a pig launching port was added for the force main; and 3) the station was connected by radio to the City's telemetry system.

Pump Station No. 6 (Honey Farm)

Constructed in 1997, Pump Station No. 6 contains two 3 hp Flygt submersible pumps that discharge into a 4-inch-diameter force main. The station collects wastewater from a small gravity basin and pumps it to the gravity collection system tributary to Pump Station No. 1. The pumps provide only 1.7 feet of total dynamic head (TDH) at the design flow rate of 100 gpm. The force main is configured to serve as a siphon during a pump failure, although this will result in surcharged pipes in the upstream gravity collection system. The pump station is located within a roundabout and has pig tail connections for a portable generator to provide backup power. The station is connected by a cell network to the City's telemetry system.



Pump Station No. 6

Pump Station BP (Business Park)

Pump Station BP was constructed in 1998 and received upgrades in 2008. The station collects wastewater from a large gravity basin in the southwest corner of the system and conveys it to the gravity collection system tributary to KCPS. Originally constructed with 28 hp pumps and a 6-inch-diameter force main, the station is now equipped with 36 hp KSB submersibles and an 8-inch-diameter force main. The station has a design capacity of 750 gpm. Backup power is provided by a 100 kW natural gas generator, and the station is connected by a cell network to the City's telemetry system.

Pump Station BP

Pump Station E (Crestview)

Pump Station E was constructed in 1998. The station collects wastewater from Pump Station N6 and a significant gravity basin in the western portion of the system and conveys it to the gravity collection system tributary to KCPS. The pump station is equipped with two 36 hp KSB submersible pumps that discharge into a 6-inch-diameter force main. The design capacity of the pump station is 240 gpm. The station has a 60 kW natural gas generator for backup power and is connected by a cell network to the City's telemetry system.

Pump Station E

Pump Station F (Fairview)

Constructed in 1998, Pump Station F is equipped with two 38 hp Flygt submersible pumps that discharge into a 6-inch-diameter force main. Pump Station F collects wastewater from a relatively small basin in the western portion of the system and conveys it to the gravity collection system tributary to Pump Station K3. The design capacity of the pump station is 230 gpm. Like Pump Station E, Pump Station F is equipped with a 60 kW natural gas backup power generator and radio telemetry.

Pump Station F

Pump Station K2 (Burke)

Pump Station K2 was constructed in 2004 and has a design capacity of 80 gpm. The pump station collects wastewater from a relatively small gravity basin in the northwestern corner of the system and conveys it to the gravity collection system tributary to Pump Station L. The station is equipped with two 23 hp Flygt submersible pumps that discharge into a 4-inch-diameter force main. Backup power is provided by a 60 kW natural gas generator. The station is connected by a cell network to the City's telemetry system.

Pump Station K2

Pump Station K3 (Muir)

Constructed in 1998, Pump Station K3 has a design capacity of 215 gpm and is equipped with two 28 hp KSB submersible pumps. The pump station collects wastewater from Pump Station F and a small gravity basin in the western portion of the system and conveys the wastewater to the gravity collection system tributary to KCPS. The pump station discharges to a 6-inch-diameter force main. The station has cellular telemetry and is equipped with a 60 kW natural gas generator for backup power.

Pump Station K3

Pump Station L (Carmichael)

Pump Station L, constructed in 2000, is equipped with two 36 hp KSB submersible pumps. The station collects wastewater from Pump Station K2 and a significant gravity basin on the western edge of the collection system and conveys this wastewater to the gravity collection system tributary to KCPS. The pump station has a design capacity of 500 gpm and discharges to an 8-inch-diameter force main. The station has a 60 kW natural gas generator for backup power and is connected by a cell network to the City's telemetry system.

Pump Station L

Pump Station N6 (Whittaker)

Constructed in 2007, Pump Station N6 is equipped with two 10 hp Flygt submersible pumps that discharge to a 3-inch-diameter force main. The station has a design capacity of 98 gpm. Pump Station N6 collects wastewater from a small basin in the western portion of the system and conveys it to the gravity collection system tributary to Pump Station E. Backup power is provided by a generator. The station is connected by a cell network to the City's telemetry system.

Pump Station N6

Pump Station S12A (Vaughn)

Pump Station S12A (Vaughn) was constructed in 2014 and is equipped with two submersible 4 hp Flygt pumps that discharge to a 4-inch-diameter force main. The station has a design capacity of 116 gpm. Pump Station S12A collects wastewater from a small basin in the western portion of the system and conveys it to the gravity collection system tributary to Pump Station BP. Backup power is provided by a generator. The pump station is connected by radio to the City's telemetry system.

Pump Station S12A

Pump Station Z (Gala)

Constructed in 2003, Pump Station Z is equipped with two 6.5 hp Flygt submersible pumps that discharge to a 3-inch-diameter force main. The station collects wastewater from a small basin in the central portion of the collection system and conveys it to the gravity collection system tributary to KCPS. The pump station has a design capacity of 77 gpm. Backup power is provided by a 30 kW natural gas generator. The pump station is connected by radio to the City's telemetry system.

Pump Station Z

Wastewater Treatment and Disposal Facilities

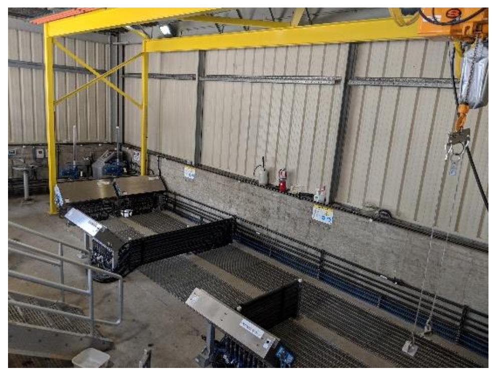
Existing System

The City's original WRF, a facultative lagoon system, was constructed in 1967. In 1997, an upgrade was completed to add a headworks facility, including screening and vortex grit removal, an oxidation ditch, two secondary clarifiers, and an ultraviolet (UV) light disinfection system. Sand filters and a chlorination system also were added to allow a portion of the effluent to be reused as Class A reclaimed water for discharge to Eagle Lake at the Golf Course. The existing lagoons were converted to sludge stabilization lagoons that allowed for long-term sludge storage.

WRF Oxidation Ditches and Solids Handling Building

Another upgrade to the WRF was completed in 2003 in which a redundant oxidation ditch was constructed.

In 2008, the solids handling system was upgraded to produce Class A biosolids. The system included an aerated sludge holding tank, as well as a dewatering centrifuge and dryer housed in a solids handling building adjacent to the sludge holding tank. The biosolids drying system remained in operation until 2015, when a fire occurred in the dryer building. After the fire, the drying system was abandoned, and the dewatered sludge was hauled to the landfill while planning, design, and construction took place to implement a new solids handling system.



WRF UV Disinfection System

In 2008, a traveling band fine screen was added to the headworks screening channel. Two manually cleaned screens in series exist in the bypass channel.

In 2015, an engineering report was completed outlining upcoming WRF improvement projects that would be completed from 2017 to 2019 to improve operation of the WRF.

In 2017, upgrades were made to the UV disinfection system, standby generator, oxidation ditch anoxic basin mixers, non-potable water system, and supervisory control and data acquisition (SCADA) system. The new UV disinfection system can meet Class A Reclaimed Water disinfection standards without requiring additional chlorination.

In 2018 and 2019, the new solids handling system was constructed, as well as various smaller upgrades throughout the WRF. The new solids handling system, which produces Class B biosolids, included an upgrade to the waste activated sludge (WAS) pump station and a new solids handling facility that includes rotary drum thickening equipment, three aerobic digesters, centrifuge dewatering equipment, and a truck bay with a weigh scale. Additionally, a biofilter was constructed to treat foul air from the solids handling processes. An upper level operations area was included in the solids handling building design. Upgrades also were made to the headworks grit removal system, including new packaged biofilters, oxidation ditch anaerobic mixers, clarifier scum pump stations, and one secondary clarifier mechanism. In addition, a new stormwater decant facility was constructed.

Treated Wastewater Discharge and Solids Disposal

Wastewater from the City's sewer system is processed at the WRF resulting in treated water and digested sludge. Depending on the time of year, the wastewater is treated to one of two different standards. Typically, from sometime in September through sometime in May, effluent water from the secondary treatment processes is disinfected and discharged to the Snoqualmie River. During the summertime months, the wastewater is treated to Class A Reclaimed Water standards for use as irrigation water at the Golf Course and several City customers. Class B biosolids are produced at the WRF year-round and hauled offsite by truck for permissible land application.

Existing WRF Environment

The WRF is located on a larger parcel of land owned by the City. The parcel number is 3024089079, and the address is 38180 SE Mill Pond Road, City of Snoqualmie, Washington. The WRF parcel is located within the City limits and is zoned Utility Park (U). The City's North Wellfield Water Treatment Plant (WTP), which is described in the **City of Snoqualmie and Adjacent Water Systems** section of this chapter, is located on the WRF parcel, along with a private concrete solids processing facility that is operated by Girard Resources & Recycling, LLC. A private driveway runs through the WRF parcel for vehicle access to the City's on-site facilities, as well as the adjacent City property to the north where the City's Public Works Office is located.

Portions of the WRF parcel have been developed with wastewater treatment infrastructure since 1967, when the original facultative lagoon system wastewater treatment plant was constructed. Currently, all existing wastewater treatment infrastructure is located within the limits of the WRF, which for the purposes of this General Sewer Plan (GSP), is defined by the enclosed perimeter fence. The recommended WRF improvements presented in this GSP also are all located within the WRF's fenced perimeter and in areas that already have been developed or disturbed. The following sections summarize specific environmental characteristics within and in the vicinity of this parcel and identify whether the recommended WRF improvements will have an affect or impact on each of these aspects. Further details on potential environment impacts can be found in the State Environmental Policy Act (SEPA) Checklist and State Environmental Review Process (SERP) documentation that was completed for this GSP and are included in **Appendix B**. This GSP is in compliance with the SEPA Checklist and corresponding Determination of Non-Significance.

Floodplains

The 100-year floodplain extends onto the WRF parcel. The 100-year floodplain elevation is 423.98 feet (North American Vertical Datum of 1988 [NAVD 88]). The lowest elevation within the fenced perimeter of the WRF is approximately 429 feet NAVD 88, which is 5 feet above the

100-year floodplain. The recommended improvements presented in this GSP are all located within the fenced perimeter.

Where the floodplain elevation may result in groundwater levels that are above the bottom of proposed buried structures, the potential for buoyancy should be evaluated for those structures.

Shorelines

The only applicable shoreline for the WRF is the Snoqualmie River, which is approximately 400 feet south of the WRF. None of the recommended WRF improvements presented in this GSP will affect the River or riparian zone setbacks. The existing piped outfall discharges into the River; however, no improvements are proposed for the outfall.

Wetlands

Wetland habitats exist within and near the WRF parcel. A Category III wetland is located southwest of the WRF, across the access road from the entrance to the WRF. In addition, unclassified wetlands are located east of the WRF. The recommended WRF improvements presented in this GSP are all located outside of the Category III wetland buffer, at least 300 feet from the unclassified wetlands, and in areas of the WRF that already have been disturbed. Therefore, the recommended improvements will not impact any wetlands or their buffers.

Threatened and Endangered Species

Based on review of the U.S. Fish and Wildlife Service (USFWS) Endangered Species Act (ESA) maps and data and Washington Department of Fish and Wildlife (WDFW) Salmonscape and Priority Habitats and Species (PHS) data, the WRF parcel and surrounding areas do not support threatened or endangered bird, mammal, or fish species.

Threatened and Endangered Habitats

Based on review of USFWS ESA maps and data, Washington State Department of Natural Resources Natural Heritage data, and WDFW PHS data, the WRF parcel and surrounding areas do not support threatened or endangered plant species.

Public Health

Any risks the WRF could pose to public health typically are contained within the fenced perimeter (air emissions are discussed in the following section); therefore, the WRF is not a risk to the public. The perimeter fence fully encloses the WRF, and all gates associated with the fence are secured. In addition to providing general security for the facility, the perimeter fence prevents unintentional access into the WRF by the public. Atypical instances of potential risks that are not contained within the fenced perimeter are hazardous wastes disposal; however, the City disposes of these wastes in a manner that meets all general and individual requirements for disposal. Biosolids that are hauled off site from the WRF meet Class B standards. The recommended WRF improvements presented in this GSP are all located within the fenced perimeter and will not result in any new public health risks.

Air Emissions

Air emissions at the WRF are either exempt from or not applicable to regulated air emissions.

Prime or Unique Farmland

Based on the Natural Resources Conservation Service Soil Survey, there is prime farmland within the WRF parcel. However, the prime farmland is outside and southeast of the fenced perimeter of the WRF, while the recommended WRF improvements presented in this GSP are all located within this perimeter.

Archaeological and Historical Sites

The Snoqualmie Falls Hydroelectric Power Plant Historic District and Snoqualmie Falls Cavity Generating Station are both approximately ¼ mile from the WRF. Both are listed on the National Register of Historic Places and the Washington Heritage Registrar. None of the recommended WRF improvements presented in this GSP will affect either of these historic places.

Based on a cultural resources assessment completed for the City in 2016 (*Cultural Resources Assessment for the City of Snoqualmie Water Reclamation Facility and North Well Treatment Facility Improvements Project*, June 9, 2016, SWCA Environmental Consultants), a Precontact Archaeological Site (45KI1275) exists adjacent to the City's North Wellfield WTP, and Holocene-aged alluvium and undisturbed alluvial deposits below fill likely are present near the southeastern portion of the WRF. The Holocene-aged soils have archaeological sensitivity. The recommended WRF improvements presented in this GSP are all located outside the areas of archeological sensitivity.

Federally Recognized Wild and Scenic Rivers

The only part of the Snoqualmie River that is listed in the National Wild and Scenic Rivers System is a stretch of the Middle Fork Snoqualmie River, which is upstream of confluences of the north, middle, and south forks of the River. These confluences are located east of and upstream of the WRF on the River.

Telemetry and Supervisory Control

Successful operation of any municipal sewer system requires gathering and using accurate sewer system information. A telemetry and supervisory control system gathers information and can control a system efficiently by automatically optimizing facility operations. A telemetry and SCADA system also provides instant alarm notification via text message to operations personnel in the event of equipment failure, operation problems, flood, fire, or other emergency situations.

The SCADA system is located at the WRF and was completely replaced in 2017 as part of upgrades at the WRF. It monitors operations at the City's lift stations using radio and cellular telemetry. All the City's lift stations are connected to the SCADA system. All alarms are logged by the SCADA system and a backup auto-dialer system alerts the on-call operator whenever problems are detected that have not been acknowledged locally or remotely within 30 minutes.

The SCADA system logs all data (flows, levels, etc.) that can be used to trend or exported for troubleshooting or reviewing equipment utilization.

Industrial Wastewater Characterization

The City has three industrial users with discharge permits on file with the Washington State Department of Ecology (Ecology). Two are Categorical Significant Industrial Users and one is a Non-Categorical Non-Significant Industrial User. The discharge permits for these industrial users are included in **Appendix H**.

JR Four, Ltd, dba Technical Glass Products, is located at 8107 Bracken Place SE and conducts metal finishing. JR Four is classified as a Categorical Significant Industrial User. Per State Waste Discharge Permit Number ST0045534, JR Four is required to pretreat wastewater for cadmium, chromium, copper, lead, nickel, silver, zinc, zirconium, cyanide, and total toxic organic compounds (TTO), as well as maintain pH and maximum flow volume within prescribed limits.

MicroConnex Corporation, located at 34935 SE Douglas Street, Suite 110, conducts manufacturing of bare printed circuit boards and is classified as a Categorical Significant Industrial User. MicroConnex Corporation is required to pretreat wastewater for cadmium, chromium, copper, lead, nickel, silver, zinc, cyanide, and TTO, as well as maintain pH and maximum flow volume within the limits prescribed on State Waste Discharge Permit Number ST0501298.

Girard Resources and Recycling, LLC, located at 38190 SE Stearns Road, is classified as a Non-Categorical Non-Significant Industrial User. Girard Resources and Recycling, which conducts concrete solids processing, is required to maintain flow volume, total suspended solids (TSS), and pH within the limits prescribed on State Waste Discharge Permit Number ST0045516.

Water Reuse

The WRF produces Class A reclaimed water that is discharged to Eagle Lake at the Golf Course. This water is used for irrigation of the Golf Course and several City customers.

DISCHARGE AND DISPOSAL REGULATIONS AND PERMITS

NPDES Regulations and City Permit

The federal Clean Water Act (CWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. “The objective of the CWA is the restoration and maintenance of the chemical, physical, and biological integrity of the country’s water.” The CWA grants individual authority to each state to define the water quality standards (within the limits set by the water quality goals) within its jurisdiction and enforce them. Water quality standards for surface waters in Washington State have been established (Chapter 173-201A Washington Administrative Code (WAC)) and are enforced by Ecology (Chapter 90.48 Revised Code of Washington (RCW)). The purpose of the water quality standards is to provide “public health and public enjoyment of the waters and the propagation and protection of fish, shellfish, and wildlife.” Each surface water in the State is identified as fresh water or marine water and designated for one or more uses, which then determines the specific water quality standards that apply to that water.

The State also has established a permit program for implementation of the National Pollutant Discharge Elimination System (NPDES) Permit Program created by the CWA. The program requires a discharge permit for any point source, such as a domestic wastewater treatment plant and discharge of pollutants to surface waters of the State for the purpose of maintaining the water quality standards. Each permit is renewed on roughly a 5-year cycle. The permit and accompanying fact sheet include information on discharge limits, monitoring schedule, and general and special conditions that apply to the applicable point source.

Ecology issued the City's renewed NPDES permit (Permit No. WA0022403) in May 2021, which also covers reclaimed water use. The permitted facility flow and loading design criteria for the WRF is included in **Table 2-8**.

Table 2-8
WRF Permitted Flow and Loading Design Criteria

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	2.15 MGD
BOD_5 Influent Loading for Maximum Month	5,220 ppd
TSS Influent Loading for Maximum Month	5,220 ppd
Reclaimed Water Production MMDF	1.56 MGD

BOD_5 = 5-day biochemical oxygen demand
ppd = pounds per day

Disinfected secondary effluent water is discharged to the Snoqualmie River, immediately upstream of Snoqualmie Falls, through a piped outfall, which is designated as Outfall No. 001 in the NPDES permit. The effluent limits for Outfall No. 001 are summarized in **Table 2-9**.

Table 2-9
NPDES Permit Effluent Limits, Outfall No. 001

Parameter	Average Monthly	Average Weekly
$CBOD_5$	25 mg/L 85% removal of influent $CBOD_5$	40 mg/L
$CBOD_5$ Mass *Effective November - July Only*	448 ppd	717 ppd
TSS	30 mg/L 538 ppd 85% removal of influent TSS	45 mg/L 807 ppd
Parameter	**Minimum**	**Maximum**
pH	6.3 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria	200/100 mL	400/100 mL
Parameter	**Average Monthly**	**Maximum Daily**
$CBOD_5$ Mass *Effective August - October Only*	51.6 ppd	206 ppd
Total Ammonia Mass (as NH3-N) *Effective August - October Only*	21.6 ppd	68.7 ppd
Temperature, Maximum 7-Day Running Average (7-DADMax) *Effective June - September Only*	N/A	24.7 ^{o}C

mg/L = milligrams per liter
mL = milliliters
^{o}C = degrees Celsius

When the wastewater is treated to Class A Reclaimed Water standards, it is discharged into a buried, concrete clearwell that is located at the WRF. The reclaimed water is then pumped to the Eagle Lake storage reservoir (also known as the 9th Hole Pond) at the Golf Course. The Eagle Lake storage reservoir is designated as Outfall No. 002 in the NPDES permit. All reclaimed water must be oxidized, filtered, and disinfected and meet the limits for Outfall No. 002 as summarized in **Table 2-10**. In addition to these limits, the source water for the reclaimed water treatment system must comply at all times with the 5-day carbonaceous biochemical oxygen demand ($CBOD_5$), TSS, and pH Effluent Limits that are shown in **Table 2-9**.

During the reclaimed water season, Outfall No. 001 remains available for discharge if flows to the plant exceed allowed reclaimed water limits or if the treatment units for the reclaimed water system are offline for maintenance or repair. Refer to **Table 2-9** for the limits associated with Outfall No. 001, which apply to any (treated) wastewater the City discharges from the WRF to the Snoqualmie River even during reclaimed water production and whether due to planned or unplanned (i.e. emergency) events.

Table 2-10
NPDES Permit Reclaimed Water Limits, Outfall No. 002

Parameter	Minimum	Maximum
Dissolved Oxygen (DO)	≥ 0.2 mg/L	N/A
Product Water - Coagulated/Filtered Water Prior to Disinfection		
Parameter	**Average Monthly**	**Instantaneous Maximum**
Turbidity	2 NTU	5 NTU
Product Water - Disinfected Reclaimed Water Prior to Distribution		
Parameter	**7-day Median**	**Sample Maximum**
Total Coliform	2.2 MPN/100 mL	23 MPN/100 mL

mg/L = milligrams per liter
NTU = nephelometric turbidity units
MPN = most probable number

The reclaimed water limits in the NPDES permit do not include a requirement for a chlorine residual in the transmission main that discharges to Eagle Lake. As part of the WRF Phase I Improvements project that was constructed in 2017, the reclaimed water disinfection system upgrade included removing the existing reclaimed water chlorination system. The installed UV system is capable of meeting the requirements for reclaimed water disinfection. The point of compliance for disinfection was moved immediately downstream of the UV system. Since the City pumps reclaimed water into a transmission main that discharges into an open water reservoir (known as Eagle Lake) with no other customers on the pipeline, Ecology allowed the removal of the chlorine residual requirement under the previous permit. Distribution of water after it gets to the open water reservoir is not addressed in this GSP and is covered in the City's *2015 Reclaimed Water Reuse Plan.*

A copy of the City's current NPDES permit is included as **Appendix A**.

Effluent Limits (Outfall No. 001) Total Maximum Daily Loads

Section 303(d) of the CWA establishes a process to identify and clean up surface waters that do not meet the applicable water quality standards. Every few years, Ecology performs a water quality assessment using collected data to determine whether or not water quality of the surface waters meet the standards. Based on the assessment, each surface water is placed into one of five categories that describes the status of the water quality and ranges from meeting the standards (Category 1) to impaired (i.e. polluted) and requiring a water improvement project (Category 5). Surface waters placed into Category 5 are formerly listed on the State's 303(d) list of polluted waters, which is named after the referenced section of the CWA.

The water improvement project process, also known as the Total Maximum Daily Load (TMDL) process, is a science-based approach to cleaning up the polluted water so that it meets the applicable water quality standards. A TMDL is a numerical value that represents the highest amount of a pollutant a surface water body can receive and still meet the standards. The TMDL then sets a basis for Ecology to develop wasteload allocations (WLAs) for point sources such as domestic wastewater treatment plants, and load allocations for nonpoint sources that discharge to the surface water (in some cases only a portion of the surface water) for which the

TMDL was developed. WLAs can then be applied as effluent limits in the treatment plant's NPDES permit. TMDLs and WLAs may only apply for part of the year based on surface water quality standards not being met only for that part of the year.

The maximum daily limits shown in **Table 2-9** are based on TMDLs that apply to the portion of the Snoqualmie River where the WRF discharge outfall is located. The applicable TMDLs and corresponding Snoqualmie WRF WLAs are summarized in this section.

CBOD, Ammonia, Soluble Reactive Phosphorus, and Fecal Coliform

Ecology conducted water quality assessments of the Snoqualmie River in 1989 and 1991 that identified impairments existed within the lower river basin. In a couple of locations, dissolved oxygen (DO) levels in the river were found to occasionally drop below the applicable water quality criteria minimum of 8.0 milligrams per liter (mg/L), with the seasonal period of concern being August through October. At various times of the year, including the period from late July through October, fecal coliform bacteria counts were found to increase above the water quality criteria maximum limit. For the assessments, the delineation between the upper river basin and the lower river basin was the confluence of the three forks (North, Middle, and South) of the Snoqualmie River near North Bend. The City and the WRF discharge are located directly downstream of the confluence.

In May 1994, Ecology published the *Snoqualmie River Total Maximum Daily Load Study* (Ecology Report No. 94-71), which recommended seasonal WLAs to help correct and further prevent the seasonal DO impairments caused by nutrient loading. The recommendations were based on modeling of different simulation conditions that Ecology performed as part of the study. Based on the recommendations for the WRF discharge, maximum daily effluent limits of 206 pounds per day (ppd) $CBOD_5$ Mass and 68.7 ppd Total Ammonia Mass (as NH3-N) for only August through October were added to the City's renewed NPDES permit issued in June 2008. Effluent limits based on the TMDL study previously were added to the City's renewed NPDES permit issued in December 2002; however, they were mis-stated (refer to the June 2008 NPDES permit Fact Sheet for details). They were stated as maximum daily concentration limits in units of mg/L, rather than maximum daily mass limits in units of ppd. In the City's renewed NPDES permit issued in April 2014, average monthly limits for $CBOD_5$ Mass and Total Ammonia Mass (as NH3-N) for only August through October were added (refer to the March 2014 NPDES permit Fact Sheet for details).

Soluble reactive phosphorus (SRP) also was evaluated as part of the May 1994 study; however, it was determined that further study of the impacts of SRP are necessary.

Results from the same modeling performed as part of the May 1994 study indicated that current and projected wastewater treatment plant discharge contributions of fecal coliform were inconsequential in comparison to nonpoint sources under the condition that each wastewater treatment plant discharge did not exceed a maximum concentration limit of 400 organisms per 100 milliliters. A maximum daily concentration limit matching the technology-based limit was added to the City's renewed NPDES permit issued in December 2002, while the monthly and weekly limits remained the same as the previous permit. The maximum daily concentration limit eventually was removed from the City's renewed NPDES permit issued in April 2014, leaving the unchanged monthly and weekly limits (refer to the

March 2014 NPDES permit Fact Sheet for details). Refer to the **Future City NPDES Permit Effluent Limits (Outfall No. 001) Changes** section in this chapter for a different bacterial indicator that will eventually replace fecal coliform.

Temperature

Snoqualmie River water temperatures were first determined to exceed the applicable water quality criteria maximums (16 degrees Celsius in the river location of the WRF discharge) based on data collected by Puget Sound Energy in 1991 and Ecology in 2001. Ecology conducted fieldwork to examine temperature patterns in the Snoqualmie River basin in 2005 and 2006, and the data showed that water temperatures in excess of the water quality criteria maximums (expressed as the 7-day average of the daily maximum temperatures (7-DADMax)) was common throughout the basin, with the seasonal period of concern being the summertime months of June through September.

In June 2011, Ecology published the *Snoqualmie River Basin Temperature Total Maximum Daily Load: Water Quality Improvement Report and Implementation Plan* (Publication No. 11-10-041), which identified seasonal temperature WLAs to address the potential contributions of wastewater treatment plant discharges to seasonal temperature impairments. Modeling of different simulation conditions performed by Ecology as part of the temperature TMDL study showed that load allocations for the nonpoint sources were considered to be sufficient to attain water quality standards. Therefore, Ecology used mixing zone mass balance calculations to determine WLAs for the wastewater treatment plant discharges (point sources) with an allowance for warming the river by 0.3 degrees Celsius (above the applicable water quality criteria maximums) per the water quality standards. The water quality standards also include a maximum effluent temperature limit of 33 degrees Celsius for wastewater treatment plant discharges when the mass balance calculation results in an effluent temperature greater than 33 degrees Celsius.

Based on the temperature WLA for the WRF discharge, a maximum daily effluent limit of 24.7 degrees Celsius 7-DADMax for only June through September was added to the City's renewed NPDES permit issued in April 2014. The WLA was calculated using a WRF discharge flow of 2.15 MGD matching the facility loading design limit for maximum month average flow. However, as noted in the publication, the highest summertime monthly average WRF flow from 2008 through 2010 was 1.12 MGD. The average dry weather WRF flow (defined in the previous GSP as the average flows for July, August, and September) was 0.90 MGD for the 2012 through 2018 period, and the highest dry weather monthly average WRF influent flow from 2012 through 2018 was 1.04 MGD, which occurred in August of 2016. The publication states the reason the 2.15 MGD flow condition was selected for the WLA was "…to be protective of the river in the event of a failure of the reclaimed water facility."

Future City NPDES Permit Effluent Limits (Outfall No. 001) Changes

Ecology can change water quality standards or NPDES permit effluent limits (the latter for the purpose of maintaining water quality standards). Known and anticipated future changes to water quality standards and NPDES permit effluent limits that are applicable to Outfall No. 001 at the WRF are summarized in this section.

Future Bacterial Indicator Effluent Limits

The receiving water of the Snoqualmie River at Outfall No. 001 is designated for Primary Contact Recreational Use (WAC 173-201A-602, Table 602: WRIA 7 – Snohomish). To protect water contact recreation in fresh water, such as the receiving water, bacterial indicator criteria (standards) are defined (WAC 173-201A-200(2)(b)). Ecology is changing the bacterial indicator from fecal coliform to *E. coli* with an effective date of January 1, 2021. The *E. coli* and expiring fecal coliform bacterial indicator criteria are both defined in the current version of WAC 173-201A-200(2)(b).

The City's NPDES permit has a fecal coliform bacteria effluent limit for Outfall No. 001. When the current permit expires, an *E. coli* bacteria effluent limit for Outfall No. 001 will be developed and become effective at the time of that permit renewal. Therefore, the fecal coliform bacteria effluent limit will remain effective until the permit expires. The permit requires the addition of *E. coli* monitoring three times per week by the City in 2024 for the purpose of developing a site-specific correlation between *E. coli* and fecal coliform.

Potential Future Nutrient Effluent Limits

DO levels in a large number of locations throughout Puget Sound do not meet the applicable water quality standards, and in many other locations show evidence of not meeting the standards in the future. The surface waters within Puget Sound that are not meeting the DO standards are listed in the State's 303(d) list (refer to the **Effluent Limits (Outfall No. 001) Total Maximum Daily Loads** section in this chapter). Ecology initiated the Puget Sound Nutrient Reduction Project (Project) in the spring of 2017 to address the problem of human sources of nutrients contributing to the low and decreasing DO levels throughout Puget Sound. Discharges of nutrients to Puget Sound from domestic wastewater treatment plants are significantly contributing to the problem. The goal of the Project is to develop a nutrient source reduction strategy, which includes reducing nutrient levels discharged from domestic wastewater treatment plants.

The Project is 3 years into an initial 5-year timeline (with 2022 as the final year) to develop the strategy. Both during and after strategy development, Ecology will begin implementing nutrient source reduction solutions. Ecology has been utilizing a model of Puget Sound to understand the problem and simulate potential improvements. Ecology has additional modeling to perform for optimization scenarios; however, results from completed modeling are being used to determine potential effluent nitrogen permit limits for domestic wastewater treatment plants with outfalls to Puget Sound (identified as marine sources). As of January 2020, Ecology made the decision to develop a general permit to implement nutrient control at all marine source domestic wastewater treatment plants. Ecology's timeline has issuance of the final general permit in 2021. Individual permits for the same plants will continue independently of, but in conjunction with, the general permit and may be modified as necessary to include facility-specific nutrient-related requirements.

As the Project continues, Ecology will eventually evaluate potential nutrient effluent permit limits for domestic wastewater treatment plants with outfalls to rivers or streams that flow to Puget Sound (identified as watershed sources), including the WRF. The timeline is unknown; however, it is anticipated that Ecology's future evaluation will result in additional nutrient effluent limits for the City's Outfall No. 001 as part of a general permit and/or the City's NPDES permit.

Other Regulations and Required Permits

Laboratory Accreditation

The State requires that all laboratories reporting data to comply with NPDES permits must be accredited (Chapter 173-50 WAC). The WRF on-site laboratory currently is accredited (No. M745-12) for determination of the following parameters: ammonia; $CBOD_5$; orthophosphate; dissolved oxygen; pH; fecal coliform; total coliform; *E. coli;* TSS; total fixed solids; and total volatile solids.

Refer to the **Future Bacterial Indicator Effluent Limits** section in this chapter for the related change from fecal coliform to *E. coli* as the bacterial indicator.

Biosolids Management

The City is subject to the State biosolids management program permitting requirements (Chapter 173-308 WAC). The City is covered under the existing statewide general permit. Class B biosolids are permitted for some land applications.

ADJACENT SEWER SYSTEMS

The closest municipal sewer service system to the City is the City of North Bend. North Bend operates a treatment plant consisting of an extended aeration activated sludge system with an oxidation ditch, secondary clarifier, UV disinfection, and outfall in the South Fork of the Snoqualmie River. North Bend treats wastewater primarily from domestic sources consisting of single- and multi-family residential units, restaurants, light commercial, and retail units. North Bend has no significant industrial customers. The North Bend collection system includes one pump station and two privately owned pump stations.

The unincorporated community of Fall City and surrounding rural areas do not have sewer service, and wastewater is managed with on-site septic systems, community drain fields, or alternative sewage treatment technologies. King County has considered constructing a sewer collection system and treatment plant to serve the Fall City area. Pumping Fall City's wastewater to the City also has been considered, but neither of these options has been implemented yet.

The communities adjacent to the City and their boundaries are shown on **Figure 2-6**. **Figure 2-7** shows the wastewater treatment facilities within 20 miles of the City.

CITY OF SNOQUALMIE AND ADJACENT WATER SYSTEMS

City of Snoqualmie

The City's existing retail water service area, which covers an area of approximately 14.5 square miles, is shown on **Figure 2-8**. The existing retail service area includes the current City limits and some areas of unincorporated King County. Along the north-south axis of the system, the existing retail water service area is approximately 3.5 miles long. Along the east-west axis, the existing retail water service area is approximately 8.3 miles long.

This section provides a brief description of the existing water system and the current operation of the facilities. The water service area, facilities, and supply sources are shown in **Figure 2-8**. Water is supplied to the City's system from Canyon Springs, the North Wellfield (Wells No. 6, No. 7, and No. 8), and the South Wellfield (Wells No. 1R and No. 2).

The City's wastewater facilities are all separated from major drinking water facilities for the City and adjacent drinking water purveyors. As a result of this separation, the City's wastewater facilities are unlikely to conflict with or impact the drinking water facilities or supplies for the City or neighboring purveyors.

Pressure Zones

The City serves customers within an elevation range of approximately 415 feet above sea level in its historic downtown area to approximately 1,140 feet above sea level on the west side of the system in the Snoqualmie Ridge area. The wide elevation range requires that water pressure be increased or reduced to maintain pressures that are safe and sufficient to meet the flow requirements of the system. The City achieves this by dividing the water system into ten different pressure zones.

Supply Facilities

Introduction

Water is supplied to the City from Canyon Springs, the North Wellfield, and the South Wellfield. Canyon Springs is located 6 miles east of the City and has an existing capacity of approximately 898 gallons per minute (gpm). The spring is located in a deep canyon on the north hillside bank of the North Fork of the Snoqualmie River.

The North Wellfield consists of Wells No. 6, No. 7, and No. 8 located in the northernmost area of the City's water service area. Well No. 6 has a capacity of approximately 550 gpm, Well No. 7 has a capacity of approximately 550 gpm, and Well No. 8 has a capacity of approximately 1,250 gpm. However, due to interference, Wells No. 6 and No. 8 are not operated simultaneously, so the wellfield has a combined capacity of approximately 1,800 gpm.

The South Wellfield consists of Wells No. 1R and No. 2 on property currently occupied by Mount Si High School. Each well has a capacity of 600 gpm.

Water Treatment

All City water sources are chlorinated. The North Wellfield WTP and South Wellfield WTP remove iron and manganese from the water produced by their respective wells. The North Wellfield WTP also treats the water to remove arsenic. At the North Wellfield WTP, a sodium hypochlorite solution is added to the raw water for oxidation, while ferric chloride is added to the raw water to coprecipitate with arsenic. Three filter trains are used to remove iron, manganese, and arsenic that binds with the ferric chloride. At the South Wellfield WTP, sodium hypochlorite is used for oxidation and then filtered with pyrolusite media to remove iron and manganese compounds. Canyon Springs water currently is treated with sodium hypochlorite generated on site. A disinfection building is located adjacent to the pressure reducing valve (PRV) vault on SE 70th Street, which houses a brine tank, 20 pounds per day sodium hypochlorite generation system, a 315-gallon hypochlorite storage tank, and chemical feed system. The sodium hypochlorite is injected into the 12-inch PVC transmission main from the springs 1,320 feet upstream of the disinfection building.

Pump Station Facilities

The City's water system has five booster pump station (BPS) facilities. The 705 BPS, 1040 BPS, and 1180-1260 BPS provide water to pressure zones in the Snoqualmie Ridge area. The 384th Avenue SE BPS and Snoqualmie Point BPS provide water to pressure zones in the southern areas of the system. A summary of the pumping facilities is shown in **Table 2-11** from the City's *Water System Plan*.

Table 2-11

Booster Pump Station Facilities Summary

Pump Station	Suction Pressure Zone	Discharge Pressure Zone	Year Constructed	Number of Pumps	Pump Type	Pump Motor Size (HP)	Pump Capacity	Has VFDs?	Sum of Pump Capacities (gpm)[1]	Generator
Snoqualmie Ridge Pressure Zones Booster Pump Stations										
705 BPS	599 Zone	705 Zone	1997	2	Horizontal end-suction	(2) 60	(2) 600 gpm @ 175' TDH	No	2,400	Kimball Creek LS Diesel Generator
			2008	2	Horizontal end-suction	(2) 60	(2) 600 gpm @ 175' TDH	Yes		Portable Diesel Generator
1040 BPS	705 Zone	1040 Zone	1996	4	Vertical turbine	(2) 100	(2) 625 gpm @ 385' TDH	No	2,500	Diesel Generator
						(2) 125	(2) 625 gpm @ 385' TDH	No		
1180-1260 BPS	1040 Zone	1180 Zone	2008	6	Vertical turbine	(1) 10	(1) 155 gpm @ 164' TDH	Yes	4,748	Diesel Generator
						(3) 40	(3) 531 gpm @ 215' TDH	Yes		
						(2) 125	(2) 1,500 gpm @ 210' TDH	No		
		1260 Zone		6	Vertical turbine	(1) 15	(1) 137 gpm @ 245' TDH	Yes	4,445	
						(3) 50	(3) 436 gpm @ 290' TDH	Yes		
						(2) 150	(2) 1,500 gpm @ 290' TDH	No		
South Pressure Zones Booster Pump Stations										
384th Avenue SE BPS	599 Zone	799 Zone	1982	3	Vertical turbine	(2) 20	(2) 200 gpm @ 216' TDH	No	1,600	Natural Gas Generator
					Horizontal end-suction	(1) 125	(1) 1,200 gpm @ 272' TDH	No		
Snoqualmie Point BPS	799 Zone	1172 Zone	1989	2	Submersible	(2) 25	(2) 150 gpm @ 414' TDH	No	300	None

1 = The actual total station capacity is typically less than the sum of pump capacities, due to increased head losses at higher flow rates. Total capacity may also be limited if the BPS electrical system is not designed to run all pumps concurrently.

Storage Facilities

The City's water system has six storage facilities that provide storage to various zones in the system. A summary of the storage facilities is shown in **Table 2-12** from the City's *Water System*

Plan. The 599 Reservoir provides storage for the 599 Zone, but currently is experiencing water quality issues. The City occasionally flushes water from the reservoir to reduce the water age. The 705 Reservoirs and 1040 Reservoirs provide storage for the Snoqualmie Ridge area. The 1172 Reservoir operates when the 384th Avenue SE BPS and Snoqualmie Point BPS are not operating to supply water to the 1172 Zone, 799 Zone, and 670 Zone via PRVs.

Table 2-12

Storage Facilities Summary

Reservoir	Approximate Location	Pressure Zone	Year Constructed	Construction Type	Capacity (MG)	Overflow Elevation (feet)	Diameter (feet)	Height (feet)
599 Zone								
599 Reservoir	South of Cortland Avenue SE	599 Zone	1961	Steel	0.5	599	52	32
Snoqualmie Ridge Pressure Zones								
705 Reservoir No. 1	Fisher Creek Park	705 Zone	1996	Steel	0.03	705	15	24
705 Reservoir No. 2			2018	Steel	0.13		30	24
1040 Reservoir No. 1	South of SE Jacobia St, between Hancock Ave SE and SE Keller St	1040 Zone	1997	Concrete	2.1	1,040	122	24
1040 Reservoir No. 2			2004	Concrete	1.7		110.5	24
South Pressure Zones								
1172 Reservoir	South of Snoqualmie Point Park	1172 Zone	1989	Steel	0.4	1,172	47	31

Distribution and Transmission System

The City's water system contains approximately 68 miles of water main ranging in size from 2 inches to 24 inches. Most of the water main (approximately 92 percent) within the system is 12 inches in diameter or less. The remaining water main (approximately 8 percent) is 14 inches in diameter or larger.

The majority of the water main is constructed of ductile iron pipe (approximately 76 percent). Other water main materials in the system include PVC, asbestos cement, cast iron, and high-density polyethylene.

Water System Interties

Water system interties are physical connections between two adjacent water systems. Interties normally are separated by a closed isolation valve or control valve. Emergency supply interties provide water from one system to another during emergency situations only. An emergency situation may occur when a water system loses its main source of supply or a major transmission main, or during firefighting situations, and is unable to provide a sufficient quantity of water to its customers. Normal supply interties provide water from one system to another during non-emergency situations and are typically supplying water at all times.

The City's only intertie is with the Walter Walker Water Works (Walter Walker) system, which is located immediately south of the City's 800 Zone. The City provides wholesale water to the Walter Walker system via a Walter Walker-owned BPS located on the City's 599 Zone Reservoir site. The Walter Walker BPS has two 70 gpm pumps that pump water through 8-inch-diameter water mains to a 40,300-gallon reservoir. The system serves approximately 14 connections.

City of North Bend

The City of North Bend (North Bend) is located to the southeast of the City. North Bend's water system serves approximately 2,387 connections with a total residential population of approximately 5,510. The City obtains its water supply from a spring source with a capacity of 1,250 gpm and a groundwater well with a capacity of 2,500 gpm. North Bend also has an emergency intertie with the Sallal Water Association.

Echo Glen Children's Center

The Echo Glen Children's Center is located to the west of Snoqualmie's water service area. The water system provides service to approximately 25 connections, with a residential population of 340 people and a non-residential population of 90 people. Water is supplied primarily from a groundwater well with a capacity of 100 gpm. A second 100 gpm groundwater well is used in emergencies for fire suppression.

Fall City Water District

The Fall City Water District (Fall City) is located to the northwest of the City. Fall City serves approximately 1,118 connections, with a residential population of approximately 2,830 people. Water is supplied from 4 groundwater wells with a total capacity of approximately 1,630 gpm. A fifth well provides an additional seasonal capacity of approximately 314 gpm.

Lake Alice Water Association

The Lake Alice Water Association (Lake Alice) system is located immediately to the west of the City. The Lake Alice system serves approximately 31 connections with a residential population of 90 people. Water is supplied from a single groundwater well with a capacity of 30 gpm.

Rumbolz Sunset Water System

The Rumbolz system is located to the south of the City. The system serves approximately 40 connections, with a residential population of 106 people. Water is supplied to the system from 2 groundwater wells with a total capacity of 70 gpm.

The Rumbolz system has approached the City for Satellite System Management Agency (SSMA) services. The City currently is evaluating the feasibility of providing SSMA services to the system.

Snoqualmie Indian Tribe – Snoqualmie Casino

In 2008, the Snoqualmie Indian Tribe completed construction of the Snoqualmie Casino, located along I-90 just outside of the City limits. The Casino system has one well, two 50,000-gallon concrete tanks, and treatment consisting of disinfection and arsenic removal. The system is designed to serve a transient population of 4,400 people and has a capacity of 125 gpm.

The Tribe owns several other properties in the area as well that have yet to be developed fully. The casino system will not serve other properties owned by the Tribe when developed.

Spring Glen Association

The Spring Glen Association, located to the north of the City, provides water to approximately 71 connections, with a residential population of 200 and a non-residential population of 45. Water is supplied to the system from a groundwater well with a capacity of 200 gpm. A second back-up groundwater well with a capacity of 200 gpm is operated seasonally.

Tokul Creek Community

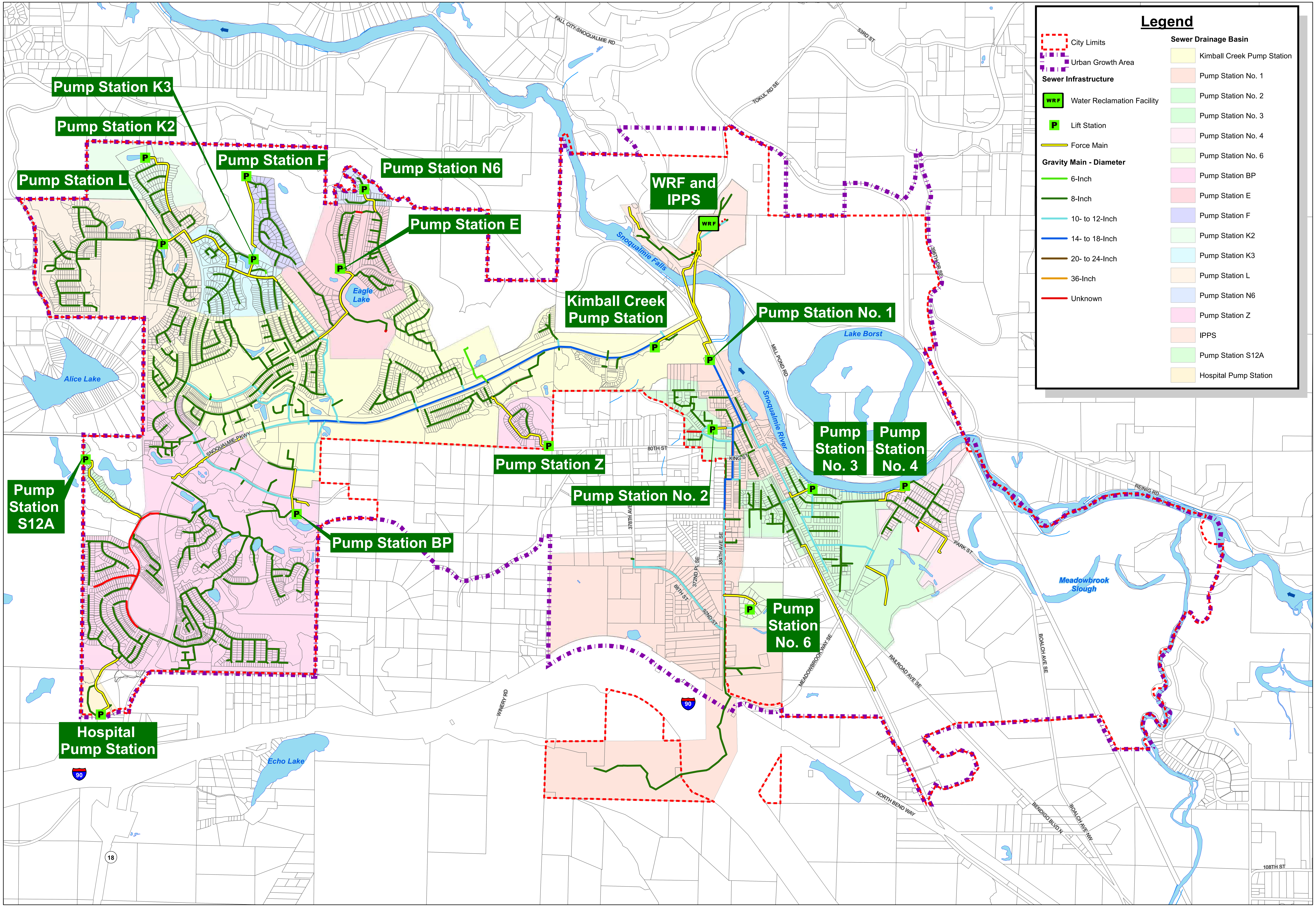
The Tokul Creek Community is a Group B water system located to the north of the Mill Site. The system has approximately 13 connections and a residential population of 23 people. Water is supplied from a groundwater spring with a capacity of 100 gpm.

Upper Preston Water Association

The Upper Preston Water User Association is located to the southwest of the City. The system provides water service to approximately 60 connections, with a residential population of 150. The source of supply is a groundwater well with a capacity of 65 gpm.

Walter Walker Water Works

The Walter Walker system is located inside the City's UGA. As discussed previously, wholesale water is supplied from the City to the Walter Walker system via a BPS located at the 599 Reservoir site. The Walter Walker system serves approximately 14 connections with a residential population of 35.



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Vicinity Map

Figure 2-2
Existing Sewer System

City of Snoqualmie
General Sewer Plan

CITY OF SNOQUALMIE

1 inch = 1,000 feet

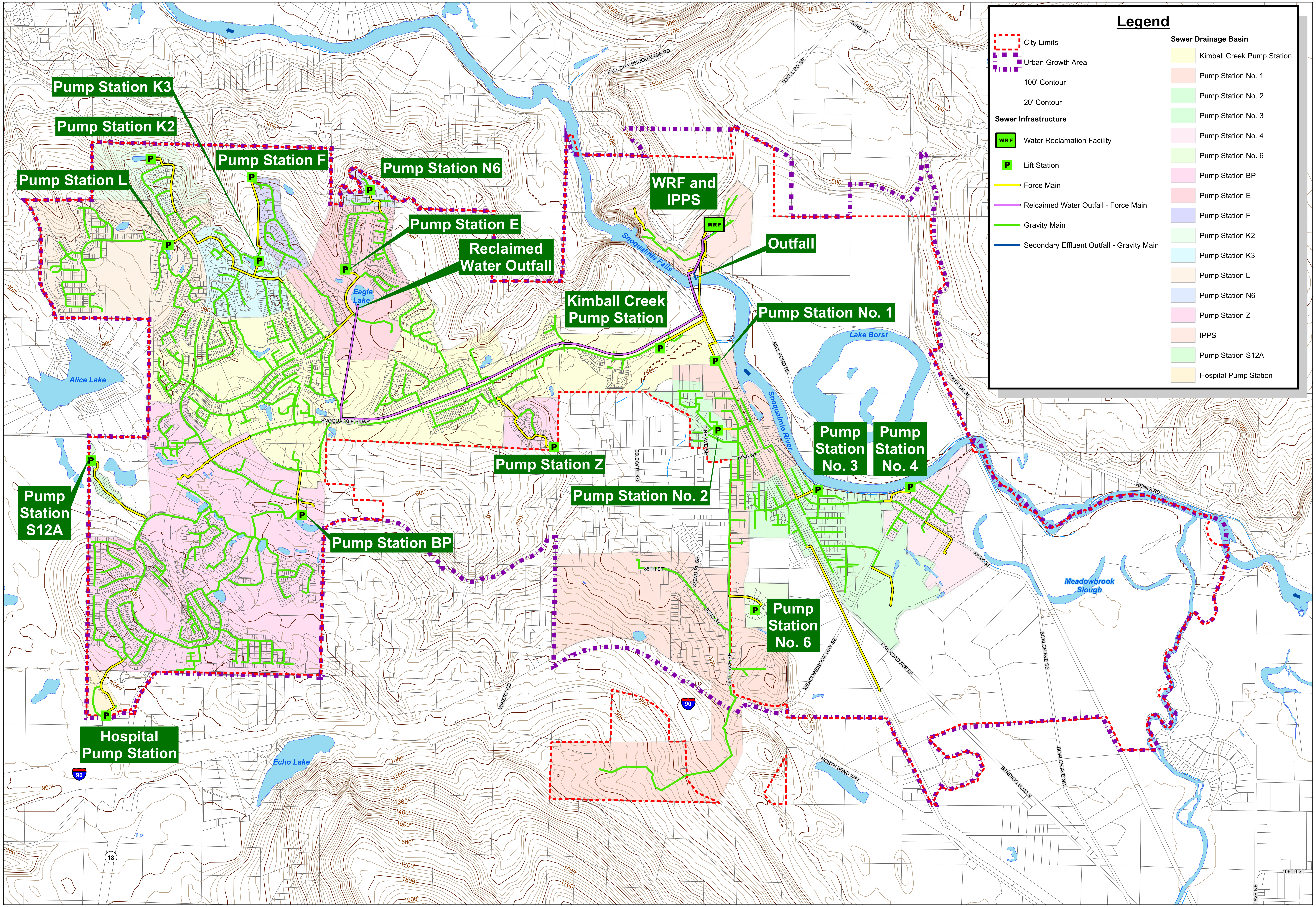
0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET   PLOT DATE: JUL 1, 2021   BY: LMOJARAB   \\RH2-118\PROJECT\DATA\SNQ\118-083\GIS\GSP-FIG_2-2_EX_SEWER_SYST.MXD



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Vicinity Map

KING COUNTY

Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Figure 2-3
Sewer Drainage Basins
City of Snoqualmie General Sewer Plan

COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

PLOT DATE: JUL 1, 2021 BY: LMOJARAB

\\RH2-118\PROJECTDATA\SNQ\118-083\GIS\GSP-FIG_2-3_SEWER_BASINS.MXD

CITY OF SNOQUALMIE

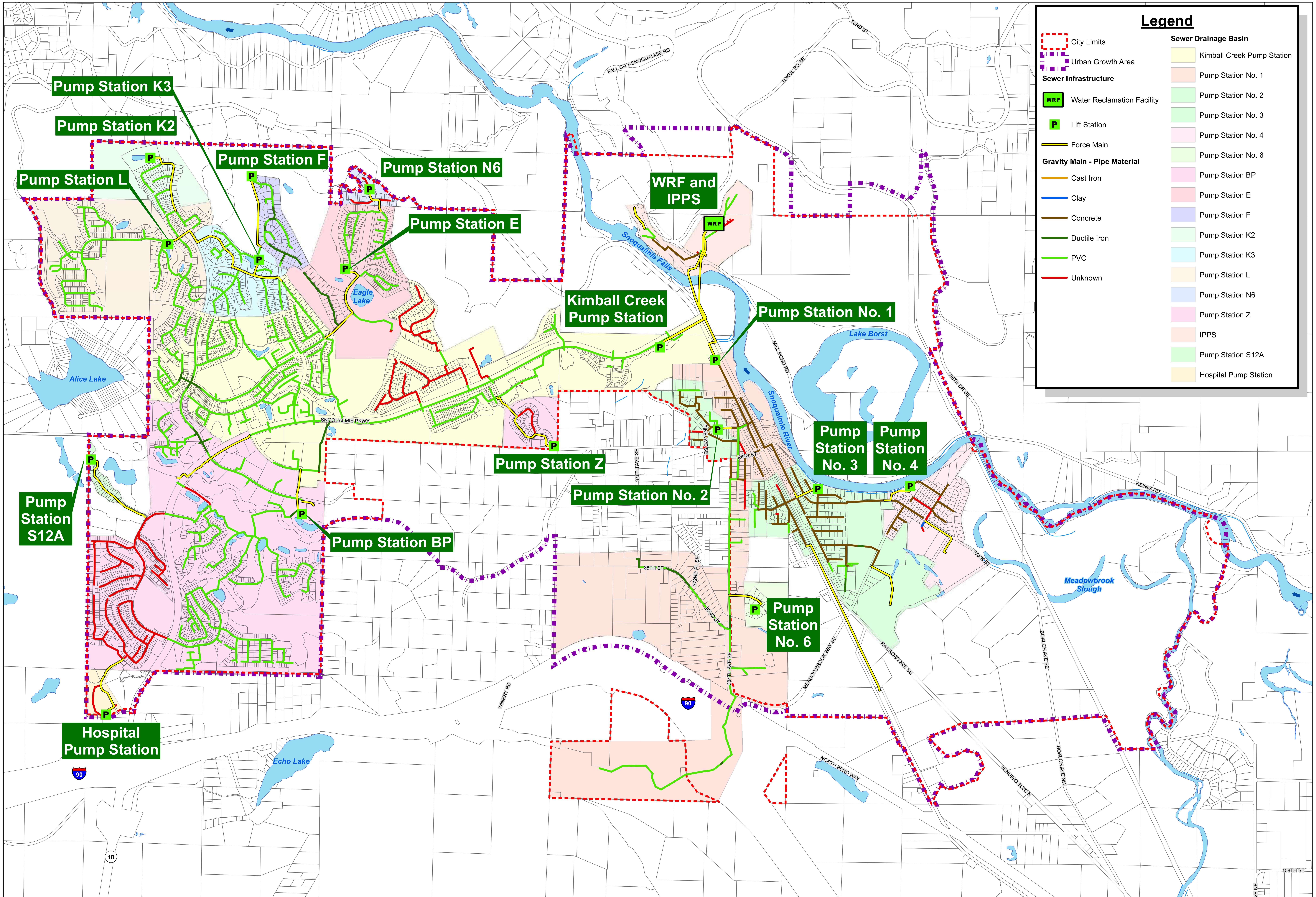
1 inch = 1,000 feet

0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH



COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

Vicinity Map

\\RH2-118\PROJECT\DATA\SNQ\118-083\GIS\GSP-FIG_2-5A_PIPE_MATERIAL.MXD BY: LMOJARAB PLOT DATE: JUL 1, 2021

Figure 2-5A
Pipe Material

City of Snoqualmie
General Sewer Plan

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

NORTH


Pump Station K3
Pump Station K2
Pump Station F
Pump Station N6
Pump Station L
Pump Station E
WRF and IPPS
Kimball Creek Pump Station
Pump Station No. 1
Pump Station No. 3
Pump Station No. 4
Pump Station Z
Pump Station No. 2
Pump Station S12A
Pump Station BP
Pump Station No. 6
Hospital Pump Station
Alice Lake
Eagle Lake
Lake Borst
Echo Lake
Snoqualmie Falls
Snoqualmie River
Meadowbrook Slough
SNOQUALMIE PKWY
FALL CITY-SNOQUALMIE RD
TOKUL RD SE
53RD ST
MILL POND RD
396TH DR SE
REINIG RD
PARK ST
KING ST
PINE AVE SE
378TH AVE SE
372ND PL SE
88TH ST
MEADOWBROOK WAY SE
RAILROAD AVE SE
BOALCH AVE SE
BOALCH AVE NW
BENDIGO BLVD N
NORTH BEND WAY
WINERY RD
108TH ST
Legend
City Limits
Urban Growth Area
Sewer Infrastructure
Water Reclamation Facility
Lift Station
Force Main
Gravity Main - Year Installed
1960 to 1969
1970 to 1979
1980 to 1989
1990 to 1999
2000 to 2009
2010 to present
Unknown
Sewer Drainage Basin
Kimball Creek Pump Station
Pump Station No. 1
Pump Station No. 2
Pump Station No. 3
Pump Station No. 4
Pump Station No. 6
Pump Station BP
Pump Station E
Pump Station F
Pump Station K2
Pump Station K3
Pump Station L
Pump Station N6
Pump Station Z
IPPS
Pump Station S12A
Hospital Pump Station
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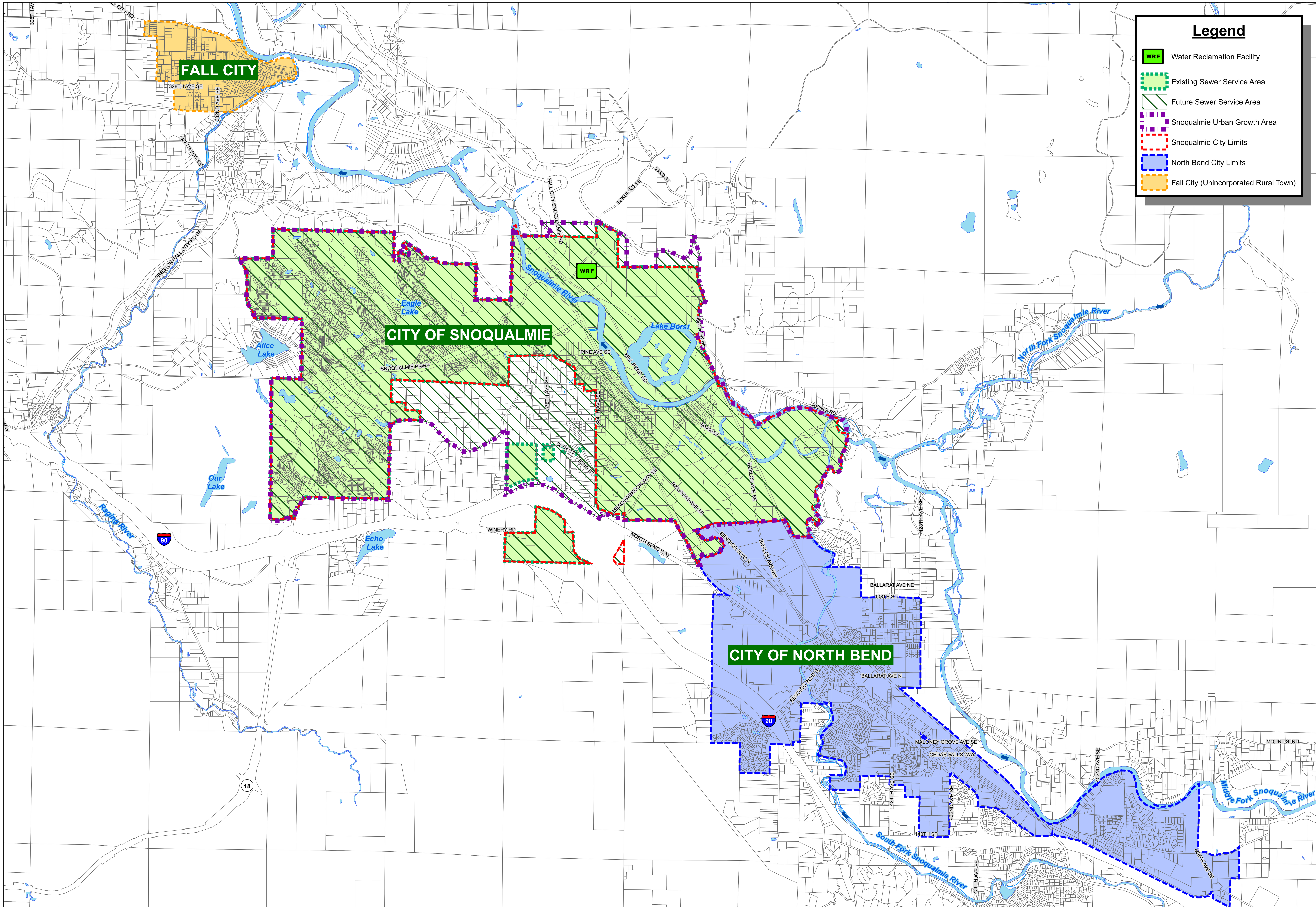
Vicinity Map
KING COUNTY
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET
PLOT DATE: JUL 1, 2021
BY: LMOJARAB
\\RH2-118\PROJECTDATA\SNQ\118-083\GIS\GSP-FIG_2-5B_PIPE_AGE.MXD
Figure 2-5B
Pipe Age
City of Snoqualmie
General Sewer Plan
CITY OF SNOQUALMIE
1 inch = 1,000 feet
0 495 990 1,980 Feet
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"
RH2
NORTH



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Vicinity Map

Figure 2-6
Sewer Service Area
City of Snoqualmie General Sewer Plan

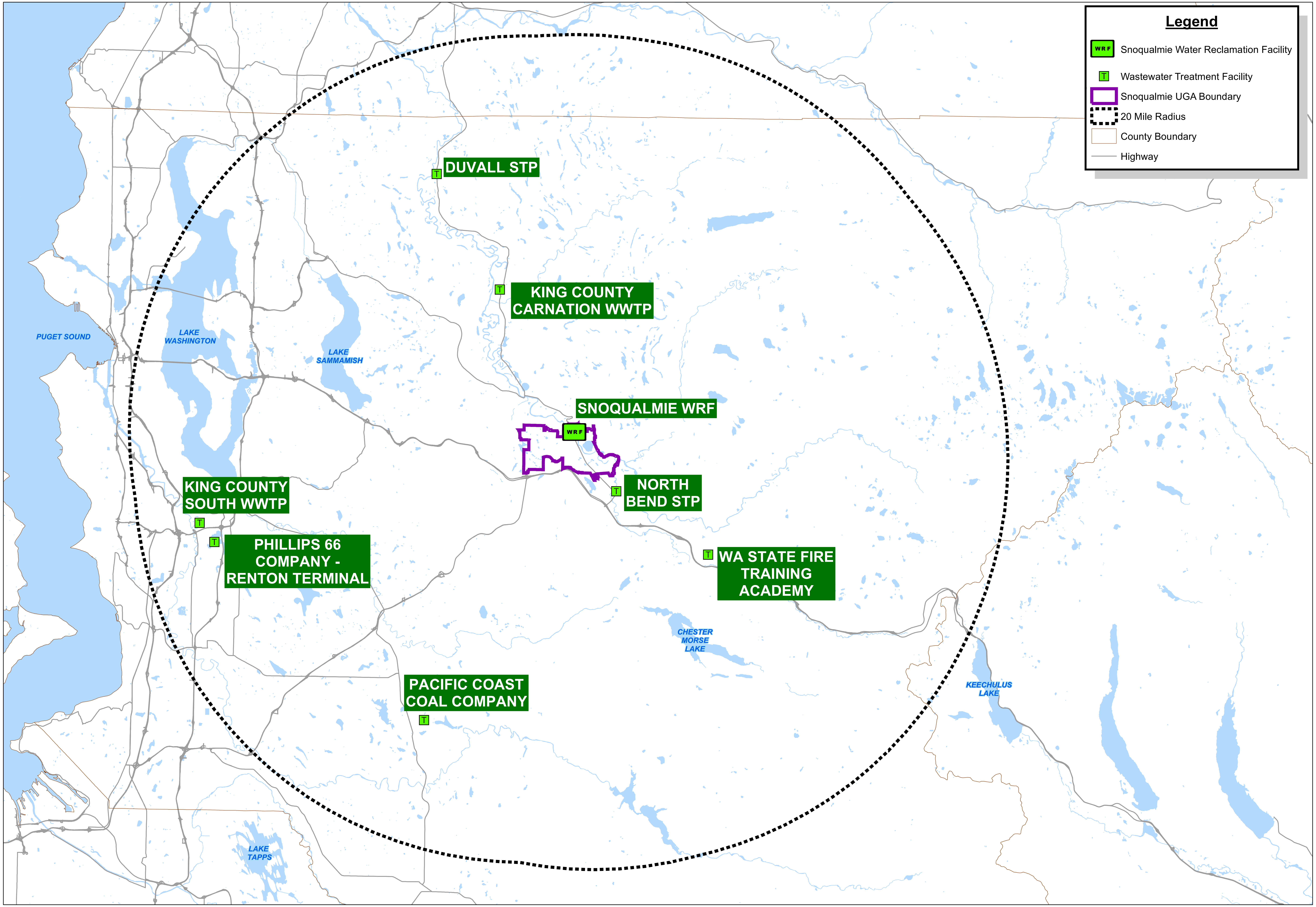
J:\DATA\SNQ\118-083\GIS\GSP-FIG_2-6_SERVICE_AREA.MXD BY: LMOJARAB PLOT DATE: JUN 14, 2022 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

1 inch = 2,000 feet

0 950 1,900 3,800 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

NORTH



\\RH2-118\PROJECTDATA\SNQ\118-083\GIS\GSP-FIG_2-7_EX_WWTFS.MXD BY: KGOMEZ PLOT DATE: JUL 1, 2021 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

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Vicinity Map

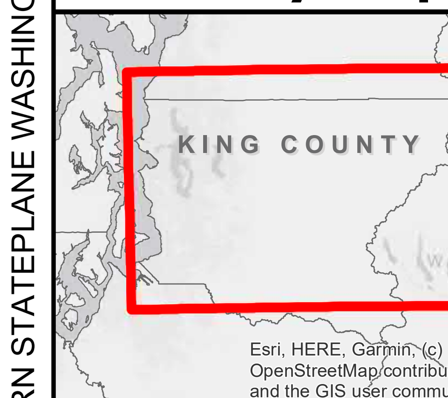

Figure 2-7
WW Treatment Facilities in Vicinity

City of Snoqualmie
General Sewer Plan

1 inch = 12,000 feet

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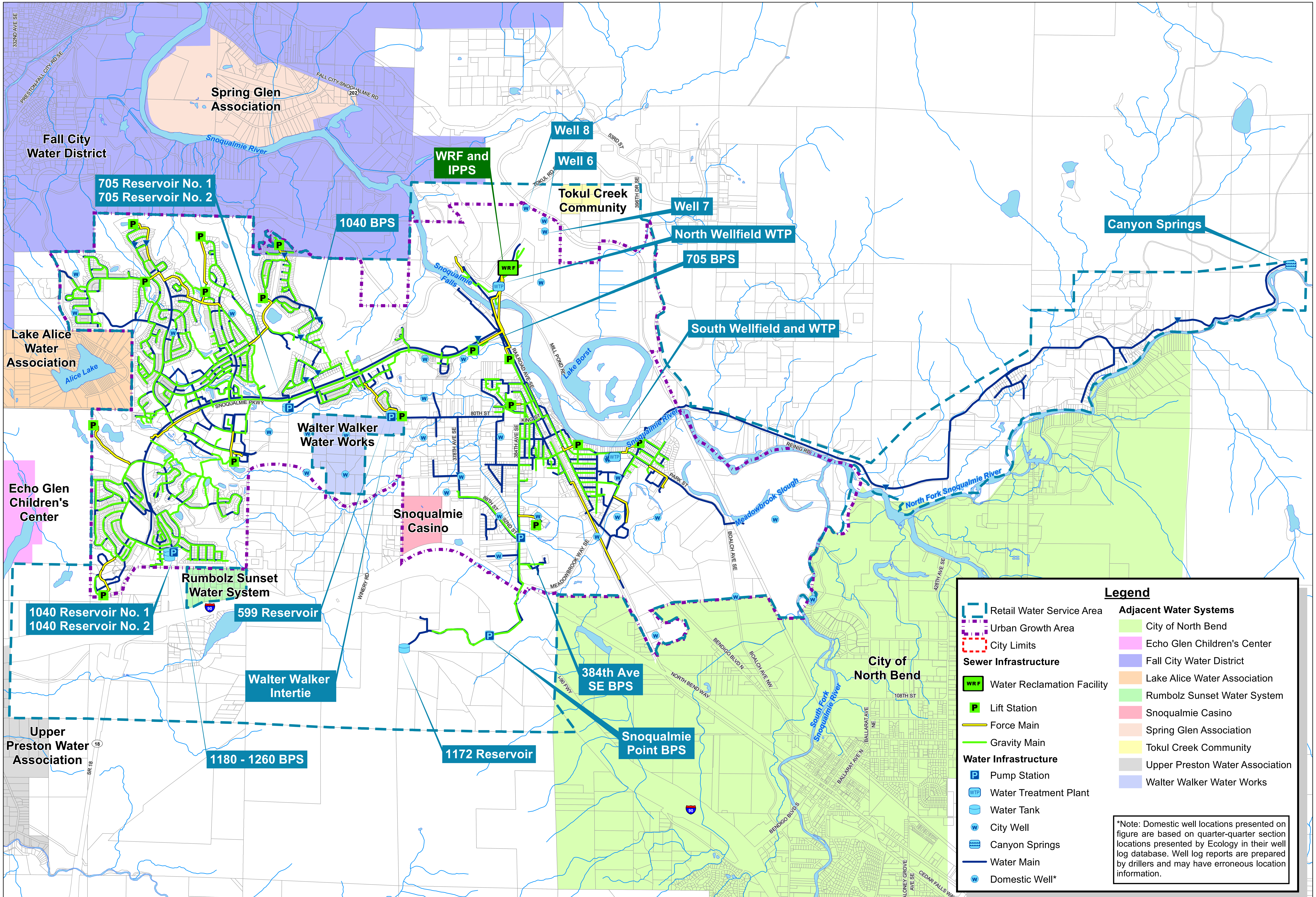
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH



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Vicinity Map

KING COUNTY

Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Figure 2-8
Existing Sewer and Water System
City of Snoqualmie General Sewer Plan

J:\DATA\SNQ\118-083\GIS\GSP-FIG_2-8_EX_WATER_&_SEWER_SYST.MXD BY: LMOJARAB PLOT DATE: JUN 16, 2022 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

1 inch = 1,500 feet

0 750 1,500 3,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

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3 | LAND USE AND POPULATION

INTRODUCTION

The State of Washington Growth Management Act (GMA) requires, among other things, consistency between land use and utility plans and their implementation. This chapter demonstrates the compatibility of the City of Snoqualmie's (City) General Sewer Plan (GSP) with other plans, identifies the designated land uses within the existing and future service area, and presents population and employment projections within the City's planning area.

COMPATIBILITY WITH OTHER PLANS AND POLICIES

To ensure that the GSP is consistent with the land use policies that guide it and other related plans, the following planning documents were examined.

- State of Washington Growth Management Act
- Puget Sound Regional Council *VISION 2040 Part III: Multicounty Planning Policies*
- *Snoqualmie 2032 City of Snoqualmie Comprehensive Plan*
- *2012 King County Countywide Planning Policies*
- *King County Comprehensive Plan*, 2016 Update

Growth Management Act

The State of Washington GMA of 1990 (and its multiple amendments) defined four goals relevant to this GSP:

1. Growth should be in urban areas;
2. There should be consistency between land use and utility plans and their implementation;
3. There should be concurrency of growth with public facilities and services; and
4. Critical areas should be designated and protected.

Urban Growth Area

The GMA requires that King County (County) designate an Urban Growth Area (UGA) where most future urban growth and development will be directed. The Countywide UGA is defined in the County's *Comprehensive Plan* and encompasses the area where this urban growth and development is projected to occur over the 20-year planning period. The current King County UGA boundaries in the vicinity of the City are shown on **Figure 3-1**.

Potential Annexation Areas

A Potential Annexation Area (PAA) is an area identified by the County and a city as expected to annex into that city during the 20-year planning period. The City's PAAs, per County mapping, are the Snoqualmie Southwest PAA (corresponding to the City's Snoqualmie Hills West and Snoqualmie Hills East planning areas), the Snoqualmie Weyerhauser West PAA (located within the City's Snoqualmie Falls planning area), the Snoqualmie Weyerhauser East PAA and the Snoqualmie Mill 2 PAA (located with the City's Mill planning area), and the Snoqualmie River Alignments PAA (located within the City's Meadowbrook planning area).

Consistency

The GMA requires planning consistency from two perspectives. First, it requires the consistency of plans between jurisdictions. This means that plans and policies of the City and County must be consistent per Revised Code of Washington (RCW) 36.70A.100. Second, the GMA requires that the implementation of the GSP be consistent with comprehensive plans (RCW 36.70A.120).

Concurrency

Concurrency means that adequate public facilities and services be provided at the time that growth occurs. For example, growth should not occur where schools, roads, and other public facilities are overloaded. To achieve this objective, the GMA directs growth to areas already served or readily served by public facilities and services (RCW 36.70A.110). It also requires that when public facilities and services cannot be maintained at an acceptable level of service, the new development should be prohibited (RCW 36.70A.110).

Critical Areas

The GMA requires that critical areas be designated and protected. Critical areas include aquifer recharge areas, wetlands, frequently flooded areas, streams, wildlife habitat, landslide hazard areas, seismic hazard areas, and steep slopes. The City has adopted development regulations identifying and protecting critical areas as required. The State Environmental Policy Act (SEPA) Checklist in **Appendix B** addresses other environmental concerns.

Puget Sound Regional Council Vision 2040 Part III: Multicounty Planning Policies

The Puget Sound Regional Council (PSRC) is designated by the governor of the State of Washington as the Metropolitan Planning Organization (MPO) and Regional Transportation Planning Organization (RTPO) for the central Puget Sound region, defined as King, Kitsap, Pierce, and Snohomish counties. PSRC's *VISION 2040* "is a shared strategy for moving the central Puget Sound region toward a sustainable future." PRSC's *VISION 2040 Part III: Multicounty Planning Policies* contains six major policy sections: Environment; Development Patterns; Housing; Economy; Transportation; and Public Services. Under each section, goals, policies, actions, and measures are identified. All the City's functional plans are required to be consistent with PSRC's *VISION 2040 Part III: Multicounty Planning Policies*.

City of Snoqualmie Comprehensive Plan

The City of Snoqualmie's *Comprehensive Plan* was last adopted in 2014, with additional amendments in 2017. The plan was developed to describe the City's vision for 2032 and to provide goals and policies for achieving the vision, as well as to meet the requirements of the GMA.

The Land Use Element of the City's *Comprehensive Plan* is the City's vision of how growth and development should occur over a 20-year horizon. While the Land Use Element goals and policies set forth general standards for locating land uses, the Land Use Designations Map (Figure 2.1) indicates geographically where certain types of uses may be appropriate. The Land Use Designations Map is a blueprint for the development of an area. The City's existing land use is shown in **Figure 3-1**.

The Land Use Element considers the general location of land uses, as well as the appropriate intensity and density of land uses given the current development trends. The Transportation and Capital Facilities and Utilities Element ensures that a new development will be served adequately without compromising adopted levels of service, which is consistent with the principal of concurrency as defined in the GMA.

King County Countywide Planning Policies

The County's 2012 *Countywide Planning Policies* are a series of policies that address growth management issues in King County. The current version of the policies includes amendments ratified on June 25, 2016. For consistency with PSRC's *VISION 2040*, the *Countywide Planning Policies* also are organized into the policy sections of Environment, Development Patterns, Housing, Economy, Transportation, and Public Facilities and Services. Page 48 of the *Countywide Planning Policies* identifies specific policies related to sewage treatment and disposal. All the City's functional plans are required to be consistent with the County's *Countywide Planning Policies.*

King County Comprehensive Plan

The current version of the King County *Comprehensive Plan* was adopted in 2016, and last amended in 2018. Chapters include the following.

- Regional Growth Management Planning
- Urban Communities
- Rural Areas and Natural Resource Lands
- Housing and Human Services
- Environment
- Shorelines
- Parks, Open Space, and Cultural Resources
- Transportation
- Services, Facilities, and Utilities

- Economic Development
- Community Service Area Subarea Planning
- Implementation, Amendments, and Evaluation

The County's plan is focused on six guiding principles, as follows.

1. Creating Sustainable Neighborhoods
2. Preserving and Maintaining Open Space and Natural Resource Lands
3. Directing Development Towards Existing Communities
4. Providing a Variety of Transportation Choices
5. Addressing Health, Equity, and Social and Environmental Justice
6. Achieving Environmental Sustainability

The County's *Comprehensive Plan* guides development and designates land use in unincorporated King County. County Land Use inside the City's future wastewater service area (which includes the City's UGA and the area in the City limits outside the UGA, which is located south of Interstate 90) is shown in **Figure 3-1**; the County's *Comprehensive Plan* can be referenced for County Land Use outside the City's future wastewater service area.

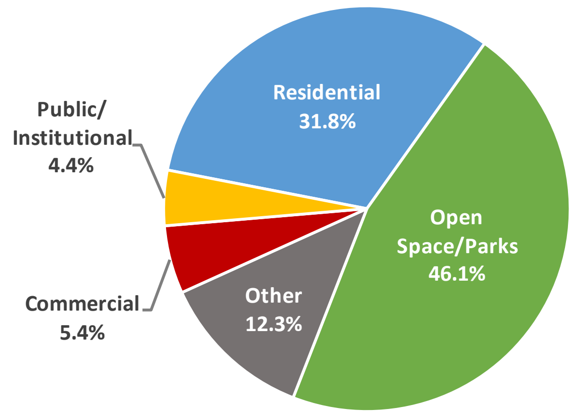
LAND USE

The future wastewater service area includes the City and portions of unincorporated King County in the City's UGA, for a total of 8.8 square miles. The future wastewater service area Land Use Map, as shown in **Figure 3-1**, guides development and can be used to forecast future wastewater flows and loadings. Land use outside the City is designated by the County, as shown in **Figure 3-1**.

Approximately 31.8 percent of the area within the City's future wastewater service area is designated for residential use, as indicated in **Table 3-1**. Approximately 46.1 percent of the future wastewater service area is designated for open space/parks; approximately 5.4 percent is designated for commercial use; approximately 4.4 percent is designated for public/institutional use; and approximately 12.3 percent is designated for other land uses or is undesignated.

Table 3-1
Land Use Inside Future Wastewater Service Area

Land Use Type	Acres	% of Total
Residential	1,794	31.8%
Open Space/Parks	2,600	46.1%
Other	694	12.3%
Commercial	307	5.4%
Public/Institutional	249	4.4%
Total	**5,644**	**100%**



POPULATION

Household Trends

The City's residential areas are largely comprised of single-family residences. The City's 2014 *Comprehensive Plan* estimated that there were approximately 3,943 housing units in the City. Of these, approximately 3,208 housing units (81.4 percent) were single-family residences, and approximately 735 housing units (18.6 percent) were one-unit attached or located in multi-unit structures. The City's average household size is estimated to be 3.0 persons in the Snoqualmie Ridge area and 2.5 persons in all other areas of the City.

Historical and Future City Population

The City has experienced rapid population growth and extensive physical development since 2000. The population of the County increased by approximately 10 percent from 2010 to 2017 based on Office of Financial Management (OFM) estimates. The population of the City increased by approximately 20 percent during the same period. A significant portion of the City's population growth is due to the continued development of the Snoqualmie Ridge on the west side of the City. **Table 3-2** illustrates the historical population growth since 1990. The historical population shown in **Table 3-2** represents the population within the City limits. The sources of the historical population numbers are the decennial census and OFM intercensal estimates.

Table 3-2
Population Trends within the City Limits

Year	Population
1990	1,546
1995	1,565
2000	1,631
2005	6,933
2010	10,670
2011	10,950
2012	11,320
2013	11,700
2014	12,130
2015	12,850
2016	13,110
2017	13,210

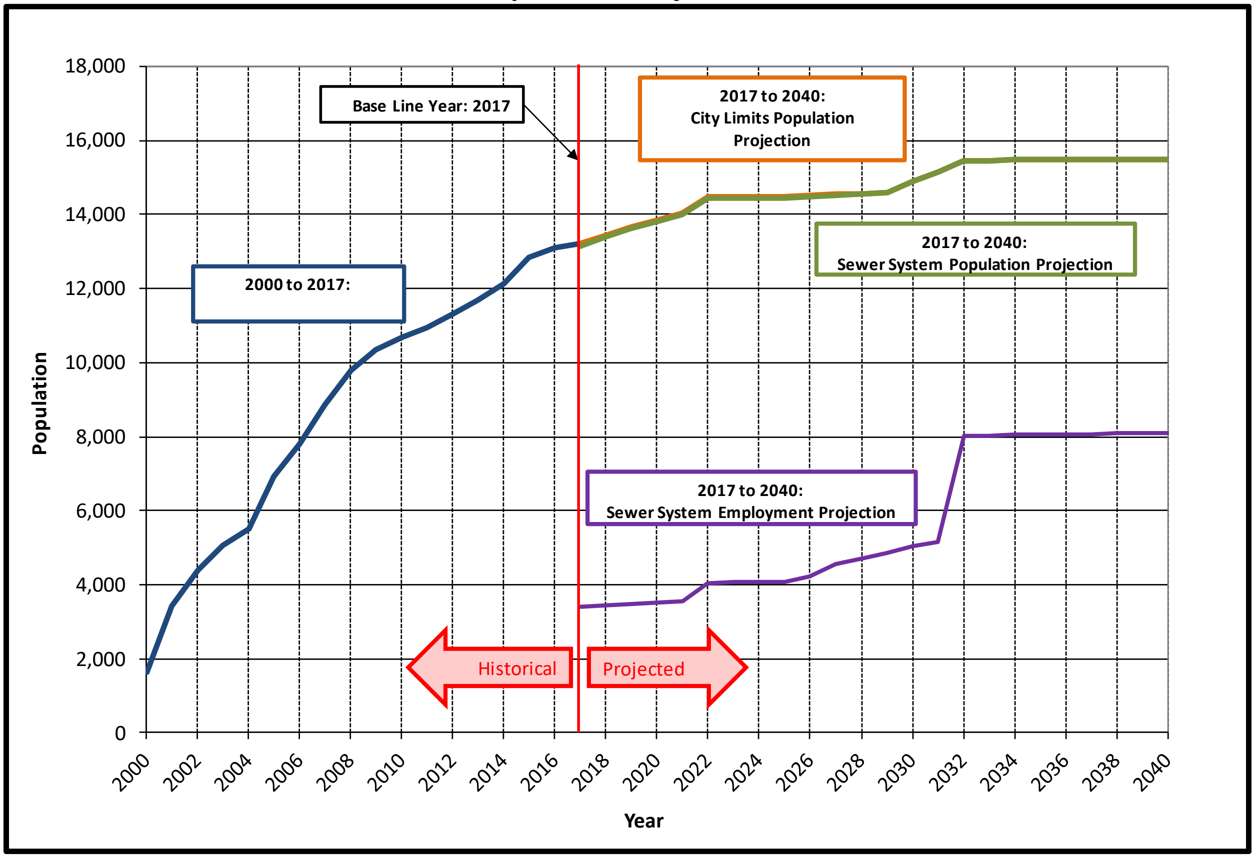
Projected future population growth within the City Limits, shown in **Table 3-3** and **Chart 3-1**, is based on current projections from the City's Community Development Department, Planning Division. Population growth is anticipated in the Mill Site, Snoqualmie Hills West, Snoqualmie Hills East, Snoqualmie Ridge Phases I and II, and Meadowbrook planning areas. The previously planned Salish development has been withdrawn by the new property owners and was not included in the population projections for the City. While the Snoqualmie Casino (Casino) is located within the UGA, no data was available to the City regarding a potential Casino expansion during the initial preparation of this GSP. Therefore, no population for the Casino was included in the population projections for the City. The City is projected to have a population of 15,499 people in 2040.

Table 3-3
Population Projections

Year	City Population	Sewer System Population	Sewer System Employment
Existing			
2017	13,210	13,151	3,410
Projected			
2018	13,450	13,391	3,437
2019	13,670	13,611	3,464
2020	13,859	13,806	3,500
2021	14,048	14,002	3,536
2022	14,478	14,438	4,054
2023	14,478	14,444	4,062
2024	14,478	14,451	4,070
2025	14,478	14,457	4,078
2026	14,506	14,492	4,229
2027	14,534	14,526	4,570
2028	14,562	14,560	4,721
2029	14,590	14,595	4,872
2030 (+10 years)	**14,877**	**14,877**	**5,023**
2031	15,164	15,164	5,166
2032	15,451	15,451	8,018
2033	15,458	15,458	8,029
2034	15,465	15,465	8,040
2035	15,471	15,471	8,051
2036	15,477	15,477	8,062
2037	15,483	15,483	8,073
2038	15,489	15,489	8,083
2039	15,494	15,494	8,093
2040 (+20 years)	**15,499**	**15,499**	**8,103**

Chart 3-1

Population Projections



Sewer System Population

The actual number of people served by the City's wastewater system is different than the population of the City limits. The City currently provides sewer service to the entire population within the City limits, except for 28 residential and 6 commercial properties that currently are unsewered. The unsewered population inside the City limits was calculated by multiplying the estimated number of unsewered residential properties by the average household size for areas of the City outside of Snoqualmie Ridge. The City also provides sewer service to an estimated four residential properties in the UGA outside the City limits. The sewer system population outside the City limits was calculated by multiplying the estimated number of connections by the average household size for unincorporated King County. As shown in **Table 3-3**, the estimated population served by the sewer system in 2017 was 13,151.

Sewer system population projections through 2040 are shown in **Table 3-3**. It was assumed that by 2030 the current sewer customers in the UGA outside the City limits would all be annexed to the City, and all unsewered properties in the City limits would connect to the City's wastewater system. The wastewater system is expected to provide service to approximately 15,499 people in 2040.

Sewer System Employment

The total employment for the wastewater system (which is defined as the number of working people that are served by the City's wastewater system through non-residential sewer connections during their work hours) shown in **Table 3-3** and **Chart 3-1** was calculated for use in wastewater flow and loading projections. Existing and future employment projections for the City were provided by the Community Development Department's Planning Division. These do not include employment at the Casino, which is located inside the City's UGA, because the City did not have information on expansion plans for the Casino during the initial preparation of this GSP.

During the 20-year planning period, the City expects employment growth to exceed population growth. Employment growth is anticipated in the Mill Site, Snoqualmie Hills East and West, Snoqualmie Ridge Phases I and II, and Historic/Meadowbrook planning areas. The previously planned Salish development has been withdrawn by the new property owners and was not included in the employment projections for the City. Employment estimated for the six unsewered commercial properties was based on the number of employees and commercial water service connections in the City's current water service area to estimate an average number of employees per connection. It was assumed that the unsewered commercial properties in the City limits would connect to the City's wastewater system by 2030. The total sewer system employment is expected to grow from 3,410 jobs in 2017 to 8,103 jobs in 2040.

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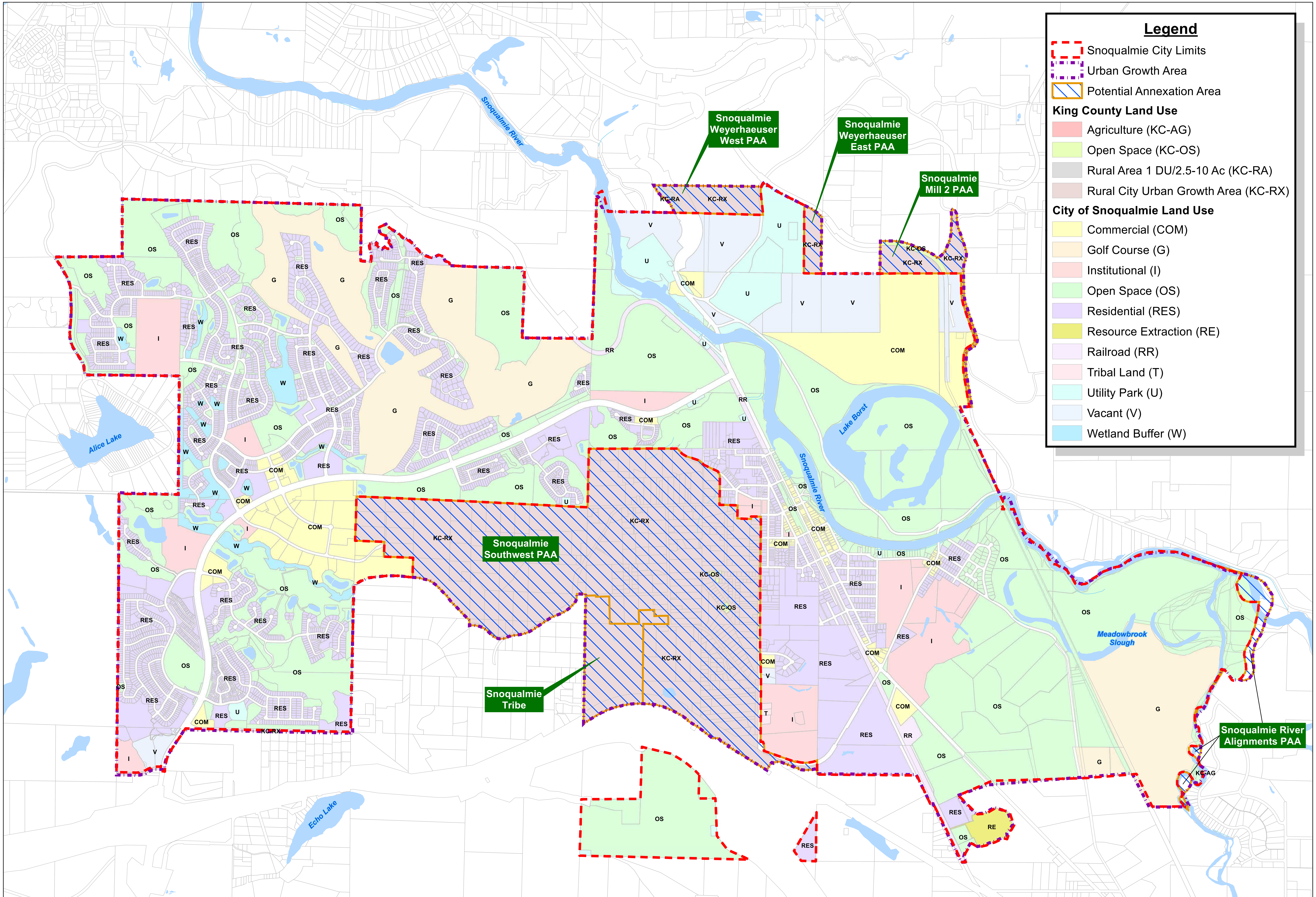

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Vicinity Map

Figure 3-1 Land Use

City of Snoqualmie General Sewer Plan

COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

PLOT DATE: SEP 24, 2021

BY: KGOMEZ

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1 inch = 1,000 feet

0 500 1,000 2,000 Feet

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4 | FLOW AND LOADING ANALYSES

INTRODUCTION

A detailed analysis of flow and loading is crucial to the planning efforts of a sewer service provider. When analyzing a sewer system, the first step is to identify current flow and load values to determine if the existing system can provide adequate service to its existing customers under the most crucial conditions in accordance with federal and state laws. A projected sewer system analysis identifies projected flow and load values to determine where the system will need to be improved to satisfy projected growth while continuing to meet federal and state laws.

Flow and load values in a sewer system are used to determine the size of gravity collection piping, lift station facilities, and force main piping, and the size and type of treatment facilities needed. This information also is used to develop the sewer service provider's National Pollutant Discharge Elimination System (NPDES) waste discharge permit, which is required by the Washington State Department of Ecology (Ecology). Several different flow scenarios were analyzed for the City of Snoqualmie's (City) sewer system and are addressed in this chapter, including average annual flow (AAF), maximum month average flow (MMF), maximum day flow (MDF), peak hour flow (PHF), and projected flows. Water Reclamation Facility (WRF) loading, inflow and infiltration (I/I), and peaking factors also are presented.

System design criteria and standards have been developed to ensure that a consistent minimum level of service is maintained throughout the City's sewer system and to facilitate planning, design, and construction of sewer system projects. A copy of the City's Sanitary Sewer Engineering Standards is included in **Appendix C**. Design requirements for sewer systems is available in Ecology's *Criteria for Sewage Works Design* (commonly known as the Orange Book).

SEWER SERVICE CONNECTIONS AND RESIDENTIAL POPULATION

Sewer Service Connections

Table 4-1 presents the City's historical sewer service connections for 2018. As of 2018, there were approximately 4,718 sewer service connections throughout the City's sewer system. Of these connections, 4,341 were single-family residential services, 112 were multi-family residential services, 233 were commercial, and 32 were public. A breakdown of the sewer service connections by customer class is shown in **Chart 4-1**.

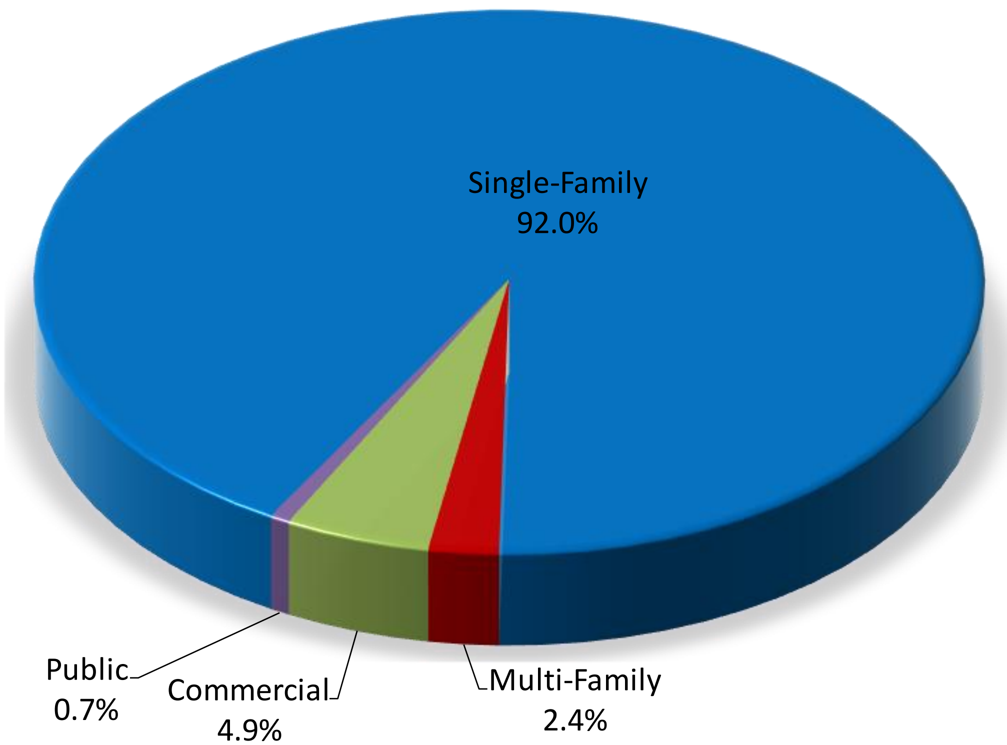
Table 4-1

2018 Sewer Connections Summary

Single-Family Residential Sewer Accounts	Multi-Family Residential Sewer Accounts	Commercial Sewer Accounts	Public Sewer Accounts	Total Sewer Accounts
4,341	112	233	32	4,718

Chart 4-1

2018 Sewer Service Connections by Customer Class



Sewer Service Population and Employment

As presented in **Chapter 3**, the City's 2017 sewer service area population is estimated to be 13,151 people. The estimate is based on the City's population of 13,210 for 2017, an average household size of 2.5 for areas in the City outside of Snoqualmie Ridge multiplied by 28 unsewered residential properties in the City limits, and an average household size of 2.74 for unincorporated King County multiplied by 4 residential properties that the City provides sewer service to in the Urban Growth Area (UGA) outside the City limits. The average household size for areas in the City outside of Snoqualmie Ridge is based on the City's *Comprehensive Plan*, which was amended in 2017, and the average household size for unincorporated King County is based on Washington State Office of Financial Management (OFM) data from the 2010 Census. **Table 4-2** presents the City's historical sewer population for 2012 through 2018.

Table 4-2

Historical Sewer Service Population and Employment Summary

Year	City Population	Sewer System Population	City Employment	Sewer System Employment
2012	11,320	11,261	3,006	2,917
2013	11,700	11,641	3,105	3,016
2014	12,130	12,071	3,203	3,115
2015	12,850	12,791	3,302	3,213
2016	13,110	13,051	3,400	3,312
2017	13,210	13,151	3,499	3,410
2018	13,450	13,391	3,526	3,437

As presented in **Chapter 3**, the City's 2017 sewer service area employment is estimated to be 3,410 employees. The estimate is based on the City's employment of 3,499 for 2017, and an average of 14.75 employees per commercial connection multiplied by 6 unsewered commercial properties in the City limits. The average employees per connection is based on the water system employment and number of water service connections for 2017. **Table 4-2** presents the City's historical sewer employment for 2012 through 2018. The existing and projected employment for the City and sewer service area do not include the Snoqualmie Casino (Casino), which is located inside the City's UGA. The Casino was accounted for separately from the City's existing and projected employment and population in this General Sewer Plan (GSP).

The City's wastewater collection planning area includes the entire UGA and the area in the City limits outside the UGA, which is located south of Interstate 90. There are parcels within the City limits that are served by on-site septic systems. Once these systems fail, City code requires that the homeowners connect to the City's municipal wastewater system if the parcel is located within 150 feet of the wastewater collection system. It is assumed for this planning document that all of these parcels in the City limits will be on the City's wastewater collection system by 2030, and the sewer service population will be the same as the UGA population by 2040. This will ensure that the City has the infrastructure in place to serve the entire UGA population.

Snoqualmie Casino

The City currently provides sewer service to the Casino, which is located inside the City's UGA and contributes significant flow and loading to the City's collection system and WRF. Wastewater flow from the Casino is monitored at a flume where the wastewater is discharged to the City's collection system, and 5-day biochemical oxygen demand (BOD_5) loading from the Casino used to be monitored as well. Since the Casino is a significant contributor to the City's sewer system and their wastewater has been monitored, some historical flow and loading analyses with the Casino removed have been presented in this chapter. These analyses were primarily prepared for evaluating flow and BOD_5 loading per capita and flow and BOD_5 loading peaking factors (without the Casino) that are used in the projections presented in this chapter.

The Casino is included in all historical and projected flows and loadings and any resulting Capital Improvement Plan (CIP) projects presented in this GSP, unless stated otherwise. The City's service agreement with the Casino (**Appendix F**) was most recently renewed in 2022 and is currently set to expire on November 30, 2026. The City anticipates that this contract will continue to be extended, and the City will continue to provide sewer service to the Casino; therefore, the historical flows and loadings from the Casino were retained in the base flow and loadings used for the initial projections in this chapter.

In 2021, the Casino requested additional sewer service from the City to accommodate a Casino expansion. This expansion will increase flow and loading discharged by the Casino to the City's existing sewer system. Additional sections have been added to this GSP regarding the projected sewer system impacts as a result of the Casino expansion.

EXISTING WASTEWATER FLOW AND LOADING

Wastewater Flow

The total influent flow to the WRF is made up of untreated flow from primarily residential customers, but also includes flow from a number of commercial, hospitality, and retail businesses, schools, and the Snoqualmie Valley Hospital. A majority of the wastewater generated from the collection system is sent to the Kimball Creek Pump Station (KCPS) located south of Snoqualmie Falls and the Railroad Avenue (Highway 202) bridge (**Figure 2-2**). KCPS pumps the wastewater to the WRF via two parallel 14-inch-diameter force mains. There is a small area of the collection system, located north and east of the Snoqualmie Falls and the Railroad Avenue bridge and surrounding the WRF, where wastewater flows by gravity to the WRF and does not flow through the KCPS.

The City's existing collection system flow rates were estimated using the WRF discharge monitoring reports and lift station run time data for the 2013 through 2017 period. The City's sewer collection system drainage basins are shown in **Figure 2-2**. As noted in **Chapter 2**, wastewater collected in the City north of the Snoqualmie River flows via gravity to the WRF, where it is pumped by the In-Plant Pump Station (IPPS) to the headworks and does not enter the WRF through the Main Pump Station.

The City's discharge monitoring reports have been reviewed and analyzed to determine current wastewater characteristics and influent loadings. **Table 4-3** summarizes the historical WRF AAFs, MMFs, and MDFs (including I/I) on an annual basis for the 2012 through 2018 period. The influent flows for October 8, 2014 and October 9, 2014, were removed from these analyses since there was a significant water main failure on these days that entered the sewer system.

Table 4-3

Historical WRF Influent Flow Summary

Year	Sewer System Population	Sewer System Employment	AAF (MGD)	AAF per Capita (gpcd)	MMF (MGD)	MDF (MGD)	Percent of NPDES Permit Max. Month Limit[1]	Peaking Factors MMF/AAF	Peaking Factors MDF/AAF
2012	11,261	2,917	0.92	82	1.22	1.90	57%	1.33	2.06
2013	11,641	3,016	0.88	76	1.12	2.08	52%	1.28	2.37
2014[2]	12,071	3,115	1.24	102	1.71	2.58	80%	1.39	2.09
2015	12,791	3,213	1.12	88	1.76	4.32	82%	1.57	3.85
2016	13,051	3,312	1.19	91	1.53	2.06	71%	1.29	1.74
2017	13,151	3,410	1.21	92	1.55	3.00	72%	1.28	2.49
2018	13,391	3,437	1.09	81	1.64	2.19	76%	1.50	2.01
2012 to 2018 Average			**1.09**	**87**	**1.50**	**2.59**	---	**1.38**	**2.37**
2012 to 2018 Max.			**1.24**	**102**	**1.76**	**4.32**	---	**1.57**	**3.85**

1 = The City's WRF is permitted for a maximum month average influent flow of 2.15 MGD.
2 = The influent flows for October 8, 2014, and October 9, 2014, were removed from these analyses since there was a significant water main failure on these days that entered the sewer system.

The monthly average and maximum influent wastewater flows recorded on the WRF's discharge monitoring reports for the 2012 through 2018 period are summarized in **Appendix D**.

Over the last 7 years, the average influent flow for the WRF is 1.09 million gallons per day (MGD), with the highest AAF of 1.24 MGD occurring in 2014. The AAF significantly increased from 2013 to 2014, and for years 2014 through 2018 it has remained at or above the 7-year average. The MDF for the WRF has varied from year to year over the same 7-year period, with the lowest MDF of 1.90 MGD occurring in 2012, and the highest MDF of 4.32 MGD occurring in 2015. It is suspected the higher MDFs may be partially due to inflow caused by flooding along the Snoqualmie River since influent WRF flows above 4.00 MGD since 2006 have corresponded with flooding in the City along the Snoqualmie River.

The WRF is currently permitted for an MMF of 2.15 MGD. The City's NPDES permit stipulates that the City shall submit a plan and schedule for continuing to maintain capacity when the flow reaches 85 percent of the permitted flow for 3 consecutive months; 85 percent of the permitted flow is approximately 1.83 MGD. As **Table 4-3** and **Appendix D** show, this limit has not been exceeded in the 2012 through 2018 period. The highest MMF of 1.76 MGD (82 percent of the permitted flow) occurred in 2015. A significant increase in the MMF occurred from 2013 to 2014; however, for years 2014 through 2018, the MMF has varied no greater than 0.12 MGD (7 percent) from the 5-year average of 1.64 MGD. In addition, the MMFs that were reported at the WRF generally only occur one month per year and are attributed to significant storm events.

Historical AAFs and MMFs for the WRF without the Casino were also analyzed to evaluate the MMF to AAF peaking factor with the Casino removed. Casino wastewater flow data was obtained for 2012 through 2017 for theses analyses. The Casino AAFs and MMFs were deducted from the WRF flows to estimate the AAFs and MMFs for the City's sewer system without the Casino. 2018 Casino flows were estimated by averaging 2012 through 2017 Casino flow data. **Table 4-4** summarizes the historical WRF AAFs and MMFs (including I/I) without the Casino on an annual basis for the 2012 through 2018 period.

Table 4-4

Historical WRF Influent Flow Summary without Casino

Year	Sewer System Population	Sewer System Employment	AAF (MGD)	AAF per Capita (gpcd)	MMF (MGD)	Peaking Factor MMF/AAF
2012	11,261	2,917	0.84	74.5	1.13	1.35
2013	11,641	3,016	0.80	68.6	1.03	1.29
2014[1]	12,071	3,115	1.16	95.8	1.63	1.41
2015	12,791	3,213	1.04	81.6	1.67	1.60
2016	13,051	3,312	1.11	85.2	1.45	1.30
2017	13,151	3,410	1.13	86.1	1.47	1.30
2018	13,391	3,437	1.01	75.6	1.55	1.53
2012 to 2018 Average			**1.01**	**81**	**1.42**	**1.40**
2012 to 2018 Max.			**1.16**	**96**	**1.67**	**1.60**

1 = The influent flows for October 8, 2014, and October 9, 2014, were removed from these analyses since there was a significant water main failure on these days that entered the sewer system.

Commercial Wastewater Flow

The City currently does not monitor wastewater flows for any of its customers, except for the Casino. Historical domestic wastewater flow rates were estimated by compiling historical winter water consumption data and the estimated number of employees for all commercial connections currently being served by the City's water system, which both exclude the Casino. The City's average winter water consumption (AWWC) per employee for commercial connections was calculated for the last 3 years to estimate the impact each employee has on the City's sewer system. For the purposes of this GSP, AWWC is defined as the average water consumption for each connection observed over the 6-month period from November through April of the following year and was assigned to the year that the 6-month period began in (i.e. the AWWC calculated for the 6-month period from November 2014 through April 2015 was used for 2014).

The AWWC was calculated for all commercial water service connections using this methodology and used to estimate the historical domestic wastewater generated per employee. The AWWC provides a good estimate of wastewater flows under existing conditions since it can be assumed that nearly all the water used is discharged into the wastewater system, as there is minimal, if any, irrigation in the City that occurs from November through April. Despite potential errors caused by this method of calculating AWWC, the provided consumption data was the most accurate data available.

The average domestic AAF for all commercial water connections for 2014 through 2016 was 38 gallons per employee per day (gped). The value does not include infiltration and inflow, wastewater generated by commercial customers, or discharge factors (percent of drinking water consumption that is recovered as wastewater in the sewer system).

An estimation of wastewater generated per capita also was approximated using residential water consumption data for the same time period. The average domestic AAF per capita for all residential connections for 2014 through 2016 was 47 gallons per capita per day (gpcd). The value does not include infiltration and inflow, wastewater generated by commercial customers, or discharge factors. For comparison, the King County *Updated Planning Assumptions for Wastewater Flow Forecasting* estimated the flow for residential customers to be 54 gpcd, which included a discharge factor of 0.8 or 0.9 depending on the data source.

Table 4-5 summarizes the estimated domestic AAF unit rates by class for 2014 through 2016.

Table 4-5

Historical Domestic AAF Unit Rate Summary

Year	Residential Domestic AAF per Capita (gpcd)	Commercial Domestic AAF per Employee (gped)
2014	45.5	48.9
2015	46.9	31.2
2016	47.6	33.8
Average	**46.7**	**38.0**

Based on the limited data available, the data in **Table 4-5** appears to show an outlier in 2014 and a fairly consistent amount in 2015 and 2016 for domestic wastewater discharged per employee from the City's commercial customers. **Table 4-5** also shows a relatively consistent amount of domestic wastewater discharged per capita for the City's residential customers.

Wastewater Loading

The City's discharge monitoring reports have been reviewed and analyzed to determine current wastewater characteristics and influent loadings. The 2012 through 2018 historical average annual and maximum month average BOD_5 and total suspended solids (TSS) loadings in pounds per day (ppd) and pounds per capita per day (ppcd) are summarized in **Tables 4-6** and **4-7**, respectively. The City used an adjustment factor for reporting influent BOD_5 and TSS loadings on its daily monitoring reports during the period reported (2012 through 2018). This was because the City's WRF sampling location at the headworks includes flows and loadings from process wastes at the WRF. The historical total influent BOD_5 and TSS loadings at the WRF that are presented in this GSP were determined by adding this adjustment factor, which is 258 ppd for BOD_5 and 215 ppd for TSS, to the values on the City's discharge monitoring reports.

Table 4-6

Historical WRF Influent BOD_5 Loading Summary

Year	Sewer System Population	Sewer System Employment	Average Annual BOD_5 (ppd)[1,2,3]	Average Annual BOD_5 per Capita (ppcd)	Max. Month Average BOD_5 (ppd)[1,2,3]	Percent of NPDES Permit Max. Month Limit[4]	BOD_5 Max. Month Average /Average Annual Peaking Factor
2012	11,261	2,917	2,023	0.180	2,450	47%	1.21
2013	11,641	3,016	1,782	0.153	2,481	48%	1.39
2014	12,071	3,115	2,702	0.224	3,523	67%	1.30
2015	12,791	3,213	3,099	0.242	4,568	88%	1.47
2016	13,051	3,312	4,158	0.319	5,243	100%	1.26
2017	13,151	3,410	3,540	0.269	4,414	85%	1.25
2018	13,391	3,437	3,023	0.226	4,891	94%	1.62
2012 to 2018 Average[5]			**2,695**	**0.216**	**3,721**	**---**	**1.37**
2012 to 2018 Max.[5]			**3,540**	**0.269**	**4,891**	**---**	**1.62**

1 = The City used an adjustment factor for reporting influent BOD_5 loadings on its daily monitoring reports during the period reported (2012 through 2018). The historical total influent BOD_5 loadings at the WRF were determined by adding this adjustment factor, which is 258 ppd, to the values on the City's discharge monitoring reports.

2 = The influent BOD_5 loading for August 7, 2013, was removed from these analyses because it was negative, which is not feasible.

3 = The influent BOD_5 loadings for October 8, 2014, and October 9, 2014, were removed from these analyses since there was a significant water main failure on these days that entered the sewer system.

4 = The City's WRF is permitted for a maximum month average influent BOD_5 loading of 5,220 ppd.

5 = Average annual and maximum month average BOD_5 loading were estimated from 2012 through 2018 data, excluding 2016. Data from 2016 was not utilized for this GSP because BOD_5 loadings for 2016 were abnormally high.

Table 4-7

Historical WRF Influent TSS Loading Summary

Year	Sewer System Population	Sewer System Employment	Average Annual TSS (ppd)[1,2]	Average Annual TSS per Capita (ppcd)	Max. Month Average TSS (ppd)[1,2]	Percent of NPDES Permit Max. Month Limit[3]	TSS Max. Month Average/ Average Annual Peaking Factor
2012	11,261	2,917	1,868	0.166	2,518	48%	1.35
2013	11,641	3,016	1,778	0.153	2,667	51%	1.50
2014	12,071	3,115	2,929	0.243	3,162	61%	1.08
2015	12,791	3,213	2,713	0.212	3,068	59%	1.13
2016	13,051	3,312	2,996	0.230	3,705	71%	1.24
2017	13,151	3,410	2,706	0.206	3,301	63%	1.22
2018	13,391	3,437	2,317	0.173	3,106	59%	1.34
2012 to 2018 Average[4]			**2,385**	**0.192**	**2,970**	**---**	**1.27**
2012 to 2018 Max.[4]			**2,929**	**0.243**	**3,301**	**---**	**1.50**

1 = The City used an adjustment factor for reporting influent TSS loadings on its daily monitoring reports during the period reported (2012 through 2018). The historical total influent TSS loadings at the WRF were determined by adding this adjustment factor, which is 215 ppd, to the values on the City's discharge monitoring reports.

2 = The influent TSS loadings for October 8, 2014, and October 9, 2014, were removed from these analyses since there was a significant water main failure on these days that entered the sewer system.

3 = The City's WRF is permitted for a maximum month average influent TSS loading of 5,220 ppd.

4 = Average annual and maximum month average TSS loading were estimated from 2012 through 2018 data, excluding 2016. Data from 2016 was not utilized for this GSP because TSS loadings for 2016 were abnormally high.

The influent BOD_5 and TSS loadings for October 8, 2014 and October 9, 2014, were removed from these analyses since there was a significant water main failure on these days that entered the sewer system.

The average annual and maximum month average BOD_5 and TSS loadings in **Tables 4-6** and **4-7** were estimated from 2012 through 2018 data, excluding 2016. Data from 2016 was not utilized for this GSP because BOD_5 and TSS loadings for 2016 were abnormally high compared to loadings from the other years during this period, possibly due to issues with aging samplers that were subsequently replaced. The monthly average and maximum influent loadings recorded at the WRF for the 2012 through 2018 period are summarized in **Appendix D**.

In the 2012 through 2018 period, the average annual influent BOD_5 loading has increased overall; however, there have been fluctuations throughout that time period with both significant increases and decreases from year to year. The average annual influent BOD_5 loading significantly increased from 2013 to 2014. In the same period, the average annual influent TSS loading also has increased overall. Average annual TSS loading was consistent in 2012 and 2013, before significantly increasing in 2014. From 2014 through 2017, average annual TSS loading remained relatively consistent before decreasing in 2018. As **Tables 4-6** and **4-7** show, the average annual BOD_5 and TSS loadings were comparatively close for 2012 through 2015, but the average annual BOD_5 loading has been noticeably higher than the average annual TSS loading since 2016. The City has noted this change in influent wastewater characteristics, but limited investigatory sampling in the sewer collection system has not indicated why the average annual BOD_5 and TSS loadings have diverged since 2016.

The WRF currently has a permitted capacity for BOD_5 and TSS influent maximum month average loading of 5,220 ppd each. The City's NPDES permit stipulates that the City shall submit a plan and schedule for continuing to maintain capacity when the loading reaches 85 percent of the permitted loading for 3 consecutive months; 85 percent of the permitted loading is 4,437 ppd for both BOD_5 and TSS. As **Table 4-7** shows, the TSS influent limit has not been exceeded in the 2012 through 2018 period. The highest maximum month average TSS loading of 3,705 ppd (71 percent of the permitted TSS loading) occurred in 2016.

As **Table 4-6** shows, the BOD_5 influent limit has been exceed once in the 2012 through 2018 period. The highest maximum month average BOD_5 loading of 5,243 ppd (100 percent of the permitted BOD_5 loading) occurred in May 2016. In addition, the maximum month average BOD_5 loading has exceeded 85 percent of the permitted limit six times (all of which occurred in 2015 through 2018), including December 2015, May 2016, October 2016, November 2016, May 2017, and January 2018. However, the influent BOD_5 loading has not exceeded 85 percent of the permitted limit for 3 consecutive months.

Historical BOD_5 loading for the WRF without the Casino was also analyzed to evaluate the maximum month average to average annual BOD_5 loading peaking factor with the Casino removed. Casino BOD_5 loading data was obtained for 2012 through the beginning of 2017 for theses analyses. The Casino renewed its sewer service agreement with the City in September of 2016; while the previous agreement required the Casino to monitor flow and BOD_5 loading, the new agreement removed the Casino's requirement to monitor BOD_5 loading. The Casino's BOD_5 loading is no longer being monitored at this time and the Casino's BOD_5 loading was not available for all of 2017. The Casino's BOD_5 loading was deducted from the WRF BOD_5 loading to estimate the BOD_5 loading for the City's sewer system without the Casino. 2017 and 2018 Casino BOD_5 loading was estimated by averaging 2012 through 2016 Casino BOD_5 loading data.

The 2012 through 2018 historical average annual and maximum month average BOD_5 loadings without the Casino, in ppd and ppcd, are summarized in **Table 4-8**. TSS is not monitored at the flume.

Table 4-8

Historical WRF Influent BOD_5 Loading Summary without Casino

Year	Sewer System Population	Sewer System Employment	Average Annual BOD_5 (ppd)[1,2,3]	Average Annual BOD_5 per Capita (ppcd)	Max. Month Average BOD_5 (ppd)[1,2,3]	BOD_5 Max. Month Average / Average Annual Peaking Factor
2012	11,261	2,917	1,639	0.146	1,989	1.21
2013	11,641	3,016	1,447	0.124	2,045	1.41
2014	12,071	3,115	2,368	0.196	3,094	1.31
2015	12,791	3,213	2,804	0.219	4,235	1.51
2016	13,051	3,312	3,835	0.294	4,808	1.25
2017	13,151	3,410	3,206	0.244	3,995	1.25
2018	13,391	3,437	2,688	0.201	4,473	1.66
2012 to 2018 Average[4]			**2,359**	**0.188**	**3,305**	**1.39**
2012 to 2018 Max.[4]			**3,206**	**0.244**	**4,473**	**1.66**

1 = The City used an adjustment factor for reporting influent BOD_5 loadings on its daily monitoring reports during the period reported (2012 through 2018). The historical total influent BOD_5 loadings at the WRF were determined by adding this adjustment factor, which is 258 ppd, to the values on the City's discharge monitoring reports.
2 = The influent BOD_5 loading for August 7, 2013, was removed from these analyses because it was negative, which is not feasible.
3 = The influent BOD_5 loadings for October 8, 2014, and October 9, 2014, were removed from these analyses since there was a significant water main failure on these days that entered the sewer system.
4 = Average annual and maximum month average BOD_5 loading were estimated from 2012 through 2018 data, excluding 2016. Data from 2016 was not utilized for this GSP because BOD_5 loadings for 2016 were abnormally high.

Historical Casino Wastewater Flow and Loading

The historical sewer flows for the existing Casino for 2012 through 2017 are shown in **Table 4-9**. The 2017 AAF discharged by the existing Casino was 73,289 gallons per day (gpd), which was used as the base for estimating additional wastewater flow from the proposed Casino expansion that is discussed in further detail later in this chapter.

Table 4-9

Historical Casino Flow Data

Year	Average Annual Flow (gpd)	Max Month Flow (gpd)	MMF / AAF Peaking Factor
2012	81,252	93,024	1.14
2013	80,863	91,069	1.13
2014	78,865	86,581	1.10
2015	77,115	88,377	1.15
2016	74,480	81,014	1.09
2017	73,289	78,690	1.07
2012 to 2017 Average	**77,644**	**86,459**	**1.11**
2012 to 2017 Max.	**81,252**	**93,024**	**1.15**

The historical sewer BOD_5 loadings for the existing Casino for 2012 through 2016 are shown in **Table 4-10**. For 2012 through 2016, the average of the average annual loadings was 334 ppd and the highest BOD_5 maximum month average to average annual peaking factor was 1.35, which occurred in 2016. These values were used as the base for estimating additional wastewater BOD_5 loading from the proposed Casino expansion, which is discussed in further detail later in this chapter.

Table 4-10

Historical Casino BOD_5 Loading Data

Year	Average Annual BOD_5 Loading (ppd)	Max Month Average BOD_5 Loading (ppd)	BOD_5 Max Month Average / Average Annual Peaking Factor
2012	384	461	1.20
2013	334	435	1.30
2014	334	429	1.28
2015	295	333	1.13
2016	323	435	1.35
2012 to 2016 Average	**334**	**419**	**1.25**
2012 to 2016 Max.	**384**	**461**	**1.35**

INFLOW AND INFILTRATION

I/I is the combination of groundwater and surface water that enters the sewer system. Infiltration is groundwater entering the sewer system through defects in the sewer system infrastructure, such as fractured pipes and leaking manholes and pipe joints. Inflow is surface water that enters the sewer system from sources such as roof and street drains and leaky manhole covers.

A sanitary sewer system must be able to carry the domestic wastewater generated by utility customers and the extraneous I/I that is a part of every sewer collection system. Excessive I/I in the sewer collection system can lead to serious issues within the collection system that may include wastewater system backups, overflows, and accelerating the structural deficiencies of the collection system. Excessive I/I also can inflate capacity requirements of the proposed collection and treatment system infrastructure.

Reducing I/I in a sewer collection system can reduce the risk of sanitary sewer overflows and the cost of treating wastewater. By reducing or eliminating I/I sources, the extraneous water that previously occupied the conveyance and treatment system can now be occupied by sewage flows. This leads to delaying conveyance and treatment projects that were needed because of the extraneous I/I water.

The U.S. Environmental Protection Agency (EPA) published a report in May 1985, *Infiltration/Inflow, I/I Analysis and Project Certification*, which developed guidelines to help determine what amount of I/I is considered to be excessive and what amount can be cost-effectively removed. The report established I/I flow rates that are considered normal or acceptable based on surveys and statistical evaluations of data from hundreds of cities across the nation. The average flow from the Casino for 2012 through 2017 exceeded 50,000 gpd; therefore, flows from the Casino were deducted from the WRF influent flow for these analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow*, *I/I Analysis and Project Certification*. 2018 Casino flows were estimated for these I/I analyses by averaging 2012 through 2017 Casino flow data.

Precipitation and temperature data were compiled from the National Oceanic and Atmospheric Administration's (NOAA) website for weather stations in and near the City.

Inflow

The EPA report gives guidelines for determining whether inflow can be classified as non-excessive. Inflow is considered to be non-excessive if the average daily flow during periods of heavy rainfall or spring thaw (i.e., any event that creates surface ponding and surface runoff) does not exceed 275 gpcd. The peak recorded daily flow in the 7 years analyzed for the City (2012 through 2018) was 4.25 MGD, which occurred on December 9, 2015. Per the weather data obtained from NOAA, this day was recorded as having 2.2 inches of precipitation. This peak inflow event equates to a 332 gpcd flow rate, which is above the EPA maximum of 275 gpcd. In addition, this day was preceded by several days of heavier precipitation that may have contributed to the infiltration on this day. The second peak recorded daily flow was 3.26 MGD, which occurred on the preceding day, December 8, 2015. This day was recorded as having 1.9 inches of precipitation. This peak inflow event equates to a 255 gpcd flow rate, which does not exceed the EPA maximum. The third highest recorded daily flow was 3.00 MGD, which occurred on November 14, 2015. This day was recorded as having 3.22 inches of precipitation and a peak inflow equating to 234 gpcd, which is below the EPA inflow guideline.

The Snoqualmie River was flooding during the high flows experienced on December 8, and December 9, 2015. it is suspected the high flows were partially due to the flooding. Additionally, just prior to the days of maximum recorded inflow, the minimum recorded temperature transitioned from below freezing to above freezing, indicating that snow melt also could have played a role in the elevated inflow during this time. This high inflow on December 9, 2015, was the only recording above the EPA threshold in the past 7 years. However, the Snoqualmie River likely will continue to flood periodically; therefore, the exceedance is considered a potentially recurring issue. Conducting an inflow study to confirm these results and locate the affected collection system areas to determine if there are any cost-effective sewer rehabilitation measures to remove any excessive inflow should be considered. This study is discussed further in **Chapter 11**.

Infiltration

The EPA's guideline for determination of non-excessive infiltration was based on the national average for dry weather flow of 120 gpcd. In order for the amount of infiltration to be considered non-excessive, the average daily flow must be less than 120 gpcd (i.e., a 7- to 14-day average measured during periods of seasonal high groundwater). Although it can be difficult to determine how much of the flow is due to I/I, peak inflow will generally occur immediately during or just after a significant rain event, while peak infiltration will occur during the high groundwater period that follows prolonged precipitation events. In addition, it is difficult to find a 7- to 14-day period without rain in the winter in the Snoqualmie area. Therefore, periods were chosen that include negligible or small amounts of rain and are smaller than 7 days. These analyses included dry periods of 4 consecutive days and greater.

The peak dry weather flow period in the last 7 years (2012 through 2018) of record for the City, occurring after a few consecutive days of rain, was the 4-day period from November 17, through November 20, 2016. This period also was directly preceded by heavy rains, and yielded an average flow of 1.533 MGD, equating to 117 gpcd. The second highest peak dry weather flow period occurred during a 4-day period from November 28, through December 1, 2017. This period was preceded by moderate rainfall and yielded an average flow of 117 gpcd. The third highest peak dry weather flow period occurred during a 5-day period from February 25, through March 1, 2014. This period directly followed a period of heavy rainfall and yielded an average flow of 113 gpcd. All three events are below the EPA's maximum infiltration criterion; therefore, the amount of infiltration is considered non-excessive. However, due to the proximity of the City's maximums to the EPA threshold, the City should continue to monitor infiltration throughout the system.

Any I/I studies that are conducted in the future should follow the guidelines defined in Chapter C-1 of Ecology's *Criteria for Sewage Works Design* (commonly known as the "Orange Book"). The I/I evaluation data is included in **Appendix E**.

PEAKING FACTORS

Once existing flow rates are measured and defined, projected flow rates can be developed. Projected flows are used to analyze how well the existing system will perform in the future and determine improvements required to maintain or improve system function. In order to establish projected flow scenarios for a sewer system, peaking factors need to be determined for the existing system, which can then be applied to projected flow rates. Peaking factors are the ratio of higher flows, such as MDF to AAF.

A peak hour flow of 5.0 MGD was assumed for 2017. This was based on the highest PHF from the flow data analyzed for this GSP and the historical PHFs presented in the City's 2012 *General Sewer/Wastewater Facility Plan*. Based on this and the 2017 AAF, a PHF/AAF peaking factor of 4.15 was established for the WRF (**Table 4-11**). Flow data also was analyzed for KCPS to estimate a PHF/AAF peaking factor for this GSP. However, the PHF/AAF peaking factors estimated for KCPS were less than the peaking factor estimated for the WRF, so the PHF/AAF peaking factor of 4.15 was used for all PHF projections in this GSP.

Table 4-11

PHF Peaking Factor

Year	AAF (MGD)	PHF (MGD)	PHF/AAF Peaking Factor
2017	1.21	5.00	4.15

Table 4-12 shows a summary of the flow and loading peaking factors at the City's WRF for the 2012 through 2018 period, which were developed using the following information:

- The maximum month average to annual average peaking factors for flow and BOD_5 loading without the Casino were selected to be slightly conservative for the maximum month average flow and BOD_5 loading projections in this GSP.
- The highest historic MMF to AAF peaking factor during this period is 1.60, which occurred in 2015 (shown in **Table 4-4**).
- The highest historic MDF to AAF peaking factor during this period is 3.85, which occurred in 2015 (shown in **Table 4-3**).
- The PHF to AAF peaking factor is 4.15 (shown in **Table 4-11**).
- The loading peaking factors exclude 2016 data as discussed previously in this chapter.
- The highest historic maximum month average to average annual BOD_5 loading peaking factor during this period is 1.66, which occurred in 2018 (shown in **Table 4-8**).
- The highest historic maximum month average to average annual TSS loading peaking factor during this period is 1.50, which occurred in 2013 (shown in **Table 4-7**).

Table 4-12

WRF Flow and Loading Peaking Factors

Flow	
Max. Month Average Flow / Average Annual Flow (MMF/AAF)	1.60
Max. Day Flow / Average Annual Flow (MDF/AAF)	3.85
Peak Hour Flow / Average Annual Flow (PHF/AAF)	4.15
BOD_5	
Max. Month Average / Average Annual Loading	1.66
TSS	
Max. Month Average / Average Annual Loading	1.50

The peaking factors presented in **Table 4-12** were used to project flows and loadings in this GSP.

PROJECTED WASTEWATER FLOW RATES

Once existing flow rates are measured and defined, projected flow rates can be developed. Projected flows are used to analyze how well the existing system will perform in the future and determine improvements required to maintain or improve system function.

Projected Growth

The City's sewer system is projected to add a total of 2,348 additional persons and 4,693 additional employees by 2040, using 2017 as the base year. The City provided an estimated distribution of population and employment growth within the UGA by planning area, which was utilized for this GSP. The population and employment growth distributions were used to allocate the projected wastewater flow in the sewage drainage basins.

Projected Wastewater Flow

The projected flows at the WRF, and the flow distribution to the various basins were developed using the following information:

- Projected AAFs were estimated using the 2017 AAF, which is approximately 1.21 MGD, as the existing baseline. Year 2017 was used as the existing baseline for flow projections because this was the highest AAF over the last 4 years.
- The City's North Wellfield Water Treatment Plant (NWTP) had a backwash water recycle system installed in early 2018. NWTP data showed approximately 0.02 MGD of backwash water from the NWTP was recycled for additional filter backwashing on an annual basis in 2018. This resulted in water demand savings for the City of approximately 0.02 MGD, which also was removed from being discharged to the City's sewer system. To account for this, the amount of NWTP backwash recycled in 2018 (approximately 0.02 MGD) was subtracted from the projected AAFs presented in this GSP.

- The average of the AAFs per capita for 2012 through 2018 without the Casino was 81 gpcd (**Table 4-4**), which includes I/I and commercial wastewater flows other than the Casino. The Orange Book provides a value for estimating the amount of wastewater flow that residents contribute of 100 gpcd. This Orange Book value is slightly more than the average of the City's historical data; therefore, 100 gpcd was used for projecting how much additional wastewater flow the projected population growth would contribute to the City's sewer system.
- The City does not currently monitor wastewater flows for any of its customers, except for the Casino. The average of the commercial domestic AAFs per employee for 2014 through 2016 without the Casino was 38 gped (**Table 4-5**); the average value was used for these analyses since the averages for 2015 and 2016 were lower than the average for 2014. The Orange Book provides a range for estimating the amount of wastewater flow that factory workers contribute of 15 to 35 gped, and the King County *Updated Planning Assumptions for Wastewater Flow Forecasting* estimated the flow for commercial customers to be 18 gped. The average of the City's historical data is slightly more than this Orange Book range and is greater than what was estimated in the King County *Updated Planning Assumptions for Wastewater Flow Forecasting*, so 38 gped was used for projecting how much additional wastewater flow the projected employment growth would contribute to the City's sewer system.
- The flow peaking factors shown in **Table 4-12** were used for estimating MMFs, MDFs, and PHFs from projected AAFs.
- Information regarding population and employment growth distributions, obtained from the City, was used to allocate the projected wastewater flow in the sewage drainage basins.

A summary of the projected flows is presented in **Table 4-13**.

Table 4-13

Projected WRF Flow

Year	Sewer System Population	Sewer System Employment	AAF (MGD)[1]	MMF (MGD)[2]	MDF (MGD)[3]	PHF (MGD)[4]	Percent of NPDES Permit Max. Month Limit[5]
2017	**13,151**	**3,410**	**1.21**	**1.55**	**3.00**	**5.00**	**72%**
2018	13,391	3,437	1.09	1.64	2.19	---	76%
2019	13,611	3,464	1.24	1.98	4.76	5.12	92%
2020	13,806	3,500	1.26	2.01	4.84	5.21	93%
2021	14,002	3,536	1.28	2.04	4.92	5.29	95%
2022	14,438	4,054	1.34	2.14	5.17	5.56	100%
2023	14,444	4,062	1.34	2.15	5.17	5.56	100%
2024	14,451	4,070	1.34	2.15	5.17	5.56	100%
2025	14,457	4,078	1.34	2.15	5.18	5.57	100%
2026	14,492	4,229	1.35	2.16	5.21	5.61	101%
2027	14,526	4,570	1.37	2.19	5.28	5.67	102%
2028	14,560	4,721	1.38	2.20	5.31	5.71	103%
2029	14,595	4,872	1.39	2.22	5.35	5.75	103%
2030 (+10 years)	**14,877**	**5,023**	**1.42**	**2.27**	**5.48**	**5.89**	**106%**
2031	15,164	5,166	1.46	2.33	5.61	6.03	108%
2032	15,451	8,018	1.59	2.55	6.14	6.60	119%
2033	15,458	8,029	1.59	2.55	6.14	6.60	119%
2034	15,465	8,040	1.59	2.55	6.14	6.61	119%
2035	15,471	8,051	1.60	2.55	6.15	6.61	119%
2036	15,477	8,062	1.60	2.55	6.15	6.62	119%
2037	15,483	8,073	1.60	2.56	6.16	6.62	119%
2038	15,489	8,083	1.60	2.56	6.16	6.63	119%
2039	15,494	8,093	1.60	2.56	6.16	6.63	119%
2040 (+20 years)	**15,499**	**8,103**	**1.60**	**2.56**	**6.17**	**6.63**	**119%**

1 = Projected AAFs were estimated by using the 2017 AAF as the baseline, adding 100 gpcd (from the Orange Book) multiplied by the projected increase in sewer population from 2017, adding 38 gped (from historical AWWC data) multiplied by the projected increase in sewer employment from 2017, and subtracting the 2018 AAF for backwash recycle at the City's NWTP (0.02 MGD).

2 = Projected MMFs were estimated by multiplying the projected AAF by the highest historic MMF/AAF peaking factor from 2012 through 2018, which was 1.60 in 2015.

3 = Projected MDFs were estimated by multiplying the projected AAF by the highest historic MDF/AAF peaking factor from 2012 through 2018, which was 3.85 in 2015.

4 = Projected PHFs were estimated by multiplying the projected AAF by 4.15.

5 = The City's WRF is permitted for a maximum month average influent flow of 2.15 MGD.

According to these projections, the WRF will need upgrades to increase MMF capacity prior to 2030. CIP projects to increase the MMF capacity of the WRF are included in **Chapter 11**.

Historical Wastewater Flow by Basin

Table 4-14 shows the historical lift station AAF rates over the 2013 through 2017 period. These flow rates were developed by using the run time records and pumping capacities for the City's lift stations.

Table 4-14

Historical AAF Rates by Basin

Lift Station	Design Firm Capacity (gpm)	2013 AAF (gpm)	2014 AAF (gpm)	2015 AAF (gpm)	2016 AAF (gpm)	2017 AAF (gpm)	Average AAF (gpm)
Kimball Creek Pump Station (Snoqualmie Parkway)[1]	6,950	---	---	---	---	784	---
Pump Station No. 1 (Railroad Place)[2]	1,800	---	---	---	---	411	---
Pump Station No. 2 (Pickering Court)	400	15	19	19	17	19	18
Pump Station No. 3 (Park Street)	700	88	101	97	87	95	93
Pump Station No. 4 (Meadowbrook)	200	22	31	37	27	31	29
Pump Station No. 6 (Honey Farm)[3]	100	27	34	38	14	43	31
Pump Station Z (Gala)	77	12	12	11	9	8	10
Pump Station E (Crestview)	240	30	33	36	35	33	33
Pump Station N6 (Whittaker)	98	3	5	6	7	4	5
Pump Station K3 (Muir)	215	24	24	26	25	24	25
Pump Station F (Fairview)	230	10	11	12	11	11	11
Pump Station L (Carmichael)	500	83	83	88	86	86	85
Pump Station K2 (Burke)[4]	80	---	7	9	7	7	8
Pump Station BP (Business Park)	750	87	108	123	131	140	118
Pump Station S12A (Vaughn)[5]	116	---	---	2	4	4	3
Hospital Pump Station[6]	194	---	---	1	1	2	1
Salish Flume	---	---	---	---	---	54	---
Water Reclamation Facility	---	611	858	778	824	838	782

Notes:

1 = Run time data could not be used to estimate historical flows at Kimball Creek Pump Station (Snoqualmie Parkway) because the pumps at this lift station have two-speed motors. The 2017 flow data for this lift station was not reliable, so the 2017 AAF for this lift station was estimated by deducting flow data for the Salish Flume from the WRF.

2 = Run time data was not used to estimate historical flows at Pump Station No. 1 (Railroad Place) because the flows estimated using this method were considered too low for this lift station in comparison to the flows from the tributary lift stations and Casino. The 2017 AAF for this lift station was estimated from flow meter data for this lift station.

3 = Run time meter for pump no. 2 at Pump Station No. 6 (Honey Farm) stopped functioning properly in 2015 and was replaced in 2016.

4 = Run time data for Pump Station K2 (Burke) was not available for 2013.

5 = Pump Station S12A (Vaughn) was constructed in 2014, so there is no run time data available for this lift station for 2013 and 2014.

6 = Hospital Pump Station was constructed in 2014, so there is no run time data available for this lift station for 2013, 2014, and part of 2015.

Run time data could not be used to estimate historical flows at KCPS because the pumps at this lift station have two-speed motors. The 2017 flow data for this lift station was not reliable, so the 2017 AAF for KCPS was estimated by deducting flow data for the Salish Flume from the WRF. Run time data was not used to estimate historical flows at Pump Station No. 1 (Railroad Place) because the flows estimated using this method were considered too low for this lift station in comparison to the flows from the tributary lift stations and Casino. The 2017 AAF for Pump Station No. 1 was estimated from flow meter data for this lift station. The 2016 AAF for Pump Station No. 6 is low because one of the run time meters was replaced that year. The 2013 AAF was not reported for Pump Station K2 because no run time data was available for that year. In addition, Pump Station S12A and the Hospital Pump Station were constructed in 2014, so there is no data available for these lift stations during the beginning of this period.

Projected Wastewater Flow by Basin

The historical wastewater flows in each basin were estimated from the 2017 AAF data (**Table 4-14**). Pump Station No. 6 has recirculation issues, so the existing flow for this basin was estimated from the number of homes in this sewer basin.

The projected wastewater flows resulting from the increase in population and employment anticipated for both the 2030 and 2040 time periods were allocated throughout the City's sewer service area based on the distribution of population and employment growth provided by the City. **Table 4-15** contains the existing and projected flow rates for the sewer drainage basins and WRF. Refer to **Chapter 3** for more information regarding the development of both population and growth scenarios.

Table 4-15

Existing and Projected AAF and PHF Rates by Basin

Basin	Existing 2017 AAF (gpm)	Existing 2017 PHF (gpm)	Projected 2030 AAF (gpm)	Projected 2030 PHF (gpm)	Projected 2040 AAF (gpm)	Projected 2040 PHF (gpm)
Kimball Creek Pump Station (Snoqualmie Parkway)	82	339	112	465	125	519
Pump Station No. 1 (Railroad Place)	294	1,220	315	1,307	354	1,469
Pump Station No. 2 (Pickering Court)	19	78	19	78	19	78
Pump Station No. 3 (Park Street)	64	264	67	279	68	281
Pump Station No. 4 (Meadowbrook)	31	129	32	132	32	133
Pump Station No. 6 (Honey Farm)	3	11	3	11	3	11
Pump Station Z (Gala)	8	33	8	34	8	34
Pump Station E (Crestview)	29	120	30	122	30	122
Pump Station N6 (Whittaker)	4	18	4	18	4	18
Pump Station K3 (Muir)	13	53	13	54	13	54
Pump Station F (Fairview)	11	47	11	47	11	47
Pump Station L (Carmichael)	79	327	95	394	95	394
Pump Station K2 (Burke)	7	28	11	45	11	45
Pump Station BP (Business Park)	135	559	183	757	183	757
Pump Station S12A (Vaughn)	4	16	5	20	5	20
Hospital Pump Station	2	8	3	14	3	14
Salish Flume	54	223	76	314	147	611
Water Reclamation Facility	838	3,472	987	4,091	1,111	4,606

Notes:
1 = Pump Station No. 6 (Honey Farm) has recirculation issues, so the existing flow for this basin was estimated from the number of homes in this sewer basin.

Lift Station Hydraulic Capacity Analyses

Current lift station pumping capacities and flow rate projections based on the existing and projected flow rates for the sewer drainage basins are provided in **Table 4-16**.

Table 4-16

Existing and Projected AAF and PHF Rates by Lift Station

Lift Station	Existing Design Firm Capacity (gpm)	Existing 2017 AAF (gpm)	Existing 2017 PHF (gpm)	Projected 2030 AAF (gpm)	Projected 2030 PHF (gpm)	Projected 2040 AAF (gpm)	Projected 2040 PHF (gpm)
Kimball Creek Pump Station (Snoqualmie Parkway)	6,950	784	3,249	911	3,777	964	3,996
Pump Station No. 1 (Railroad Place)	1,800	411	1,702	436	**1,806**	476	**1,972**
Pump Station No. 2 (Pickering Court)	400	19	78	19	78	19	78
Pump Station No. 3 (Park Street)	700	95	393	99	411	100	414
Pump Station No. 4 (Meadowbrook)	200	31	129	32	132	32	133
Pump Station No. 6 (Honey Farm)[1]	100	3	11	3	11	3	11
Pump Station Z (Gala)	77	8	33	8	34	8	34
Pump Station E (Crestview)	240	33	138	34	140	34	140
Pump Station N6 (Whittaker)	98	4	18	4	18	4	18
Pump Station K3 (Muir)	215	24	100	24	101	24	101
Pump Station F (Fairview)	230	11	47	11	47	11	47
Pump Station L (Carmichael)	500	86	355	106	440	106	440
Pump Station K2 (Burke)	80	7	28	11	45	11	45
Pump Station BP (Business Park)	750	140	582	191	**791**	191	**791**
Pump Station S12A (Vaughn)	116	4	16	5	20	5	20
Hospital Pump Station	194	2	8	3	14	3	14
Salish Flume	---	54	223	76	314	147	611
Water Reclamation Facility	---	838	3,472	987	4,091	1,111	4,606

Notes:
-Highlighted flows exceed current firm pumping capacity.
1 = Pump Station No. 6 (Honey Farm) has recirculation issues, so the existing flow for this basin was estimated from the number of homes in this sewer basin.

As indicated in **Table 4-16**, Pump Station No. 1 is near capacity, and capacity upgrades to Pump Station BP may be necessary in the future to handle projected flows. These improvements are discussed further in **Chapter 11**.

The City also is planning to perform an I/I study in the future to identify areas of its system with significant I/I and cost-effective improvements that could be implemented to reduce I/I in the City's sewer system. These I/I improvements could reduce or mitigate the I/I component of the PHFs in the City's sewer collection system, which could reduce or mitigate projected flows.

PROJECTED WASTEWATER QUALITY

The projected BOD_5 and TSS loadings at the WRF were developed using the following information:

- Average annual BOD_5 and TSS loadings were projected using the 2018 average annual loadings as the baselines, since this was the most recent loading data available.
- The average of the average annual BOD_5 loadings per capita for 2012 through 2018, excluding 2016, without the Casino was 0.188 ppcd (**Table 4-8**). The Orange Book provides a value for estimating the amount of BOD_5 loading that residents contribute of 0.2 ppcd. This Orange Book value is slightly more than the average of the City's historical data, so 0.2 ppcd was used for projecting how much additional BOD_5 loading the projected population growth would contribute to the City's sewer system.
- The average of the average annual TSS loadings per capita for 2012 through 2018, excluding 2016, without the Casino was estimated to be 0.178 ppcd based on WRF AAFs, Casino AAFs, and average annual TSS loadings at the WRF. The Orange Book provides a value for estimating the amount of TSS loading that residents contribute of 0.2 ppcd. This Orange Book value is slightly more than the average of the City's historical data; therefore, 0.2 ppcd was used for projecting how much additional TSS loading the projected population growth would contribute to the City's sewer system.
- There is not enough information available to estimate how much employees in the City's sewer service area contribute to BOD_5 and TSS loading. The Orange Book provides a range for estimating the amount of BOD_5 and TSS loading that factory workers contribute of 0.03 to 0.07 pounds per employee per day (pped). The average of this range (0.05 pped) was used for projecting how much additional BOD_5 and TSS loading the projected employment growth would contribute to the City's sewer system.
- The loading peaking factors shown in **Table 4-12** were used for estimating maximum month average loadings from projected average annual loadings.

A summary of the projected BOD_5 and TSS loadings are presented in **Tables 4-17** and **4-18**, respectively.

Table 4-17

Projected WRF Influent BOD5 Loading

Year	Sewer System Population	Sewer System Employment	Projected Average Annual BOD_5 (ppd)	Projected Max. Month Average BOD_5 (ppd)[2]	Percent of NPDES Permit Max. Month Limit[3]
2018	**13,391**	**3,437**	**3,023**	**4,891**	**94%**
2019	13,611	3,464	3,068	5,104	98%
2020	13,806	3,500	3,109	5,172	99%
2021	14,002	3,536	3,150	5,240	100%
2022	14,438	4,054	3,263	5,428	104%
2023	14,444	4,062	3,264	5,431	104%
2024	14,451	4,070	3,266	5,434	104%
2025	14,457	4,078	3,268	5,436	104%
2026	14,492	4,229	3,282	5,461	105%
2027	14,526	4,570	3,306	5,500	105%
2028	14,560	4,721	3,321	5,524	106%
2029	14,595	4,872	3,335	5,548	106%
2030 (+10 years)	**14,877**	**5,023**	**3,399**	**5,655**	**108%**
2031	15,164	5,166	3,464	5,762	110%
2032	15,451	8,018	3,664	6,095	117%
2033	15,458	8,029	3,666	6,098	117%
2034	15,465	8,040	3,668	6,101	117%
2035	15,471	8,051	3,669	6,104	117%
2036	15,477	8,062	3,671	6,107	117%
2037	15,483	8,073	3,673	6,110	117%
2038	15,489	8,083	3,675	6,113	117%
2039	15,494	8,093	3,676	6,115	117%
2040 (+20 years)	**15,499**	**8,103**	**3,678**	**6,118**	**117%**

1 = Projected average annual BOD_5 loadings were estimated by using the 2018 average annual BOD_5 loading as the baseline and adding 0.2 ppcd (from the Orange Book) multiplied by the projected increase in sewer population from 2018 and 0.05 pped (from the Orange Book) multiplied by the projected increase in sewer employment from 2018.

2 = Projected maximum month average BOD_5 loadings were estimated by multiplying the projected average annual BOD_5 loading by the highest historic maximum month average to average annual BOD_5 loading peaking factor from 2012 through 2018 (excluding 2016), which was 1.66 in 2018.

3 = The City's WRF is permitted for a maximum month average influent BOD_5 loading of 5,220 ppd.

Table 4-18

Projected WRF Influent TSS Loading

Year	Sewer System Population	Sewer System Employment	Projected Average Annual TSS (ppd)	Projected Max. Month Average TSS (ppd)[2]	Percent of NPDES Permit Max. Month Limit[3]
2018	**13,391**	**3,437**	**2,317**	**3,106**	**59%**
2019	13,611	3,464	2,362	3,544	68%
2020	13,806	3,500	2,403	3,605	69%
2021	14,002	3,536	2,444	3,667	70%
2022	14,438	4,054	2,557	3,836	73%
2023	14,444	4,062	2,559	3,839	74%
2024	14,451	4,070	2,560	3,841	74%
2025	14,457	4,078	2,562	3,844	74%
2026	14,492	4,229	2,577	3,866	74%
2027	14,526	4,570	2,600	3,901	75%
2028	14,560	4,721	2,615	3,923	75%
2029	14,595	4,872	2,629	3,945	76%
2030 (+10 years)	**14,877**	**5,023**	**2,693**	**4,041**	**77%**
2031	15,164	5,166	2,758	4,138	79%
2032	15,451	8,018	2,958	4,438	85%
2033	15,458	8,029	2,960	4,441	85%
2034	15,465	8,040	2,962	4,443	85%
2035	15,471	8,051	2,964	4,446	85%
2036	15,477	8,062	2,965	4,449	85%
2037	15,483	8,073	2,967	4,451	85%
2038	15,489	8,083	2,969	4,454	85%
2039	15,494	8,093	2,970	4,456	85%
2040 (+20 years)	**15,499**	**8,103**	**2,972**	**4,458**	**85%**

1 = Projected average annual TSS loadings were estimated by using the 2018 average annual TSS loading as the baseline and adding 0.2 ppcd (from the Orange Book) multiplied by the projected increase in sewer population from 2018 and 0.05 pped (from the Orange Book) multiplied by the projected increase in sewer employment from 2018.
2 = Projected maximum month average TSS loadings were estimated by multiplying the projected average annual TSS loading by the highest historic maximum month average to average annual TSS loading peaking factor from 2012 through 2018 (excluding 2016), which was 1.50 in 2013.
3 = The City's WRF is permitted for a maximum month average influent TSS loading of 5,220 ppd.

According to these projections, the WRF will need upgrades to increase BOD_5 treatment capacity prior to 2030. CIP projects to increase the treatment capacity of the WRF are included in **Chapter 11**.

Mill Site Development Wineries

As mentioned in **Chapter 3**, population and employment growth is anticipated at the Mill Site. The majority of this growth is anticipated to occur as part of the Snoqualmie Mill Site Development (Mill Site), which is located in the City's UGA, north of Lake Borst, east of the Snoqualmie River, and southeast of the City's WRF. According to the *Preliminary Draft Environmental Impact Statement (PDEIS) for the Mill Site*, the Mill Site has been proposed to be built in three phases, with wineries being anticipated as part of the first phase. The projected population and employment growth for the Mill Site are included in the City's projections.

Preliminary projected flows and loadings developed from the PDEIS for the Mill Site wineries are shown in **Table 4-19**.

Table 4-19

Mill Site Winery Effluent Summary During Wine Processing Period

	Without Pretreatment[1]	With Pretreatment[2]
Primary Wine Processing Period	September through November	
Projected Average Winery Effluent Flow		
Total Annual Flow (gallons per year)	452,200	
Average Flow (gallons per day)	5,024	
Projected Average Winery Effluent BOD_5		
BOD_5 Concentration (mg/L)	3,000	300
BOD_5 Loading (ppd)	126	13
Projected Average Winery Effluent TSS		
TSS Concentration (mg/L)	800	350
TSS Loading (ppd)	34	15

1= Without pretreatment, the winery effluent BOD_5 and TSS concentrations were estimated to be 3,000 mg/L and 800 mg/L, respectively, based on the information provided in the PDEIS for the Mill Site.

2 = With pretreatment, the winery effluent BOD_5 and TSS concentrations were estimated to be 300 mg/L and 350 mg/L, respectively, based on the maximum allowed for pretreated wastewater in the City's Municipal Code.

However, it is uncertain at this time how many and how large the wineries will be, how much wine is expected to be produced at the Mill Site over what time period (i.e. these wineries may phase in over a period of time), and what type and capability of pretreatment the winery wastewater produced will receive prior to being discharged to the City's sewer system. Therefore, for purposes of this GSP, flows and loadings from these wineries have not been included. A separate engineering report will be prepared for the Mill Site wineries waste discharge when plans for the development are further along and there is a better understanding of how much winery wastewater is anticipated to be discharged by the Mill Site, and what type of pretreatment the City will accept.

SUMMARY WITHOUT CASINO EXPANSION

Table 4-20 provides a summary of the existing, 10-year (2030), and planning year (2040) flow and BOD_5 and TSS loading for the City's wastewater collection system. Recommended improvements for increasing the influent flow and loading capacity of the WRF are documented in **Chapter 11**, which include converting the existing two oxidation ditches to plug flow reactors and constructing a third clarifier.

Table 4-20

Summary of Existing and Projected Flow and Loading at the WRF

Flow (MGD)			
	Existing (2017)	**Projected 2030**	**Projected 2040**
Average Annual Flow	1.21	1.42	1.60
Max. Month Average Flow	1.55	2.27	2.56
Max. Day Flow	3.00	5.48	6.17
Peak Hour Flow	5.00	5.89	6.63
BOD_5 (ppd)			
	Existing (2018)	**Projected 2030**	**Projected 2040**
Average Annual BOD_5	3,023	3,399	3,678
Max. Month Average BOD_5	4,891	5,655	6,118
TSS (ppd)			
	Existing (2018)	**Projected 2030**	**Projected 2040**
Average Annual TSS	2,317	2,693	2,972
Max. Month Average TSS	3,106	4,041	4,458

PROJECTED WASTEWATER FLOW AND LOADING WITH CASINO EXPANSION

Table 4-21 shows the existing and projected Casino flow and BOD_5 loadings that were developed for the analyses presented in this GSP. The existing Casino flows and loadings were based on the following:

- The Casino's 2017 AAF was 73,289 gpd, which was used for the existing Casino AAF.
- The MMF and PHF were estimated using the Casino's 2017 AAF and the MMF to AAF and PHF to AAF peaking factors of 1.60 and 4.15, respectively, from **Table 4-12**.
- For 2012 through 2016, the Casino's average of the average annual BOD_5 loadings was 334 ppd, which was used for the existing Casino BOD_5 loading.
- The maximum month BOD_5 loading was estimated to be 556 ppd using the average annual loading of 334 ppd and the maximum month average to average annual peaking factor of 1.66 from **Table 4-12**.

The projected sewer flows and BOD_5 loadings for the proposed Casino expansion were estimated based on the following:

- The projected sewer AAF, MMF, and PHF were developed and provided by Jacobs Engineering Group Inc. (Jacobs).

- The maximum month BOD_5 loading was estimated to be 921 ppd based on the projected average annual loading provided by Jacobs in conjunction with the Casino's 2016 maximum month average to average annual peaking factor of 1.35.

Table 4-21

Existing and Projected Casino Flow and BOD_5 Loading

Scenario	Flow			BOD_5 Loading	
	Average Annual (gpd)	Max Month (gpd)	Peak Hour (gpm)	Average Annual (ppd)	Max Month (ppd)
Existing	73,289	117,282	211	334	556
Casino with Expansion	216,000	245,000	254	684	921

The PHF projected for the proposed Casino expansion is 254 gallons per minute (gpm) (as shown in **Table 4-21**), which was used for evaluating the City's wastewater gravity collection system capacity and lift station capacities.

The projected sewer flows and BOD_5 loadings for the proposed Casino expansion were added to the City's initial sewer flow and BOD_5 loading projections. **Tables 4-13** and **4-17**, which display flow and loading projections, were updated to show the effect of the Casino expansion occurring in 2024 and are presented in **Tables 4-22** and **4-23**, respectively. The evaluations of the City's WRF capacity was updated based on the projections presented in **Tables 4-22** and **4-23**. CIP projects to increase the MMF and BOD_5 treatment capacity of the WRF prior to 2030 are included in **Chapter 11**.

Table 4-22

Projected WRF Flow

Year	AAF with Expanded Casino (MGD)	MMF with Expanded Casino (MGD)	PHF with Expanded Casino (MGD)	Percent of NPDES Permit Max. Month Limit[1]
2021	1.28	2.04	5.29	95%
2022	1.34	2.14	5.56	100%
2023	1.34	2.15	5.56	100%
2024	1.48	2.28	5.63	106%
2025	1.49	2.28	5.63	106%
2030 (+10 years)	**1.56**	**2.40**	**5.95**	**112%**
2040 (+20 years)	**1.74**	**2.69**	**6.70**	**125%**

1 = The City's existing WRF is permitted for a MMF of 2.15 MGD.

Table 4-23

Projected WRF Influent BOD_5 Loading

Year	Projected Average Annual BOD_5 with Expanded Casino (ppd)	Projected Max. Month Average BOD_5 with Expanded Casino (ppd)	Percent of NPDES Permit Max. Month Limit[1]
2021	3,150	5,240	100%
2022	3,263	5,428	104%
2023	3,264	5,431	104%
2024	3,616	5,799	111%
2025	3,618	5,802	111%
2030 (+10 years)	**3,749**	**6,020**	**115%**
2040 (+20 years)	**4,028**	**6,484**	**124%**

1 = The City's existing WRF is permitted for a maximum month average influent BOD_5 loading of 5,220 ppd.

Lift Station Hydraulic Capacity Analyses with Casino Expansion

Wastewater from the proposed Casino expansion is anticipated to flow by gravity to Pump Station No. 1, where it will be pumped to the KCPS, which will then pump it to the City's WRF. This is the same path wastewater from the existing Casino follows. The lift station hydraulic capacity analyses were updated for KCPS and Pump Station No. 1 to include additional flow from the Casino expansion, as shown in **Table 4-24**.

Table 4-24

Lift Station Capacity Analysis with Casino Expansion and Planned Improvements

Lift Station	Future Design Firm Capacity (gpm)[1]	Peak Hour Flow with Casino Expansion (gpm)		
		Existing 2017	Projected 2030	Projected 2040
Kimball Creek Pump Station (Snoqualmie Parkway)	4,861	3,293	3,820	4,039
Pump Station No. 1 (Railroad Place)	2,200	1,745	1,849	2,015

1 = The future design firm capacities are the estimated lift station firm capacities once CIPs WW1 (Existing Kimball Creek Pump Station Improvements) and WW 3 (Pump Station No. 1 (Railroad Place) Improvements), as described in **Chapter 11,** are complete.

The City's KCPS capacity was evaluated assuming the proposed KCPS improvements (further described in CIP WW1 in **Chapter 11)** were completed. It is estimated that the capacity of this lift station will increase to approximately 4,861 gpm after these improvements are completed. The capacity evaluations for KCPS and Pump Station No. 1 are presented in **Table 4-24**. There is projected to be sufficient capacity at KCPS during 2040 PHF for the proposed Casino expansion, as shown in **Table 4-24**.

There is currently not sufficient capacity at Pump Station No. 1 during projected 2040 PHF for the proposed Casino expansion and projected City sewer flows. The total 2040 PHF to Pump

Station No. 1 is approximately 2,015 gpm (**Table 4-24**). The City's Pump Station No. 1 capacity was evaluated assuming the proposed Pump Station No. 1 improvements (further described in CIP WW3 in the in **Chapter 11**) were completed. The capacity of Pump Station No. 1 needs to be verified after CIP WW3 is completed. If the capacity of the improved Pump Station No. 1 is less than 2,015 gpm, additional improvements will be needed so that Pump Station No. 1 has adequate capacity for the 2040 PHF along with the proposed Casino expansion.

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5 | POLICIES AND COLLECTION SYSTEM DESIGN CRITERIA

INTRODUCTION

The City of Snoqualmie (City) operates and plans sewer service for the City and associated sewer service area residents and businesses according to the design criteria, laws, and policies that originate from the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology).

These laws, design criteria, and policies guide the City's operation and maintenance of the sewer system on a daily basis, as well as the City's plan for growth and improvements. The overall objective is to ensure that the City provides high quality sewer service at a fair and reasonable cost to its customers. These laws, design criteria, and policies also set the standards the City must meet to ensure that the sewer system is adequate to meet existing and future flows. The collection system's ability to handle these flows is detailed in **Chapter 6**, and the recommended improvements are identified in **Chapter 11**.

The City Council adopts regulations and policies that cannot be less stringent or in conflict with those established by the federal and state governments. The City's policies take the form of ordinances, memoranda, and operational procedures, many of which are summarized in this chapter.

The City will maintain an updated sewer system plan that is coordinated with the Land Use Element of the *Comprehensive Plan* so that new development will be located where sufficient sewer system capacity exists or can be efficiently and logically extended.

The policies associated with the following categories are presented in this Chapter.

- Regulations
- Customer Service
- Collection System
- Lift Station
- Operational
- Organizational
- Financial

REGULATIONS

National Pollutant Discharge Elimination System Permit

Wastewater discharge into surface waters of the State shall have a National Pollutant Discharge Elimination System (NPDES) permit from Ecology. Refer to **Chapter 2** for details on the City's NPDES permit. The permit contains a flow limit, influent and effluent quality standards, monitoring requirements, pretreatment requirements, and system maintenance requirements. A copy of the City's NPDES permit is included in **Appendix A**.

Other Regulations and Required Permits

Refer to **Chapter 2** for other regulations and required permits that apply to the City's Water Reclamation Facility (WRF).

CUSTOMER SERVICE POLICIES

Policies

- Increase the capacity of the collection system and WRF to reflect increased usage trends influenced by the City's growth and economic development.
- Continue the development of City ordinances regulating public use of the City sewer system and update as required.

Sewer Service and Connection

- The sewer service area is limited to the City limits.
- Provide sewer service to properties within the City's sewer service area, provided all policies related to service can be met. Increase the WRF and collection line capacities to meet the needs of City residents and land within the UGA, as well as State and federal discharge standards.
- Require properties that develop or redevelop within the City limits to connect to the City's sewer system if the subject property is within 150 feet of an existing City sewer main.
- Sewer system service generally will not be extended to properties within the UGA until such properties are annexed into the City limits. Snoqualmie Municipal Code (SMC) 13.04.290 provides the City Council with the option to consent to provision of service outside the City limits.
- Sewer system extensions, required to provide sewer service to proposed developments, shall be approved by the Department of Public Works and must conform to the City's General Sewer Plan, Ecology requirements, King County Public Health requirements, the SMC, and the City's most current, adopted Sanitary Sewer Engineering Standards. All costs of the extension shall be borne by the developer or applicant. The 2004 Sanitary Sewer Engineering Standards are included in **Appendix C**.
- For sewer service applications within the City limits, the City will review the availability for sewer service at the time of land use permitting, site development permit review, and building permit review. During the land use permitting process, the City will determine if sewer is available for the site. During the site development permit review, the City will address the sizing and location of the sewer extension. The formal sewer service application begins at the time of building permit, when service sizing is evaluated.

- Applicants for a development approval, except those exempted from concurrency under the Growth Management Act, must submit an application for a certificate of sewer concurrency along with the development approval application. City policy requires annexation before sewer service can be provided outside the City limits.
- Sewer collection system, lift station, and WRF capacity will be considered when providing sewer availability to applicants.
- Sewer availability shall expire at the time that the associated permit expires (i.e. land use, site development, or building permit).
- Time extensions in regard to sewer availability shall be granted in accordance with the associated permit requirements. When extensions are denied, the disputes are handled through the rules guiding the associated permit process. Disputes can be brought to the City Council for consideration, appeal, or resolution.
- Chapter 13.04 of the SMC provides sewer regulations for the City's sanitary sewer system.
- The City does not allow surface water runoff into the municipal sewer system.
- New sewer extensions may require some property owners to participate in Utility Local Improvement Districts (ULIDs).

Septic System Policies

- Approximately 34 parcels within the City limits have been identified by City staff as using on-site sewage systems. All developed parcels outside the City limits and within the UGA use on-site sewage systems, with the exception of approximately 5 parcels. According to the Growth Management Act, no new on-site septic sewage systems should be allowed in the UGA as new development is intended to be at urban densities that require sewers. In addition, Chapter 70.118 RCW requires counties to develop and implement management plans for on-site sewage systems.
- No new on-site septic systems are allowed inside the City limits on properties where existing City sewer main is within 150 feet of the boundary of the subject property.
- Existing single-family homes with septic systems in good working condition, per King County Public Health, may continue to be used. All septic systems in the City shall be monitored per King County Public Health regulations.
- All non-developing properties that annex into the City are encouraged to phase out their septic systems and connect to the City's municipal sewer system.
- Property owners with a failing septic system, as documented by King County Public Health, shall connect to the City's sewer system if the property is located on or adjacent to an existing sewer main.
- Connection to the public sewer system is not required for single-family homes that generate sewage that are located 150 feet or more away from the public sewer.
- The City is aware of Engrossed Senate Bill (ESB) 5871, which became effective on July 24, 2015, and requires cities, towns, and counties to offer an administrative appeals process to consider denials of permit applications to repair or replace a septic system

where connection to a sewer system is required for single-family residences. The City will review appeals to repair or replace septic systems as they are submitted in accordance with ESB 5871.

- Any private residential or commercial development property that is within City limits is required to connect to the public sewer system regardless of the distance from the public sewer.

COLLECTION SYSTEM POLICIES AND DESIGN CRITERIA

Sanitary Sewer Design Criteria

- Standards for sewer system facilities are defined by WAC 173-240-050.
- All sewer lines and facilities within the City shall be designed in accordance with good engineering practice by a professional engineer with the minimum design criteria presented in the *Criteria for Sewage Works Design*, prepared by Ecology, August 2008, or as superseded by subsequent updates. Chapter C1 of this document includes standards and guidelines for design considerations (e.g. minimum pipe sizes, pipe slopes, and wastewater velocities), maintenance considerations, estimating wastewater flow rates, manhole locations, leak testing, and separation from other underground utilities. These criteria have been established to ensure that the sanitary sewers convey the sewage and protect the public health and environment. The sewer lines also shall conform to the latest regulatory requirements relating to design.
- Sewers shall be designed and constructed in accordance with the City's most current Sanitary Sewer Engineering Standards.

Gravity Sewer Design Criteria

- All sewers shall be designed as a gravity sewer whenever feasible and buried at a minimum depth of 5 feet.
- The layout for extensions shall provide for the future continuation of the existing system as determined by the City. The smallest diameter sewer allowed is 8 inches for gravity mains and 6 inches for side sewers, inside the public-right-of-way. A 6-inch-diameter lateral is required for all commercial or business owners. For those buildings serving over 10 units or for side sewers serving more than 1 building, side sewers shall be a minimum of 8 inches in diameter and must connect to a manhole.
- Manholes shall be a minimum of 48 inches in diameter and will be spaced at intervals not to exceed 400 feet as set forth in the City's Sanitary Sewer Engineering Standards.
- Manholes also shall be located at changes in grade, direction, and sewer size, and at intersections. All manhole rings and covers in flood zones shall be water tight. All manholes shall have bolt-locking covers.
- New mains connecting to an existing main shall be made via a new or existing manhole.
- Where a new utility line crosses below an asbestos cement (AC) main, the AC pipe shall be replaced with ductile iron (DI) pipe to 3 feet past each side of the trench.

- The minimum sewer main slope shall be 0.004 feet per foot for 8-inch-diameter sewer lines. The minimum slope may be reduced if the area cannot be served by gravity flow. If the slope is decreased, the pipe diameter shall be increased in accordance with Table C1-1 of Ecology's *Criteria for Sewage Works Design* and subject to approval by the City.
- Testing of the gravity sewer lines and manholes shall be completed in the presence of the City. The method of testing shall be at the option of the installer per the City's Sanitary Sewer Engineering Standards.

Design Flow Rates

- All new gravity sewers shall be designed to have a minimum velocity of 2 feet per second when flowing full.
- No overflows will be permitted.

Separation Between Sanitary Sewer and Other Utilities

- A minimum horizontal separation of 10 feet and a minimum vertical separation of 18 inches is required between sewer and water lines (edge to edge).
- The City's Sanitary Sewer Engineering Standards (which the City refers to as Chapter 5 Standards) (**Appendix C**) will be followed, and the guidelines provided in Ecology's *Criteria for Sewage Works Design* should be followed for difficult spacing or other situations.

Design Period

- The design period is the length of time that a given facility will provide safe, adequate, and reliable service. The design period selected is based on the economic life of a given facility, which is determined by the structural integrity of the facility, the rate of degradation, the replacement cost, the cost of increasing the capacity of the facility, and the projected population growth rate serviced by the facility.
- The life expectancy for new sanitary sewers, using current design practices, is in excess of 50 years.

Force Main Design Criteria

- All force mains within the City shall be designed in accordance with good engineering practice by a professional engineer with the minimum design criteria presented in the *Criteria for Sewage Works Design*, prepared by Ecology, August 2008, or as superseded by subsequent updates. Chapter C2 of this document contains design considerations for force mains.

Side Sewer Design Criteria

- Side sewers shall be constructed in accordance with all applicable City, local, and State regulations. See the City's Municipal Code and Chapter 5 Standards (**Appendix C**) for specific criteria.

LIFT STATION POLICIES AND DESIGN CRITERIA

- Lift stations shall be designed in accordance with the City's most current Sanitary Sewer Engineering Standards and the Ecology's *Criteria for Sewage Works Design*.

OPERATIONAL POLICIES

Maintenance

- Equipment breakdown is given the highest maintenance priority, and repairs should be made as soon as possible.
- Equipment should be replaced when it becomes obsolete.
- Worn parts should be repaired, replaced, or rebuilt before they represent a high failure probability.
- Equipment that is out of service should be returned to service as soon as possible.
- A preventive maintenance schedule shall be established for all facilities, equipment, and processes.
- Spare parts shall be stocked for all equipment items whose failure will impact the ability to meet other policy standards.
- Tools shall be obtained and maintained to repair all items whose failure will impact the ability to meet other policy standards.
- Dry, heated shop space shall be available to all maintenance personnel to maintain facilities.
- Written records and reports will be maintained on each facility and item of equipment showing its operation and maintenance history.

Temporary and Emergency Services

- Compliance with construction standards (not quality standards) may be deferred for temporary sewer service.
- Compliance with all standards may be deferred for emergency sewer service.
- Compliance with all applicable NPDES waste discharge permit requirements must be met.

Reliabilities

- The City shall invest sufficient resources to ensure that the sewer system is constructed, operated, and maintained to ensure consistent and reliable service is provided to its customers.

ORGANIZATIONAL POLICIES

Staffing

- The sewer utility staffing levels are established by the City Council based on the financial resources of the City and needs of the sewer utility.
- The City has two Group IV certified wastewater treatment operators, two Group III certified wastewater treatment operators, one Group II certified wastewater treatment operator, and two Group I certified wastewater treatment operators.
- Personnel certification and training will comply with State-established standards.

FINANCIAL POLICIES

General

- The City will set rates, charges, and fees to maintain sufficient funds to operate, maintain, and upgrade its sewer system as necessary to provide safe and reliable sewer service to its customers. These rates will comply with State regulations and be evaluated in conjunction with the annual budget process to ensure that forecasted expenses and impacts of regulations are reflected in the rate structure.
- Each lot or parcel of real property required to be connected to the City's sewer system shall be subjected to a monthly sewer charge whether such lot or parcel of real property is actually connected to the sewer system. This monthly sewer charge will be waived if the property owner can establish, to the satisfaction of the City Engineer, that the lot or parcel is connected to a septic system approved by King County.
- The sewer connection charge(s) must be paid prior to issuance of the permit by the City and shall be determined for each individual connection as requested by the applicant in accordance with the City's Municipal Code.
- The City shall collect sewer extension charges for owners of properties that individually benefit from publicly built sewer extension facilities, except for those property owners who previously paid for their fair share of such an extension through a Local Improvement District (LID) or ULID.
- The cost of any modification to the system shall be borne by each property abutting upon or benefiting from such modifications or by the owners of such property.
- If sewer system facilities must be installed or upgraded as a result of a developer's impacts, the new facilities or upgrades shall conform to the City's policies, criteria, and standards and shall be accomplished at the developer's expense. The City, however, shall be responsible for any portion of the costs that are attributable to general facilities, such as over-sizing or over-depth requirements, and offer latecomers fees to developers.
- If written application for service is approved by the City, the application shall be considered as a contract in which the applicant agrees to abide by such rates, rules, and

regulations in effect at the time of signing the application or as may be adopted thereafter by the City and to pay all charges, rates, and fees promptly.

- In addition to all other user rates and service connection fees required to be paid to the City, service call fees may apply when made at the request of the owner or occupant of the premises for assistance in locating and/or repairing a plugged sanitary sewer drain in accordance with the City's Municipal Code.
- The City shall manage its income and expenses in a self-supporting manner in compliance with applicable laws and regulations and its own financial policies.
- The City shall establish a Capital Improvement Plan (CIP) that describes the anticipated improvements or modifications to the sewer system, planned replacement of aging facilities, upgrades to existing facilities to provide additional capacity for projected growth, and construction of general facilities to aid growth. The CIP will be completed on a 2-year basis.
- A working capital reserve will be maintained to cover unanticipated emergencies, bad debts, and fluctuations in cash flow.
- The City will maintain information systems that provide sufficient financial and statistical information to ensure conformance with rate-setting policies and objectives.

Connection Charges

The owners of properties that have not been assessed, charged, or borne an equitable share of the cost of the sewer collection system and WRF shall pay one or more of the following connection charges prior to connection to a sewer main.

1. Latecomers Fees: Latecomers fees are negotiated with the City, developers, and property owners for the reimbursement of a pro rata portion of the original costs of sewer system extensions and facilities and are documented in a Recovery Contract or City resolution, depending on the application.
2. Connection Charges: Connection charges shall be assessed against any property connecting to the sewer system. This charge is for the major facilities that deliver the sewage to the WRF and for the facilities to treat and dispose of the sewage. This charge reimburses customers who have paid for the facilities described and for building capacity to accommodate growth.
3. Developer Extension Charges: These charges are for the administration, review, and inspection of a developer extension project.
4. Developer-Funded Improvements: These are costs incurred by a developer to upgrade and increase capacity in the sewer system to accommodate the increase in flow from the proposed development.

6 | SEWER COLLECTION SYSTEM EVALUATION

INTRODUCTION

This chapter presents the analysis of the existing City of Snoqualmie (City) wastewater collection system. Individual sewer system components were analyzed to determine their ability to meet policies and design criteria under both existing and projected flow conditions. The policies and design criteria are presented in **Chapter 5**, and the wastewater system flow and loading analysis is presented in **Chapter 4**. A description of the existing wastewater system facilities and current operation is presented in **Chapter 2**. The capital improvement projects resulting from the existing and projected flow conditions analyses are presented in **Chapter 11**.

COLLECTION SYSTEM ANALYSIS

Hydraulic Model

Background

A computer-based hydraulic model of the existing sewer system was created using the SewerCAD® program, developed by Haestad Methods. The entire sewer collection system was modeled, including gravity mains, force mains, and sewer lift stations. The hydraulic model was created using the best information available and data provided by the City. Pipe locations, lengths, diameters, and materials were added based on the previous hydraulic sewer model, GIS data, as-built drawings, various system maps, survey information, and information acquired from the City. Manhole invert and rim elevation data from record drawings and survey information was used, if available, for the City's major trunk sewers (all pipes 10 inches in diameter and larger or downstream of a lift station). The remaining elevation data was extracted from King County topographic data. Minimum slope and cover values also were used in the development of the model and are annotated in the model. The output from this model was used to evaluate the capacity of the existing collection system and identify improvements that will be required to handle wastewater flows. The model can be updated and maintained for use as a tool to aid in future planning.

Model Limitations

Due to the number of data gaps and assumptions used in the model, the accuracy of the model should be confirmed prior to undertaking any replacement or rehabilitation projects, especially for projects not located along a major trunk sewer. The results of the modeling should be considered approximate and additional investigations, such as field surveys, flow monitoring, and lift station pump down tests, should be performed in the vicinity of any proposed improvements prior to design and construction. If it is found that the input information differs significantly from actual conditions, the model should be updated accordingly and rerun to confirm the original results.

The modeling was performed using a steady-state analysis, which shows all flows reaching all downstream points simultaneously. This is conservative and not truly representative of conditions that occur, since it takes some time for wastewater to travel downstream through the sewer system, which stores and attenuates peak flows.

Flow Data

Existing and projected flow rates for the sewer drainage basins were developed in **Chapter 4**. **Table 4-13** in **Chapter 4** details average annual flow (AAF) and peak hour flow (PHF) for each sewer drainage basin, and **Table 4-14** in **Chapter 4** details AAF and PHF for each sewer lift station. As discussed in **Chapter 4**, the City's sewer system is estimated to have a peak hour peaking factor of 4.15 times the AAF. The total existing and projected flows are shown in **Table 4-11** in **Chapter 4**. It is recommended that the City obtain additional flow data from the sewer drainage basins to accurately evaluate capacity in areas with suspected deficiencies for future planning and design.

Facilities

The hydraulic model of the existing system contains all active existing system facilities. Available information for the lift station, such as pump capacity, total dynamic head, horsepower, wet well diameter, wet well depth, and force main diameter, is included in the model. For simplicity, the existing lift stations are modeled as having variable frequency drives (VFDs) on the pumps so that they discharge at the same rate as the influent flow rate regardless of head conditions.

Hydraulic Analyses Results

Hydraulic analyses were performed based on the existing flow rates (2017), as well as projected flow rates for 2030 and 2040. In the evaluation, the criteria for listing a trunk sewer pipe as deficient is that the upstream manhole is surcharged more than 1 foot during PHF. This criteria was used for the City's collector sewer pipes (all non-trunk sewer mains), but it was only applied to sewer pipes that the model indicated had a PHF of at least 340 gallons per minute (gpm), which is the approximate capacity of an 8-inch gravity main at minimum slope with a Manning's "n" value of 0.013 according to the Manning formula.

Figure 11-1 highlights current system deficiencies. **Figure 11-2** provides capacity deficiencies for projected 2030 and 2040 conditions. The results for the existing, 2030, and 2040 modeling are included in **Appendix G**. The improvements for all sewer mains identified as having deficient hydraulic capacity were sized to meet projected 2040 PHFs.

Pipe Capacity Deficiencies

It is intended that this General Sewer Plan (GSP) contain an inclusive list of recommended system improvements; however, additional projects may need to be added or removed from the list as growth occurs or conditions change. The City will evaluate the capacity of the wastewater collection system as growth occurs and development applications are received.

Existing System

Based on the hydraulic analysis of the existing collection system, the 10-inch trunk sewer line along 384th Avenue SE, between SE Newton Street and SE Kimball Creek Drive, needs to be upsized in the near future. This trunk sewer line contains a pipe with an adverse slope, and the hydraulic analysis of the existing collection system indicates that a portion of this pipeline has PHFs that cause some of the trunk lines along 384th Avenue SE to surcharge more than 1 foot during existing PHFs (the City's criteria for listing a sewer pipe as deficient) and will require upsizing this portion of this trunk line. This is addressed as part of the City's Capital Improvement Plan (CIP) (CIP SM1; described further in **Chapter 11**). The hydraulic analysis also indicates the 15-inch trunk sewer lines along Railroad Place SE, between Pump Station No. 1 and SE Fir Street, surcharges less than 1 foot during existing PHF. The 2012 GSP identified this trunk line for capacity upgrades, which is addressed as part of the City's CIP (CIP SM3; described further in **Chapter 11**). These improvements are shown in **Figure 11-1** in **Chapter 11**. The pipe size upgrades are scheduled based on capacity of the existing pipes being reached at the existing flow rate. However, the proposed size of pipe is based on the flow projections for 2040.

The modeling results also indicate there are several small sections of the collection system that should be monitored at this time. These sections include: 1) the collector sewer pipes between Pump Station BP and Norman Avenue SE, which may be near capacity; 2) the trunk lines between Snoqualmie Parkway and Bracken Place SE, which the model indicates has some surcharging; 3) the trunk lines along Laurel Avenue SE between Chanticleer Avenue SE and Fairway Avenue SE, which the model indicates may be near capacity; and 4) the trunk line along Railroad Place SE between the alley south of SE Alpha Street and SE Beta Street, which the model indicates surcharges during existing PHFs. These areas are shown in **Figure G-1** in **Appendix G**. It is recommended that the City monitor flow in these areas identified to determine the actual peak flows in the system.

2030 Projections and 2040 Projections

Based on the analysis of the system using projected flow rates for 2030 and 2040, and assuming the existing system deficiency improvements will be completed, no portions of the collection system are required to be upsized. However, the modeling results indicate there are several small sections of the collection system that should continue to be monitored. These sections include the collector sewer pipes between Pump Station BP and Norman Avenue SE, which may be near capacity or have some surcharging, the trunk lines between Snoqualmie Parkway and the intersection of SE Center Street and Bracken Place SE, which the model indicates may have some surcharging, the trunk lines along Laurel Avenue SE between Chanticleer Avenue SE and Fairway Avenue SE, which the model indicates may be near capacity or have some surcharging, and the trunk line along Railroad Place SE between the alley south of SE Alpha Street and SE Beta Street, which the model indicates may surcharge during 2030 and 2040 PHFs. These areas are shown in **Figure G-3** in **Appendix G**.

Other Existing Gravity Collection System Deficiencies

The projects listed in the previous sections are a result of the hydraulic modeling effort for 2017, 2030, and 2040 conditions. In addition to these projects, City staff desire to repair and rehabilitate other regions of the collection system due to their condition. These projects are described in CIP SM1 through CIP SM6 and are shown on **Figure 11-1** in **Chapter 11**.

Inflow and Infiltration

As indicated in the inflow and infiltration (I/I) evaluation section of **Chapter 4**, the existing per capita flow rates for the City are above the criteria for inflow and slightly below the criteria for infiltration set by the U.S. Environmental Protection Agency (EPA) in the *Infiltration/Inflow, I/I Analysis and Project Certification* report, indicating that there might be an inflow problem based on the limited analyses completed as part of this GSP.

The City will continue to be aware of the potential for I/I and continue efforts to construct new systems to prevent I/I and maintain existing facilities and pipelines as needed to remove I/I. The City should consider conducting an I/I study to confirm the results of the I/I evaluation and to locate the affected collection system areas to determine if there are any cost-effective sewer rehabilitation measures to remove any excessive inflow. This study is addressed in CIP M4. In addition, the City plans to perform a sewer system investigation to locate defects in the City's historic area (which is conveyed by Pump Station No. 1) that could be contributing to I/I. These CIPs are discussed further in **Chapter 11**.

LIFT STATION ANALYSIS

Lift Station Capacity

Existing System

The hydraulic analysis of the City's existing lift stations (**Table 4-14**) indicates that they have no capacity deficiencies. As discussed previously, capacity analyses of each lift station are based on estimated peak hour flow. According to discussions with the system operators, there are no known capacity deficiencies in the City's existing lift stations during normal operating conditions. However, the system operators have indicated that Pump Station Nos. 1, 3, and 4 have long pump run times during Snoqualmie River flooding events, and the pumps at Pump Station No. 1 run continuously for multiple hours during peak non-flood flows. Flows at the lift stations should continue to be monitored to determine if influent flow during peak events begin to approach or exceed the pumping capacity of the lift stations.

2030 and 2040 Projections

Based on the hydraulic analysis of the system using projected flow rates, the City's existing Pump Station No. 1 and Pump Station BP are projected to be out of capacity prior to 2030. Capacity upgrades are recommended for Pump Station No. 1 (CIP WW3) and Pump Station BP (CIP DF1) to accommodate existing and additional flows.

Developer-funded lift stations in the southeast portion of the Pump Station BP sewer basin (also known as Plat S22), the Snoqualmie Hills West Planning Area, the Snoqualmie Hills East Planning Area, and the Snoqualmie Mill Site may be necessary as growth within the Urban

Growth Area (UGA) occurs in those areas. The lift station facilities and force mains are recommended to be designed for the long-term 2040 projected flows.

Other Existing Lift Station Deficiencies

A number of miscellaneous items have been identified for the City's existing lift stations that need to be addressed. These items are identified below and incorporated in the City's CIP.

Existing Kimball Creek Pump Station Miscellaneous Improvements

The Kimball Creek Lift Station was constructed in 1998 to lift wastewater from the City's collection system to the Headworks of the Water Reclamation Facility (WRF). The pumps each discharge at approximately 3,475 gpm and 2,000 gpm at the high and low speeds, respectively. Pumps No. 1 and No. 2 were installed during the original lift station construction. The third pump was installed in approximately 2012. The pumps originally were designed to provide lower flow outputs through inlet flow control by each pump's pre-rotation basin, but this operation does not reliably occur. The lift station was analyzed in detail by RH2 Engineering, Inc., as documented in the *2019 Kimball Creek Lift Station Evaluation Technical Memorandum* (2019 Memo). The findings and recommendations of the 2019 Memo are summarized in this GSP.

The lift station was sized for full build-out conditions with the capability of meeting the 7.12 million gallons per day (MGD) (approximately 5,000 gpm) design PHF with two pumps in operation. With a nominal low speed setting of 2,000 gpm, the pumps are oversized for the current average daily dry influent flow rates that generally vary between 200 gpm and 1,400 gpm at diurnal conditions. As such, the lift station causes excessive flow cycling and spikes to the WRF. This poses operational issues for the WRF, including inconsistencies in the capture efficiency of the screening and grit removal system, reduced hydraulic retention time in the anaerobic and anoxic zones of the oxidation ditches, increased loading rates to the secondary clarifiers, and flow spikes to the ultraviolet (UV) channel that affect the efficiency of the disinfection system.

During the planning period, improvements should be made to the Kimball Creek Lift Station to provide better flow pacing for influent to the WRF.

The 2019 Memo provided a detailed alternatives analysis for three possible options for upgrading the station:

- Alternative 1 – Change impeller and volute liner for existing pumps.
- Alternative 2 – Replace one existing pump with a baseflow pump.
- Alternative 3 – Utilize a variable frequency drive for existing pumps.

The 2019 Memo reviewed previous documentation from the pump manufacturer and attempts by WRF operators to reduced flow rates with a "trimmed" impeller. These attempts were not successful; therefore, Alternative 1 proved to not be viable.

Alternative 2 included the replacement of one existing pump with a smaller "baseflow" pump to better match the baseflow condition. The installation of this pump would require replacement of the existing pre-rotation bay and a reduction in the pipe size between the manifold and the pump to ensure adequate flushing velocities. Valves and fittings also would be installed to allow the baseflow pump to discharge to a separate force main from the large pumps to ensure that tandem operation of a large pump and a baseflow pump could be achieved. The baseflow pump would be operated on a new VFD to provide the highest flow matching capability. As part of the project, a new control panel would be included, and in addition to the VFD for the baseflow pump, the motor control center (MCC) section for one of the large existing pumps would be replaced with a new section, including a VFD. The WRF operators also requested that a shelf-spare baseflow pump be provided as part of the project. As a result of this project, one of the existing large pumps would become a shelf spare as well. This alternative would reduce the firm capacity of the lift station from 10 MGD (two large pumps in operation) to approximately 7 MGD (one large and one baseflow pump in operation). However, this provides adequate capacity for the projected 20-year PHFs.

Alternative 3 proposed installing a VFD to drive one of the existing pumps to allow further turn down of the pump. However, review of the manufacturer’s pump curves in the 2019 Memo showed that the turndown would likely be limited to 1,000 gpm and would require the pump to operate very inefficiently. This alternative was ruled out during review with the City.

Alternative 2 is the preferred alternative for upgrading the lift station. This item is identified in the City’s CIP (CIP WW1 in **Chapter 11**).

Pump Station No. 1 (Railroad Place) Improvements

Run time and flow meter data indicate that the pumps at Pump Station No. 1 run continuously for multiple hours during peak non-flood flows. Based on results of the flow projections, it is estimated that the PHF to Pump Station No. 1 will reach approximately 2,015 gpm by 2040 with the Snoqualmie Casino expansion, as shown in **Table 4-24**. This projected flow exceeds the lift station's 1,800 gpm capacity. The original intent of this project was to upgrade the pumps at Pump Station No. 1 to increase the capacity of this lift station. However, preliminary analyses performed for this project indicate that the projected 2040 PHF could be handled at this lift station if the existing force main is replaced with a 12-inch-diameter force main. This item is identified in the City’s CIP (CIP WW3).

Pump Station No. 2 Reconstruction and Force Main Replacement

Pump Station No. 2 was originally constructed in 1965. The existing piping, valves, electrical equipment, roofing, and one remaining original pump have exceeded their useful lives and require replacement. In addition, the existing force main is made of steel and is beneath a wetland. The force main requires rehabilitation or replacement. This item is identified in the City’s CIP (CIP WW2).

Pump Station No. 3 Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City’s capability of monitoring this lift station. This item is identified in the City’s CIP (CIP WW4).

Pump Station No. 4 Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. This item is identified in the City's CIP (CIP WW5).

Pump Station No. 6 Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. The ball check valves were removed previously because they were causing the pumps to airlock, and the City plans to replace the check valves with swing check valves. These items are identified in the City's CIP (CIP WW6).

Pump Station BP Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. This item is identified in the City's CIP (CIP WW7).

Pump Station E Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. In addition, this lift station does not have pump rails, and the City plans to have pump rails installed to ease removal and placement of the pumps during maintenance at this lift station. These items are identified in the City's CIP (CIP WW8).

Pump Station F Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. This item is identified in the City's CIP (CIP WW9).

Pump Station K2 Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. This item is identified in the City's CIP (CIP WW10).

Pump Station K3 Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. In addition, this lift station does not have pump rails, and the City plans to have pump rails installed to ease removal and placement of the pumps during maintenance at this lift station. These items are identified in the City's CIP (CIP WW11).

Pump Station L Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. This lift station also does not have pump rails, and the City plans to have pump rails installed to ease removal and placement of the pumps during maintenance at this lift station. These items are identified in the City's CIP (CIP WW12).

Pump Station N6 Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. This item is identified in the City's CIP (CIP WW13).

Pump Station No. S12A Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. The valve vault hatch for this lift station is not traffic rated, so the City plans to replace the valve vault hatch with a traffic-rated access hatch for safety reasons. This lift station also does not have any bollards, so the City plans to install bollards around the lift station's transformer, control panel, access hatches, and gas meter for safety reasons. These items are identified in the City's CIP (CIP WW14).

Pump Station Z Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. This item is identified in the City's CIP (CIP WW15).

Hospital Pump Station Miscellaneous Improvements

This lift station does not have a flow meter, and the City plans to have a flow meter installed to improve the City's capability of monitoring this lift station. This item is identified in the City's CIP (CIP WW16).

Other Future Lift Station Deficiencies

Future Kimball Creek Pump Station Miscellaneous Improvements

Two of the existing pumps at the Kimball Creek Lift Station were installed in 1998, and the third pump was installed in 2012. The oldest pumps are nearing their expected design life and should be replaced during the planning period, although the installation of the baseflow pump, as discussed previously, is the highest priority project for this lift station. Once the baseflow pump is installed, the existing large pumps will operate much less frequently, allowing their useful life to be extended. The operators should continue to monitor wear on these pumps and budget for the following projects:

- Replace the oldest two pumps and replace the final existing non-VFD MCC section (after two are replaced during the baseflow pump project) with a new MCC section including a VFD. This item is identified in the City's CIP (CIP WW17 in **Chapter 11**).
- Replace the third existing pump (installed in 2012) during the planning period. This item is identified in the City's CIP (CIP WW18 in **Chapter 11**).

7 | EXISTING TREATMENT FACILITY EVALUATION

INTRODUCTION

This chapter presents the evaluations of the existing Water Reclamation Facility (WRF), including an effluent water quality performance evaluation. This chapter describes and evaluates existing liquid stream and solids handling processes for current and future operating conditions. It also presents an evaluation of the electrical and supervisory control and data acquisition (SCADA) systems. Deficiencies identified from the evaluations are described, and recommendations for capital improvements are summarized. Alternatives analyses apply to some of the capital improvements, which are presented and analyzed in **Chapter 8**. Preferred alternatives and all WRF capital improvements are identified in **Chapter 9**.

OVERVIEW OF WRF

History

The City of Snoqualmie's (City) sewer collection system was originally constructed in the 1960s. Wastewater from the system was processed at the City's wastewater treatment plant, which was constructed in 1967 on the site of the current WRF. The treatment plant consisted of a facultative lagoon system with two lagoons, and the effluent was disinfected with chlorine and discharged to the Snoqualmie River. The treatment plant was upgraded in two phases to what is now known as the WRF. The first phase was constructed in 1997 and generally consisted of a headworks, an oxidation ditch, two secondary clarifiers, an ultraviolet light (UV) disinfection system, an in-plant pump station, two reclaimed water filters, a reclaimed water pump station, conversion of the lagoons for sludge stabilization and storage, a lagoon decant pump station, and connection to the off-site portion of the Snoqualmie River outfall. The second phase was constructed in 2003 to expand the WRF with a second oxidation ditch, a third reclaimed water filter, and additional UV disinfection system capacity.

There have been subsequent major improvements to upgrade the WRF. In 2008, construction was completed for the addition of a solids handling system consisting of a sludge holding tank and dryer building with sludge dewatering and drying processes to produce Class A biosolids. The City followed completion of those improvements with decommissioning of the lagoons. Further upgrades constructed at the WRF since completion of the City's 2012 General Sewer Plan (GSP) are summarized in the following section.

Capital Improvements Completed Since 2012 General Sewer Plan

Sixteen capital improvement projects were recommended at the WRF in the 2012 GSP. The projects were scheduled over a 6-year timeline with construction from 2014 through 2020.

Since the 2012 GSP was completed, a fire occurred in the dryer building. As a result of the fire, the dryer was permanently removed in April 2015. Dewatered sludge was hauled offsite to a landfill until construction of a new solids handling system was completed as described further in this section.

The 2015 *Snoqualmie WRF Improvements Engineering Report* by RH2 Engineering, Inc., (RH2) (2015 Engineering Report) was completed to address the engineering report requirements (Washington Administrative Code (WAC) 173-240-060) for the capital improvement projects. A majority of the capital improvement projects from the 2012 GSP were included in the 2015 Engineering Report. Some, such as the vactor decant station project, do not require an Engineering Report, others were combined with a larger project. The sludge drying facility odor control upgrades and solids handling nitrogen padding system projects were both eliminated because the City abandoned the dryer and planned to implement new solids handling processes as a new project. This brought the total to twelve capital improvement projects identified for the WRF in the 2015 Engineering Report. Ten of the projects were scheduled for construction from 2016 through 2018, and the remaining two were designated for further evaluation of the final timelines.

The implementation plan for the WRF capital improvement projects was developed with a phased approach, resulting in a total of four planned phases. The ten scheduled projects were grouped into Phases 1 and 2, which have been constructed and are described as follows. The two remaining projects were designated as Phases 3 and 4 and have not been constructed. A summary of the evolution of the capital improvement projects since the 2012 GSP is shown in **Table 7-1**.

Table 7-1

Summary of WRF Capital Improvement Projects Evolution since 2012 General Sewer Plan

2012 General Sewer Plan WRF Projects	2015 Engineering Report WRF Projects	Implementation Phase
Raw Wastewater Pump Station	Raw Wastewater Influent Monitoring	Phase 1 (constructed)
Anoxic Mixer	Anoxic Mixer Replacement	
UV Disinfection System Upgrades	UV Disinfection System Upgrades	
Air Gap System/Non-Potable Water System Improvements	Non-Potable Water System Improvements	
Standby Generator System Upgrades	Standby Generator System Upgrades	
Additional Parking		
Site Security Improvements	Automatic Site Access Gate	
Grit Removal System Improvements	Grit Removal System	Phase 2 (constructed)
Anaerobic Mixers	Anaerobic Mixers	
Scum Pump Station	Scum Pump Station	
Aerobic Digester	Solids Treatment (Aerobic Digester Facility)	
Operations Building and Shop Facility Remodel		
Sludge Drying Facility Odor Control Upgrades	N/A (project removed)	
Solids Handling Nitrogen Padding System	N/A (project removed)	
Vactor Decant Station	N/A (did not require an Engineering Report)[1]	
Third Secondary Clarifier	Third Secondary Clarifier	Phase 3
N/A (no project listed)	Oxidation Ditch Aerators	Phase 4

1 = The Vactor Decant Station project was not included in the 2015 Engineering Report, but it was constructed as part of the Phase 2 improvements.

Construction of Phase 1 was completed in 2017 and generally consisted of upgrades to the wastewater influent flow and water quality monitoring, replacement and upgrade of the Oxidation Ditch No. 1 anoxic basin mixer, replacement and upgrade of the UV disinfection system, upgrades to the non-potable water system, replacement and upgrade of the standby generator and fuel tank, new site fencing and access gates for improved security, and other facility security upgrades. Upgrades to the WRF SCADA system and relocation of effluent water quality monitoring instrumentation also were completed as part of the Phase 1 improvements. Refer to the **Liquid Stream Existing Facilities Evaluation** and **Electrical and SCADA Existing Systems Evaluation** sections for additional information about the Phase 1 improvements.

Construction of Phase 2 was completed in 2019 and generally consisted of upgrades to the headworks grit removal, replacement and upgrade of all oxidation ditch anerobic basin mixers, upgrades to Secondary Clarifier No. 1, conversion from gravity scum conveyance to scum pump stations at each clarifier, and replacement of the sludge dewatering and abandoned drying processes with a new solids handling system, including thickening, aerobic digestion, and dewatering processes to produce Class B biosolids. Odor control systems for the headworks and new solids handling processes and additional administration space also were constructed as part of the Phase 2 improvements, along with replacement and upgrade of the Vactor decant station, replacement of the utility electrical service transformer, and decommissioning of the sludge holding tank and dryer building. The sludge holding tank and appurtenances were removed and disposed. Equipment within the dryer building was either removed and disposed of or relocated to the solids handling building, while the dryer building was left in place for use as the shop building. Stress testing was performed for both clarifiers prior to developing the Secondary Clarifier No. 1 upgrades. Refer to the **Liquid Stream Existing Facilities Evaluation**, **Solids Handling Existing Facilities Evaluation**, and **Electrical and SCADA Existing Systems Evaluation** sections for more information about the Phase 2 improvements.

The remaining two projects of the twelve total capital improvement projects identified for the WRF are yet to be implemented and are shown in **Table 7-2**, along with the designated phase numbering. Changes to the scheduling and improvements for each project are documented in this GSP.

Table 7-2

2015 Engineering Report WRF Capital Improvement Projects Not Yet Implemented

Planned WRF Projects Remaining	Implementation Phase
Third Secondary Clarifier[1]	Phase 3
Oxidation Ditch Aerators[2]	Phase 4

1 = The timing of this project is changing as described within this GSP.

2 = This project is changing as described within this GSP.

Figure 7-1 shows an overall site plan of the WRF with completed improvements.

WRF EFFLUENT WATER QUALITY PERFORMANCE

As discussed in **Chapter 2**, the City's National Pollutant Discharge Elimination System (NPDES) permit identifies effluent limits for WRF disinfected secondary effluent discharged to the Snoqualmie River (Outfall No. 001). A review of historical effluent water quality relative to the permit effluent limits was used to evaluate overall WRF treatment performance as applies to applicable processes (i.e. excluding reclaimed water production processes). Recorded data in the City's WRF daily monitoring reports (DMRs) from the 2014 through August 2019 time period was reviewed. This section describes the water quality data review and findings. Refer to **Chapter 4** for WRF influent flow and loading details.

CBOD

Historical effluent levels of 5-day carbonaceous biochemical oxygen demand ($CBOD_5$) are shown in the following charts. **Chart 7-1** shows 24-hour composite concentration measurements, and **Chart 7-2** shows calculated mass. In addition, **Table 7-3** shows the minimum calculated $CBOD_5$ percent removal value for each calendar year (minimum occurrence) during the time period reviewed. Year-long effluent $CBOD_5$ mass is shown **Chart 7-2**; however, stricter total maximum daily load (TMDL) permit effluent limits apply to $CDOD_5$ from August through October. A performance evaluation specific to the $CBOD_5$ TMDL limits is presented later in this section.

Chart 7-1

Historical WRF Effluent $CBOD_5$ Concentration

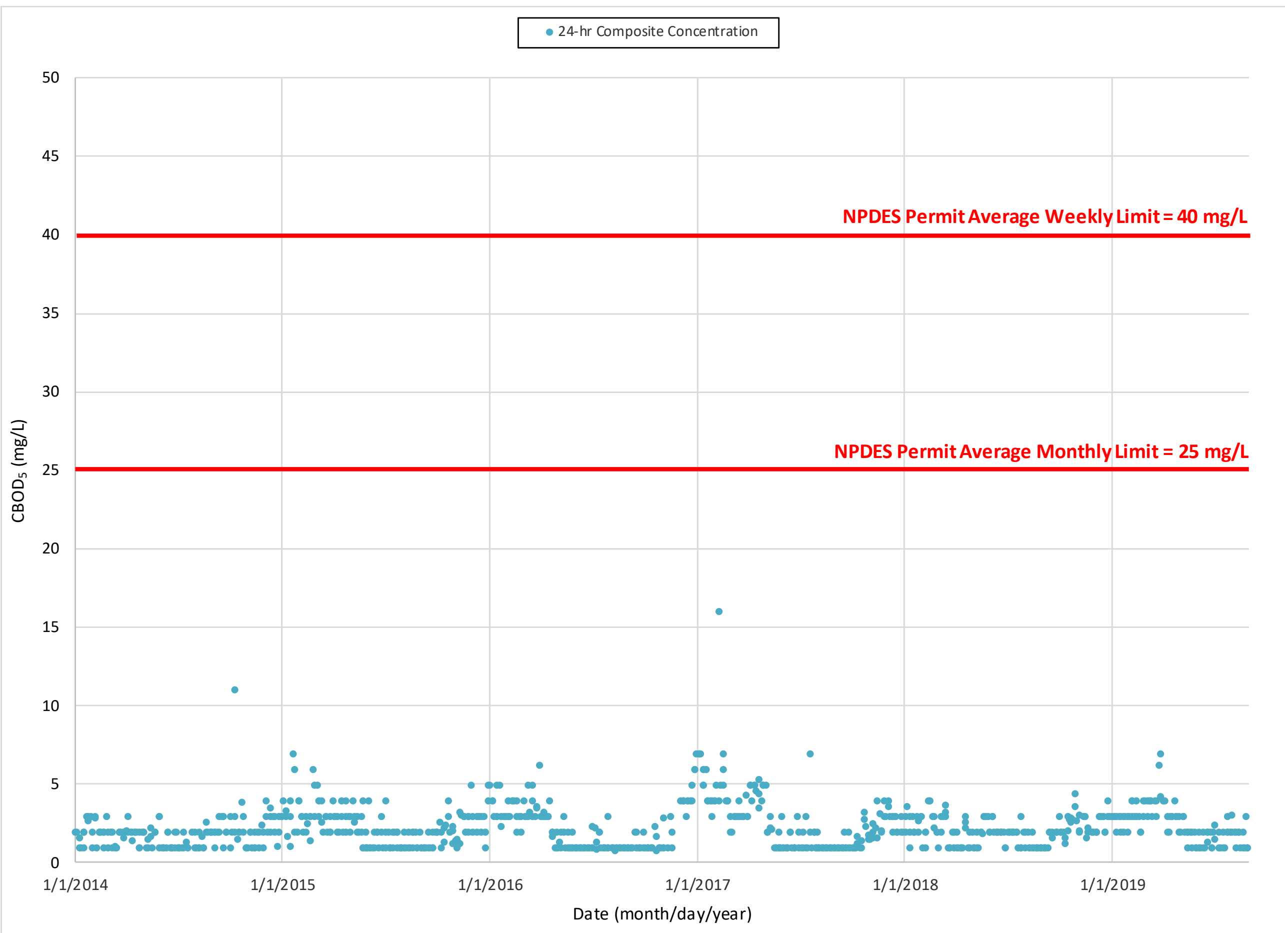


Chart 7-2

Historical WRF Effluent $CBOD_5$ Mass (Non-TMDL Limits)

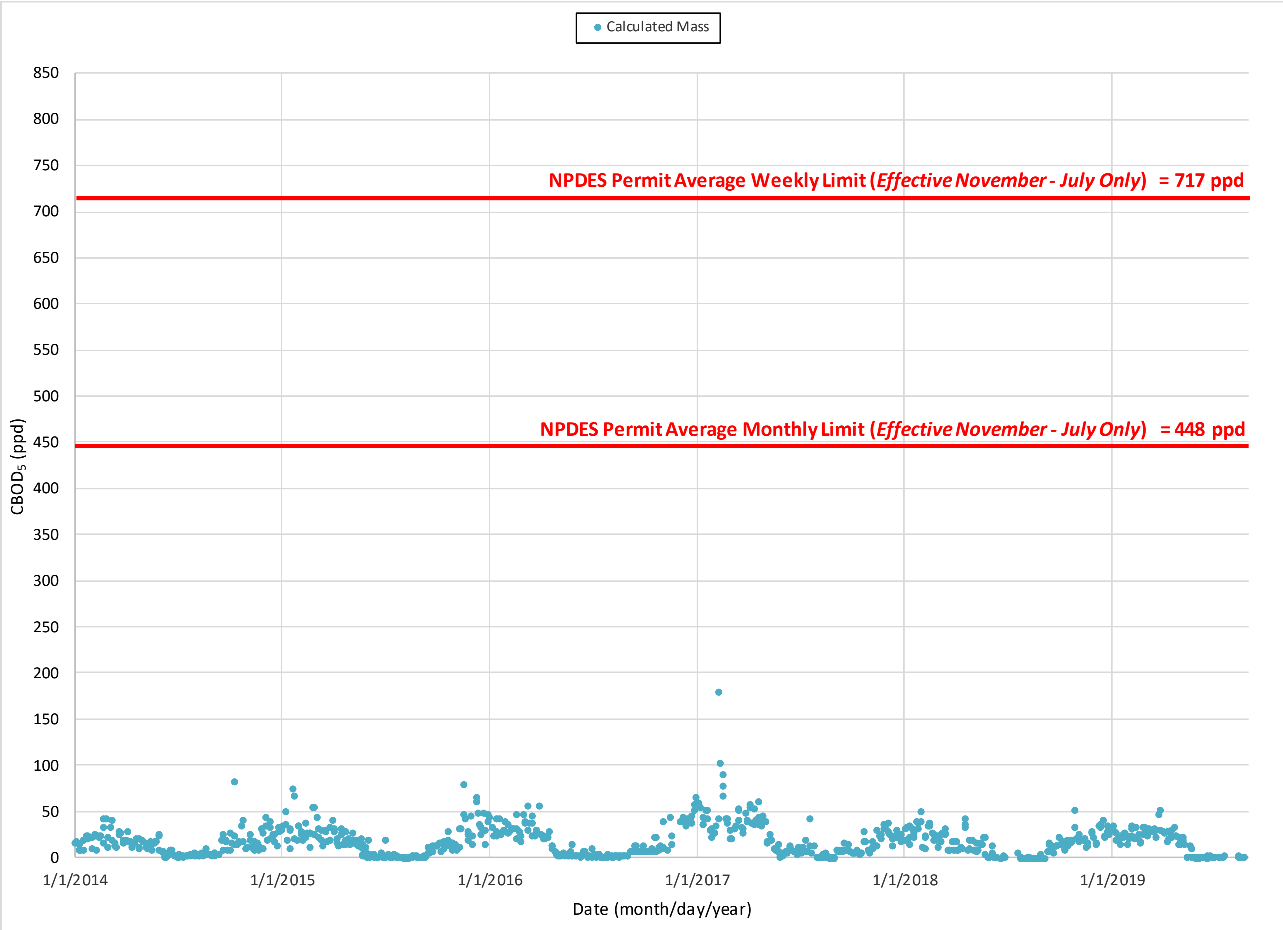


Table 7-3

Historical WRF $CBOD_5$ Percent Removal Annual Minimums

	2014[1]	2015	2016	2017	2018	2019[2]	Units
Minimum Occurrence	84.00 (97.02)	98.36	98.19	96.92	97.75	97.40	%
NPDES Permit Average Monthly Limit (Minimum)			85				%

1 = For comparison, the second value shown is the next lowest occurrence in 2014.

2 = The 2019 data reviewed was through August.

As shown in the charts, the concentration and non-TMDL mass permit effluent limits for $CBOD_5$ have been met throughout the time period. Effluent $CBOD_5$ concentration and mass have been well below the corresponding average monthly limits and consistent from year to year.

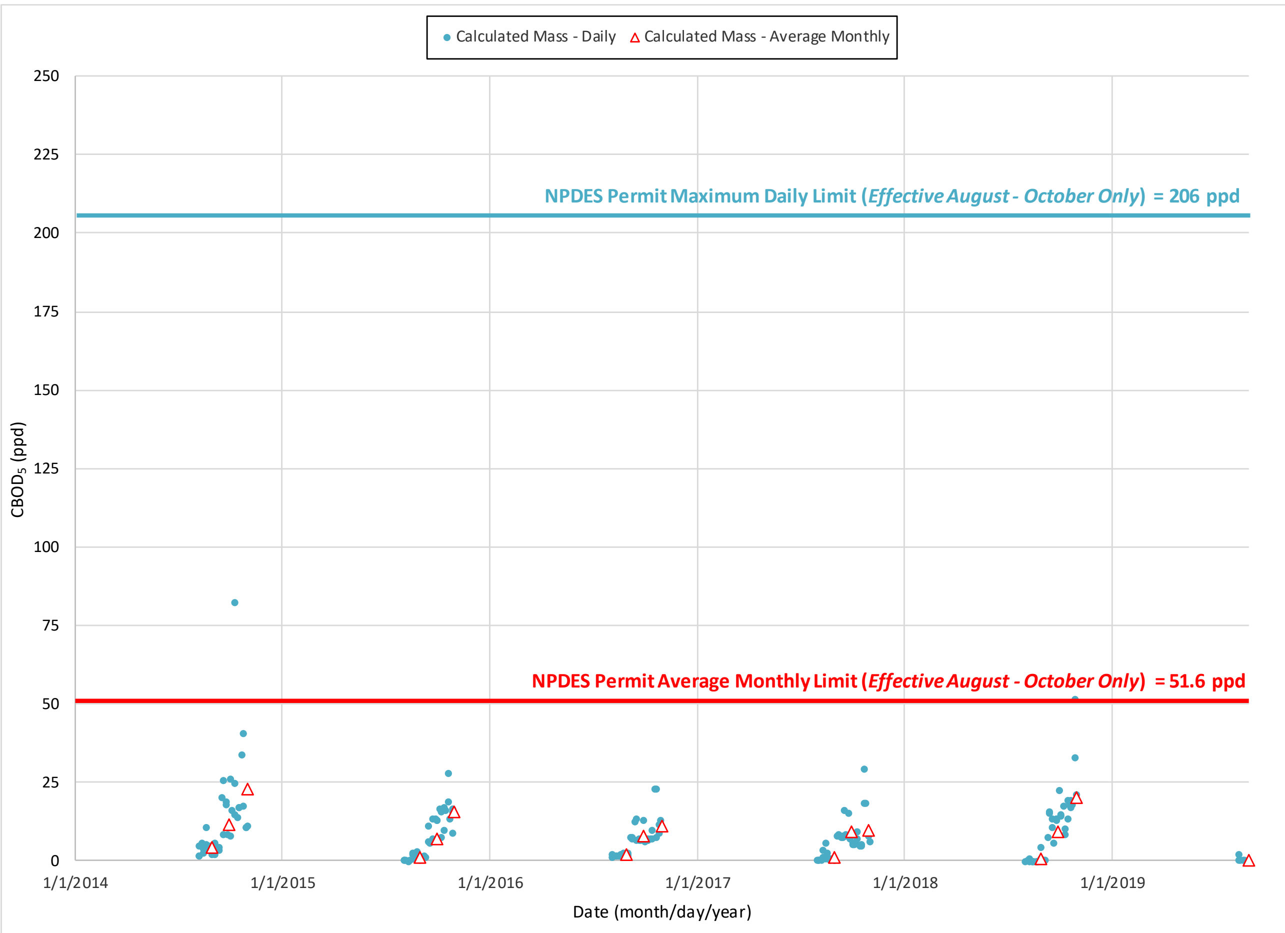
As shown in the table, $CBOD_5$ percent removal has been well above the average monthly permit effluent limit (minimum) throughout the time period, except in 2014. In 2014, the lowest percent removal calculated was 84 percent (on November 4th), which is below the limit of 85 percent. The lowest percent removal calculated during the rest of 2014 was 97 percent.

Total Maximum Daily Load

The $CBOD_5$ TMDL permit effluent limits apply from August through October. **Chart 7-3** shows historical effluent levels of $CBOD_5$ calculated mass, both daily values and monthly averages, during those months. Monthly averages are shown on the last day of the month.

Chart 7-3

Historical WRF Effluent $CBOD_5$ Mass during August through October (TMDL Period)



As shown in the chart, the TMDL permit effluent limits for $CBOD_5$ have been met throughout the time period. Effluent $CBOD_5$ daily mass has been relatively consistent from year to year and below the TMDL average monthly limit of 51.6 pounds per day (ppd), except for two occurrences. The first occurred on October 8, 2014, when a mass of 83 ppd was calculated. The second occurred on October 28, 2018, when a mass of 52 ppd was calculated. Neither occurrence resulted in a violation because the corresponding average monthly mass was 23 ppd and 20 ppd, respectively.

TSS

Historical effluent levels of total suspended solids (TSS) are shown in the following charts. **Chart 7-4** shows 24-hour composite concentration measurements, and **Chart 7-5** shows calculated mass. In addition, **Table 7-4** shows the minimum calculated TSS percent removal value for each calendar year (minimum occurrence) during the time period.

Chart 7-4

Historical WRF Effluent TSS Concentration

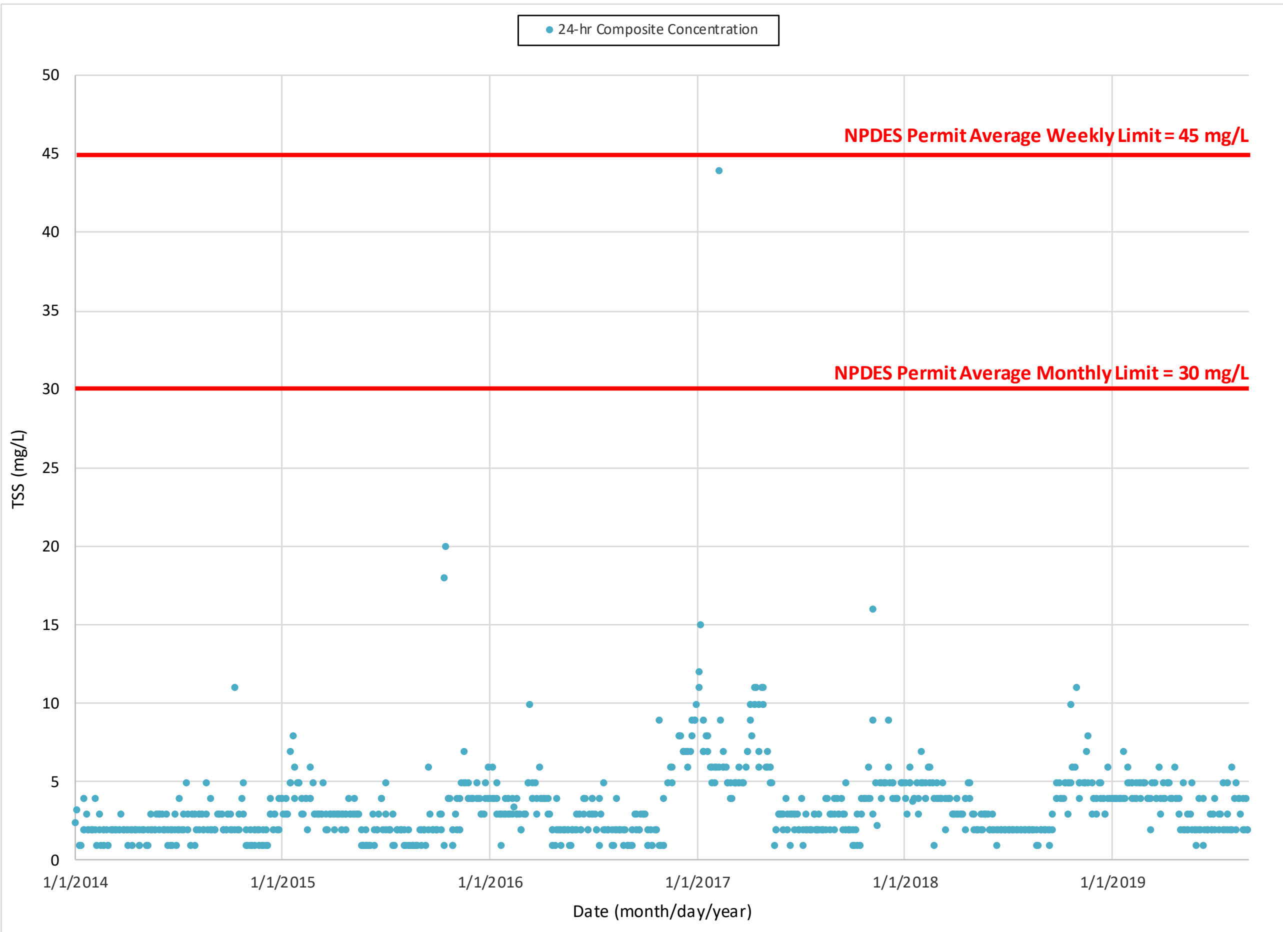


Chart 7-5

Historical WRF Effluent TSS Mass

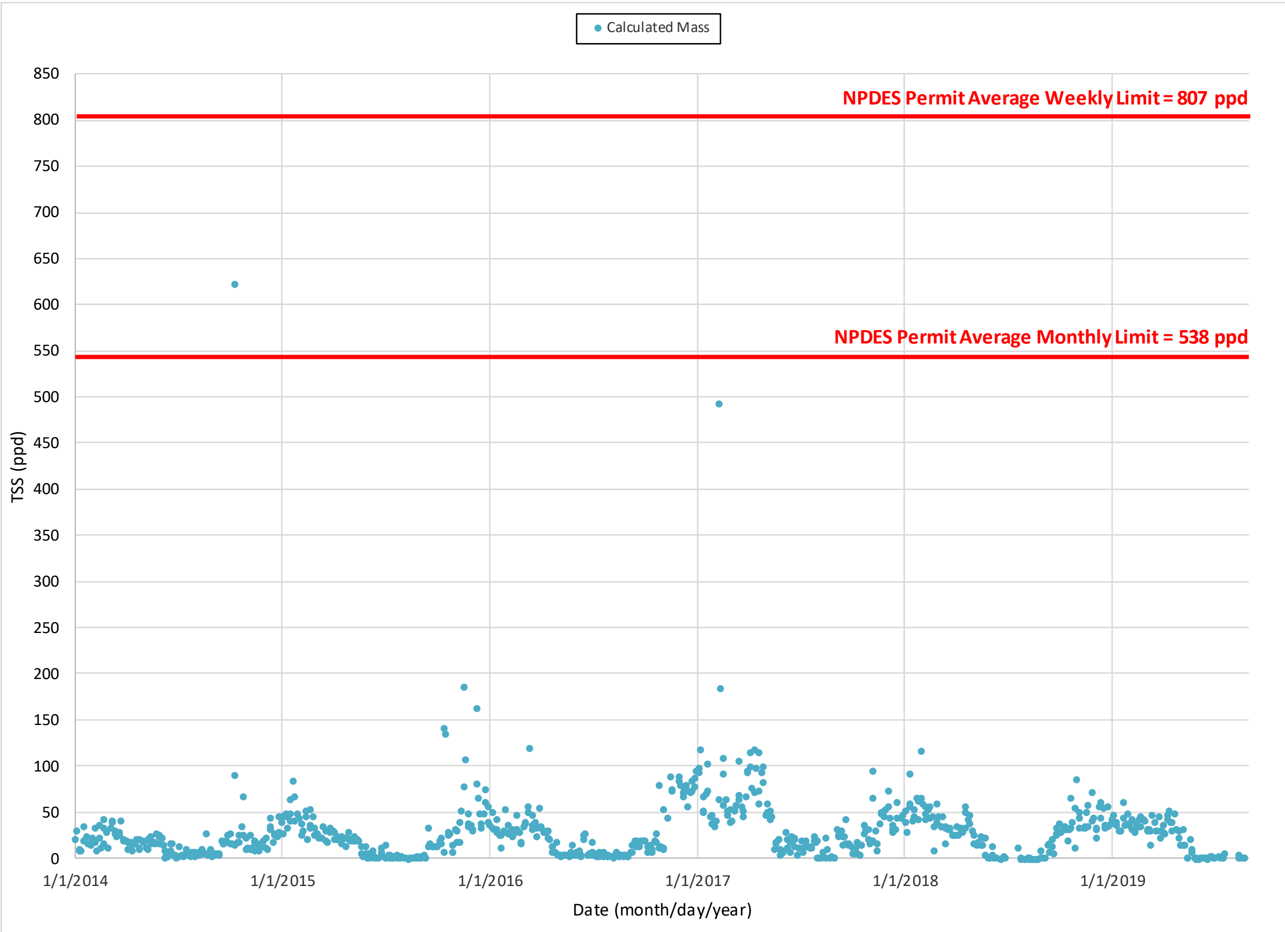


Table 7-4

Historical WRF TSS Percent Removal Annual Minimums

	2014	2015	2016	2017	2018	2019[1]	Units
Minimum Occurrence	98.33	98.52	95.91	95.04	93.86	94.63	%
NPDES Permit Average Monthly Limit (Minimum)				85			%

1 = The 2019 data reviewed was through August.

As shown in the charts, the concentration and mass permit effluent limits for TSS have been met throughout the time period. Effluent TSS concentration and mass have been consistent from year to year, except for winter 2016 through spring 2017 when levels for both were roughly double what they typically are. Effluent TSS concentration has been well below the average monthly limit of 30 milligrams per liter (mg/L), except for two occurrences. The first, which is not shown in **Chart 7-4**, occurred on October 8, 2014, when a concentration of 83 mg/L was measured. The second occurred on February 8, 2017, when a concentration of 44 mg/L was measured. Neither occurrence resulted in a violation because the corresponding average monthly concentration in both cases was approximately 9 mg/L. Effluent TSS mass has been well below the average monthly limit of 538 ppd, except for one occurrence. Corresponding with the elevated October 8, 2014 TSS concentration measured, the resulting TSS mass calculated was 623 ppd. This occurrence was not a violation because the corresponding average monthly mass was 71 ppd.

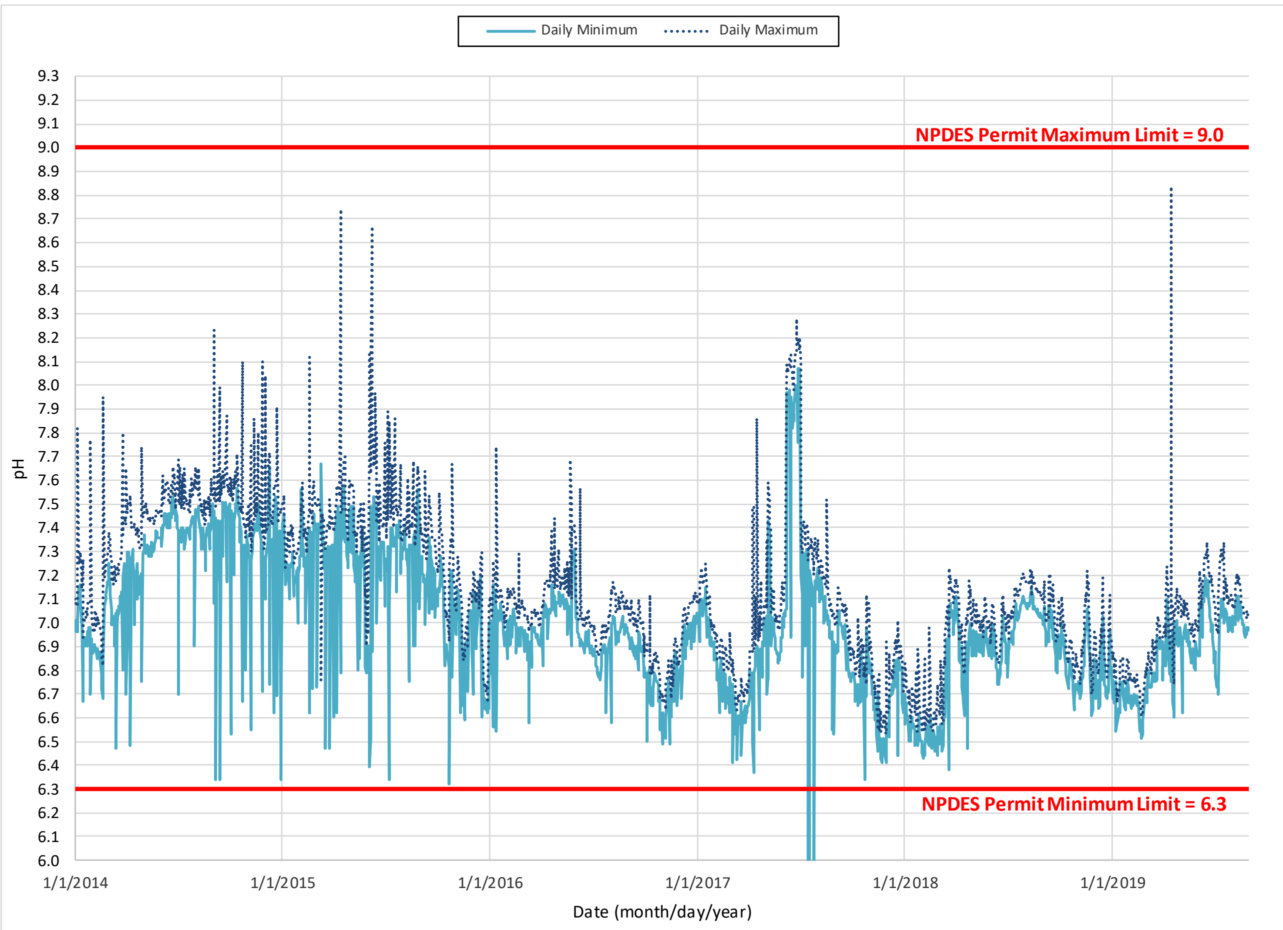
As shown in the table, the permit effluent limit (minimum) for TSS percent removal has been met throughout the time period, and TSS percent removal has been well above the limit.

pH

Historical effluent daily minimum and maximum pH measurements are shown in **Chart 7-6**.

Chart 7-6

Historical WRF Effluent Daily Minimum and Maximum pH



As shown in the chart, daily minimum and maximum pH have been within the permit effluent limits throughout the time period, except for three occurrences in July 2017. Minimum pH was measured at 5.23 (on July 17th), 5.23 (on July 18th), and 5.80 (on July 27th), which are all below the minimum limit of 6.3 and resulted in permit violations. The cause of the very low pH measurements was identified by the City as an instrumentation issue that occurred due to construction activities for the Phase 1 improvements in 2017. The issue was corrected.

Fecal Coliform Bacteria

Table 7-5 shows the maximum measured fecal coliform bacteria count for each calendar year (maximum occurrence) during the time period reviewed.

Table 7-5

Historical WRF Effluent Fecal Coliform Bacteria Annual Maximums

	2014	2015[1]	2016	2017[2]	2018	2019[3]	Units
Maximum Occurrence	16	72 (23)	7	62 (46)	22	4	#/100 mL
NPDES Permit Monthly Geometric Mean Limit				200			#/100 mL
NPDES Permit Weekly Geometric Mean Limit				400			#/100 mL

1 = For comparison, the second value shown is the next highest occurrence in 2015.

2 = For comparison, the second value shown is the next highest occurrence in 2017.

3 = The 2019 data reviewed was through August.

As shown in the table, the permit effluent limits for fecal coliform bacteria have been met throughout the time period. Effluent fecal coliform bacteria counts have been well below the monthly geometric mean limit.

Refer to **Chapter 2** for the future bacterial indicator change to *E. coli*, which will not take effect for several years.

Ammonia Total Maximum Daily Load

The total ammonia TMDL permit effluent limits apply from August through October. **Table 7-6** shows the maximum calculated total ammonia mass value during August through October for each calendar year (maximum occurrence) during the time period reviewed.

Table 7-6

Historical WRF Effluent Total Ammonia Mass Annual Maximums during August through October

	2014	2015	2016	2017	2018	2019[1]	Units
Maximum Occurrence	1.62	0.46	0.44	0.54	0.45	0.07	ppd
NPDES Permit Average Monthly Limit				21.6			ppd
NPDES Permit Maximum Daily Limit				68.7			ppd

1 = The 2019 data reviewed was through August.

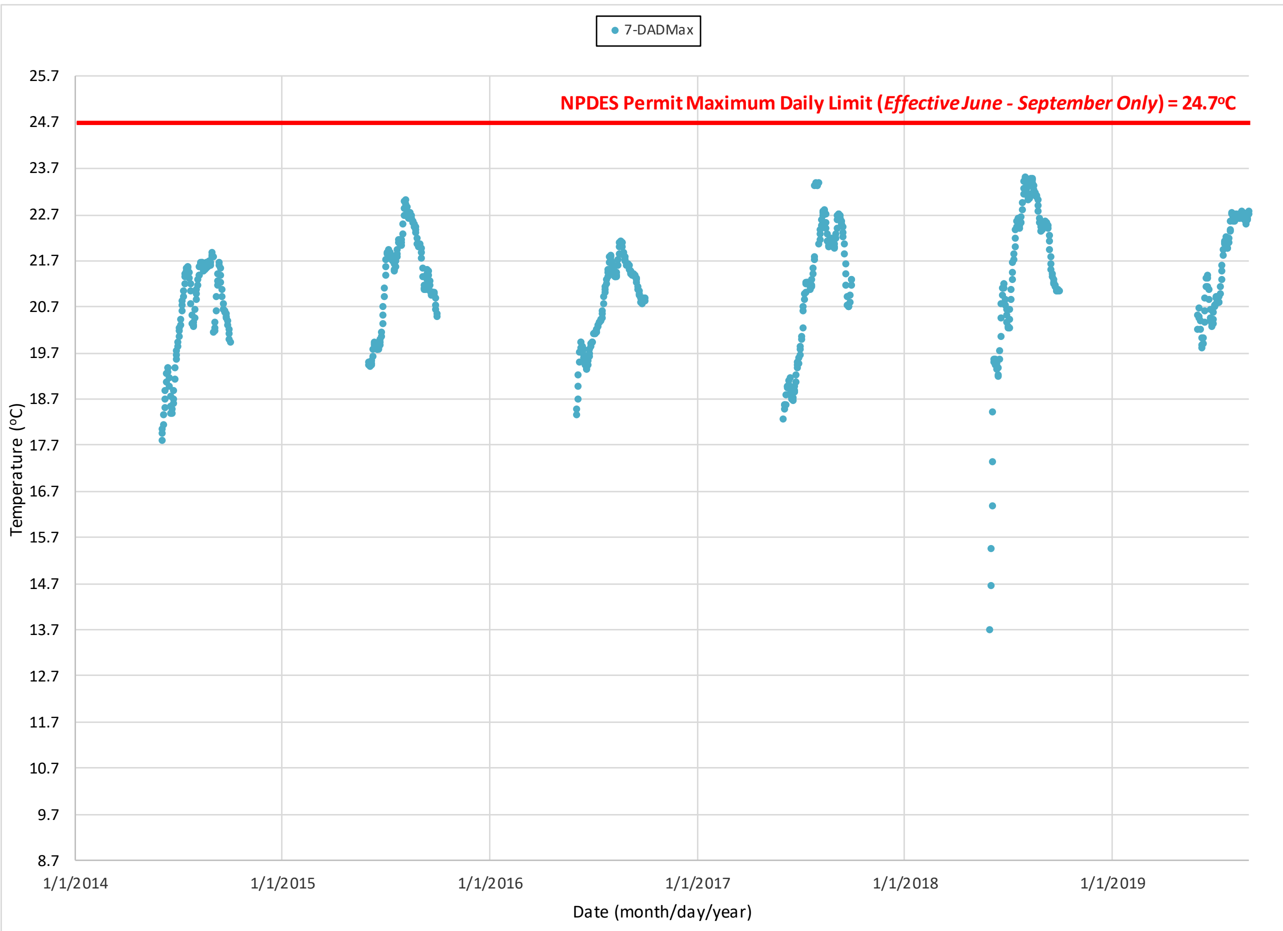
As shown in the table, the TMDL permit effluent limits for total ammonia have been met throughout the time period. Effluent total ammonia mass has been well below the TMDL average monthly limit.

Temperature Total Maximum Daily Load

The temperature TMDL permit effluent limit applies from June through September and is expressed as the 7-day average of the daily maximum temperature (7-DADMax). **Chart 7-7** shows historical effluent values of calculated 7-DADMax temperature during those months.

Chart 7-7

Historical WRF Effluent 7-DADMax Temperature during June through September



As shown in the chart, the TMDL permit effluent limit for temperature has been met throughout the time period. Typically, effluent temperatures peak during August, which often is when ambient temperatures are warmest. Over the time period, the peak annual 7-DADMax increased from approximately 21.7 degrees Celsius in 2014 to approximately 23.7 degrees Celsius in 2018. However, through August the peak in 2019 is approximately 22.7 degrees Celsius. The City should continue to closely monitor the temperature peaks.

Summary of Evaluation

Based on the historical effluent water quality data review presented, the overall WRF process has been performing well when treating to meet historical NPDES permit effluent limits for discharge to the Snoqualmie River (Outfall No. 001). Proposed changes to the permit and projected flow and loading increases require further evaluation of potential future performance deficiencies. Evaluations of current and future WRF treatment capacities at current and projected flow and loading conditions through the 20-year planning period are presented throughout the remaining sections of this chapter.

FLOW AND LOADING PROJECTED IMPACTS

The design criteria for the existing WRF compared to the projected flow and loading increases presented in **Chapter 4** are summarized in **Table 7-7**. The current rated capacity of the WRF is represented by the listed existing WRF design criteria. Projected flow and loading for years 2030 and 2040 also are shown for evaluation (refer to **Chapter 4** for the estimation of projections). The parameters listed are WRF influent flow and loading. As discussed in the **Headworks** section of this chapter, actual WRF influent flow and loading is measured by the headworks Parshall flume and from samples from the headworks composite sampler, respectively.

Table 7-7

Existing WRF Flow and Loading Capacity Evaluation

Parameter	Existing WRF Design Criteria	Projected Flow and Loading 2030 (+10 years)[2]	Projected Flow and Loading 2040 (+20 years)[2]	Units
WRF Influent Flow and Loading				
Average Annual Flow (AAF)	1.64	1.56	1.74	MGD
Maximum Month Average Flow (MMF)	2.15[1]	**2.4**	**2.69**	MGD
Maximum Day Flow (MDF)	-	5.48	6.17	MGD
Peak Hour Flow (PHF)	7.30	5.95	6.70	MGD
Average Annual BOD_5	3,750	3,749	6,020	ppd
Maximum Month Average BOD_5	5,220[1]	**4,028**	**6,484**	ppd
Average Annual TSS	3,750	3,749	6,020	ppd
Maximum Month Average TSS	5,220[1]	4,028	6,484	ppd

1 = City NPDES permit flow and loading design criteria value.

2 = Bold values represent projected flow or loading is greater than the design criteria.

The TSS projections and design criteria are conservatively assumed to be equal to BOD.

The NPDES permit stipulates that the City shall submit a plan and schedule for maintaining adequate WRF capacity when the flow or loading is projected to meet or exceed the rated capacity within the 5-year planning period. Based on the projections estimated in **Chapter 4**, both maximum month average flow and maximum month average 5-day BOD (BOD_5) are projected to be greater than the existing WRF design criteria within the 5 year planning period. Further evaluation of existing liquid stream and solids handling individual process capacities are presented in the following sections and specific deficiencies are identified for development of recommended improvements in this GSP.

LIQUID STREAM EXISTING FACILITIES EVALUATION

Overview

Nearly all wastewater from the City's collection system is conveyed to the WRF from the Kimball Creek Pump Station (KCPS). Wastewater is pumped from KCPS through two parallel force mains that discharge to the inlet of the WRF headworks. Wastewater collected in the City north of the Snoqualmie River flows via gravity to the In-Plant Pump Station (IPPS) located on the WRF site. Wastewater from the IPPS, which includes WRF-generated wastewater and process drains, is pumped through a single force main that also discharges to the inlet of the headworks. Wastewater then flows by gravity through the headworks, to the oxidation ditches, the secondary clarifiers, UV disinfection, and then to the Snoqualmie River through an outfall structure. In the reclaimed water season, gravity filtration is included, and the water is pumped to the reclaimed water outfall. Refer to **Chapter 2** for details on KCPS. Refer to the **In-Plant Pump Station** section in this chapter for details on the IPPS.

This section describes and evaluates the WRF liquid stream processes and structures, which also are shown schematically in **Figure 7-2**. As part of this evaluation, RH2 has identified deficiencies based on life expectancy and/or functionality determined through this evaluation or industry standards. The scope of this GSP did not entail an in-depth- evaluation of WRF structures, pipes, equipment, or other systems and did not include testing or other methods of inspecting interior conditions. General physical and functional conditions evaluation was limited to visual observation and discussion with City staff. In general, the WRF is very well maintained and the visible elements appear to be generally in good condition except where noted otherwise.

Liquid Stream Hydraulic Capacity Evaluation

Hydraulic profiles for the WRF liquid stream processes and structures are shown in **Figures 7-3** and **7-4**. Both figures show the processes and structures have hydraulic capacity for at least the WRF design peak hour flow of 7.3 million gallons per day (MGD). As shown in **Table 7-7** and **Chapter 4**, the projected 2040 peak hour flow is 6.63 MGD. Therefore, the WRF liquid stream processes and structures have hydraulic capacity for projected flows at least through the 20-year planning period. Where applicable, individual process components that are not rated for current and/or projected flows are identified in the process evaluations that follow.

Headworks

Description

The headworks generally provides screening, grit removal, flow measurement, and water quality sampling of the WRF influent. Influent flow from two 14-inch force mains from KCPS, one force main from the IPPS, and one future (currently plugged) force main enters the headworks at the inlet structure and is directed into one or two screening channels. The primary flow path is into a mechanical fine screen; the bypass channel contains a manual bar screen. Screened influent flows into a vortex-style grit chamber and then to a Parshall flume before leaving the headworks to go to the oxidation ditches. A composite sampler, with its collection tube located in the inlet structure, takes samples for influent water quality analyses.

The original concrete channels, gates, and Parshall flume installed in 1997 have remained unchanged. Equipment modifications to the headworks have been implemented since the original construction. The lower level of the headworks, which includes the grit classifier and screenings/grit dumpster, was enclosed with a steel building in 2019.

The primary influent channel includes a mechanically cleaned perforated plate band screen. This screen and associated screenings compactor were installed by City staff in approximately 2012 to replace the original equipment. Screenings are compacted and discharged into a dumpster in the lower level of the headworks. Parallel to the primary channel is a backup channel, which includes a weir followed by a 1½-inch manually cleaned, bar screen and a ⅜-inch manually cleaned bar screen.

Screened influent flows through a circular concrete grit chamber, which greats a vortex flow path to aid in grit settling. Grit system modifications were constructed in 2019. At the time, the grit chamber was isolated and completely drained. Based on visual observation, the interior concrete of the structure is in good condition. The original air lift system was replaced with a grit pumping system. The original grit paddle drive was in adequate condition based on visual observation and was kept in place. The grit pump is top-mounted above the original grit paddle drive. A screw-type dewatering classifier, along with a grit cyclone separator, was installed to replace the previous classifier within the lower level of the headworks. A pipe is routed from the pump to the cyclone separator to convey the grit slurry. Underflow from the cyclone separator is discharged to the classifier. Dewatered grit from the classifier is discharged into the same dumpster as the discharged screenings. The overflow from the cyclone separator and drain from the classifier are connected to drain piping to the IPPS.

Influent flow into the WRF is measured and recorded continuously utilizing the Parshall flume and associated ultrasonic level sensor downstream of the grit chamber. In 2017, a 9-inch Parshall flume, integrated into a manhole structure, was installed to separately measure the collection system gravity flow to the IPPS. An ultrasonic level sensor also was installed for continual measurement and recording. The manhole structure was installed at the 12-inch gravity pipe near the WRF entrance site access gate. Influent water quality (loading) samples are collected by the composite sampler. A new composite sampler was installed by City staff in 2017 to replace the previous sampler. Samples are analyzed at the on-site laboratory and manually recorded. In 2017, two additional composite samplers also were installed at the WRF as part of other improvements. One is installed adjacent to the 9-inch Parshall flume manhole to provide the City with the ability to separately sample the collection system gravity flow to the IPPS. The other is installed in the now enclosed lower part of the headworks to provide the City with the ability to separately sample the pumped flow from the IPPS to the headworks inlet. The stated flow and water quality measurement improvements were implemented to allow the City to separately account for the WRF influent flow and loading constituents: collection system wastewater from KCPS; collection system wastewater to the IPPS; and WRF-generated wastewater (including process drains) to the IPPS.

Odor control improvements were completed in 2019 that generally consisted of replacing all open channel grating with odor-tight covers, enclosing the lower part of the headworks, and conveying all foul air from the covered and enclosed spaces to above-grade packaged biofilters for air scrubbing.

Evaluation

The concrete structures, gates, and Parshall flume appear to be in good condition per visual observation and are not expected to require replacement or significant improvements during the planning period. Due to the recent equipment improvements discussed, the new equipment is expected to be suitable for use throughout the planning period. Minor repairs may occur as a part of normal operations and maintenance and are intended to be handled using the operations and maintenance budget.

The original John Meunier MECTAN® grit paddle agitator (within the vortex chamber) and associated drive is expected to exceed its useful life during the planning period. It is recommended that a new grit paddle drive be by Smith and Loveless to match the manufacturer of the newly installed PISTA® control system, top-mounted grit pump, and vacuum priming system. In addition to replacing the paddle drive, consideration should be given to making incremental changes to the grit chamber, such as adding baffling, to improve grit removal.

The headworks design summary is included in **Table 7-8**.

Table 7-8

Existing Headworks Design Summary

Existing WRF and Primary Screening Design	
Influent Flow (MGD)	
Peak Hour Flow	7.30
Headworks Primary Screen Peak Flow Rating (MGD)	7.30
Headworks Equipment	
Measurement of WRF Influent Flow (at Headworks outlet)	
Type	Parshall Flume
Number	1
Throat Width (in)	18
Flow Measurement Range (MGD)	0.07 to 15+
Primary Channel Screening	
Type	Perforated Plate
	Mechanically Cleaned
Number	1
Openings Diameter (in (mm))	0.25 (6)
Backup Channel Screening	
Type	Bar
	Manually Cleaned
Number	2
Openings between Bars (in (mm)) of Upstream Screen	1.5 (38)
Openings between Bars (in (mm)) of Downstream Screen	0.375 (10)
Grit Removal	
Type	Vortex
	Paddle Agitator
Number	1
Diameter (ft)	12
Peak Design Flow (MGD)	10
Grit Pumping	
Type	Recessed Impeller
	Top-mounted
Number	1
Capacity (gpm @ ft TDH)	250 @ 25
Motor Nameplate Horsepower	7.5

The headworks structure and equipment were designed for a peak hour flow of 10 MGD, which is not expected to be exceeded during the planning period. The influent primary screen is rated for 7.3 MGD. City staff believe that the mechanical screen is periodically overwhelmed when two pumps operate at KCPS, exceeding the 7.3 MGD capacity. However, this issue is expected to be resolved with the addition of the base flow pump and the re-rating of the KCPS as described in **Chapter 11**.

Activated Sludge System

Description

Oxidation Ditches

The activated sludge system consists of two oxidation ditches and two secondary clarifiers, each of identical size. From the outlet of the headworks, wastewater flows by gravity through a buried pipeline directly to a flow splitter structure located in front of Oxidation Ditch No. 2. The flow splitter is used to mix wastewater from the headworks effluent with return activated sludge (RAS) from the secondary clarifiers, and then to direct flow to either one or both ditches. Manually operated (open/close) gates are used to either allow flow to a ditch or to isolate a ditch. From the flow splitter, flow is directed to the first anaerobic zone (An 1) of the online ditch(es). Flow then passes through, in order, the second anaerobic zone (An 2), the anoxic zone (Ax 1), and the carrousel (aerated) zone, all within the ditch. Mixed liquor flows out of the ditch through an outlet box and is then conveyed by gravity through a buried pipeline to the mixed liquor control structure ahead of the secondary clarifiers. At the far end of the carousel from the anoxic zone inlet, there is an internal recycle back to the anoxic zone through a manually adjustable vane gate and concrete channel.

The oxidation ditches provide biological treatment via an activated sludge process that includes enhanced biological phosphorus removal (EBPR) and nitrogen removal. Each oxidation ditch consists of anaerobic and anoxic tanks, and an aerobic system in a carousel configuration. Both of the concrete ditch structures are the originals (the first being constructed in 1997, the second in 2003), as are all flow splitter and mixed liquor weir gates. All these items appear to be in good condition and are inspected periodically during annual blowdown of each ditch. Some equipment modifications have been implemented over the years, including replacement of all anaerobic zone mixers. Submersible mixers were installed in the anaerobic zones of both ditches in 2019 to replace the previous mixers. The vertical shaft submerged turbine mixer in the Oxidation Ditch No. 2 anoxic zone is the original. The anoxic zone mixer in Oxidation Ditch No. 1 was replaced in 2017 with an Invent vertical shaft hyperbolic mixer. Aeration is provided in the aerated zone of each ditch by the original vertical shaft surface aerators. The aeration process is controlled by three dissolved oxygen (DO) sensors located in the carousel portion of the ditches. Status of the anoxic zone is measured by two different oxidation reduction potential (ORP) sensors. This system was updated, and most of the sensors were added in 2017.

Mixed Liquor Control Structure

The mixed liquor control structure is used to receive mixed liquor flow from the oxidation ditches and then direct the flow to one or both secondary clarifiers. Additionally, optional chemical addition is provided. The original concrete structure and equipment are still in place and appear to be in good condition per visual observation.

Two buried pipelines, one from each ditch, connect to the mixed liquor control structure. Each clarifier has a dedicated pipeline from the structure, and the corresponding weir gate is manually operated to either allow flow to the clarifier or isolate the clarifier.

Alum and polymer injection piping is installed at the mixed liquor control structure as discussed in the **Chemical Additions** section.

Secondary Clarifiers

The two 70-foot-diameter circular secondary clarifier structures are still original and serve to provide solids separation of the mixed liquor from the oxidation ditches via sedimentation. Secondary effluent overflows the top weir and settled solids are collected at the bottom of the tank via the clarifier mechanism for removal as waste activated sludge (WAS) or returned to the ditch(es) as RAS. The original concrete tankage appears to be in good condition and is inspected periodically during annual blowdown of each clarifier. Secondary Clarifier No. 2 has all original equipment, including the feedwell and inlet, and the clarifier drive mechanism. Secondary Clarifier No. 1 has the original clarifier drive mechanism, but in 2019, a new feedwell with energy dissipating inlets was installed to replace the original feedwell. Additionally, a new scum removal system consisting of a full radius skimmer and scum trough was installed to remove scum that is trapped on the surface of the clarifier by the scum baffle. The new skimmers are attached to the feedwell and include provision for a future effluent launder brushing system for algae removal. The full radius scum trough is supported from the clarifier sidewall interior and includes an automatic flushing system to flush the scum trough and scum pipe. Secondary Clarifier No. 2 has the original full radius scum skimmer attached to one of the rake arms, which directs scum to a small scum box. At each clarifier, the scum is conveyed through piping that extends from the box/trough through the clarifier wall to the dedicated scum pump station on the other side.

RAS System

Each secondary clarifier structure has a RAS pump station structure integrated into and adjacent to part of the sidewall exterior. The pump station structure consists of a rectangular-shaped wet well with an access hatch.

The RAS inlet buried pipeline is routed from the center of the clarifier, underneath the clarifier structure, and up through the floor of the pump station. Two submersible pumps are installed within the wet well. Pumped flow from the RAS pump station is discharged into the oxidation ditches flow splitter. Pumped RAS is conveyed through individual buried force mains from each pump station that combine into a single buried force main that connects to the flow splitter. The combined RAS force main includes provision for connection to future third and fourth secondary clarifiers.

Two of the four RAS pumps are original and were installed in 1997. The other two have been replaced by City staff. All four variable frequency drives (VFDs) also have been replaced.

Evaluation

Oxidation Ditches Structures and Equipment

The concrete ditch structures should have an indefinite life and are not expected to significantly deteriorate or necessitate substantial improvements in the planning period. The gates appear to be in good condition per visual observation and likely will be suitable for the planning period, although if some replacements are required these are intended to be handled using the operations and maintenance budget. The anaerobic zone mixers installed in 2019, as well as the Oxidation Ditch No. 1 anoxic zone mixer replaced in 2017, are likely to be suitable for the planning period. The aerators, at approximately 17 and 23 years of age depending on the install year, will necessitate replacement during the planning period, as will the anoxic mixer in Oxidation Ditch No. 2. As discussed further in this chapter, ditch improvements to increase capacity and rectify operational deficiencies are expected early in the planning period, and the required equipment replacements will be handled as part of that larger project.

Secondary Clarifiers Structures and Equipment

The original secondary clarifier drive units at each clarifier were installed in 1997. The clarifier drive units are nearing the end of their expected service life and are recommended to be replaced with either new or refurbished drives.

In addition, City operations staff spend significant time cleaning the clarifier effluent launders due to algae growth. Adding effluent launder covers to each clarifier may reduce algae growth, and the City plans to include these as part of a future clarifier rehabilitation project.

In 2019, Secondary Clarifier No. 1 was retrofitted with a reduced feedwell with energy dissipating inlets and a full radius scum trough. The upgrades have functioned well; therefore, it is recommended they be implemented for Secondary Clarifier No. 2. Prior to implementing the upgrades, it is recommended that stress testing be performed on Secondary Clarifier No. 1. The results can be used to develop potential minor modifications to the Secondary Clarifier No. 2 upgrades that will further enhance performance.

RAS System

The two original RAS pumps are approximately 23 years old. A typical useful life for similar pumps is 20 years. However, each clarifier has full redundancy in its RAS pumps, meaning that a single RAS pump is normally operating. Further, only one clarifier (add one RAS pump) operates for a significant portion of the year. Lastly, these pumps operate continuously on a VFD and are not subject to the wear and tear caused by frequent across-the-line starts and stops typical of most submersible sewage pumps. As such, the useful life of the RAS pumps may be significantly longer than 20 years provided that normal maintenance is completed. Since no more than two RAS pumps are ever required to operate at a time (one for each clarifier), two redundant pumps should remain available. Should a RAS pump require replacement, it is intended to occur as part of the operations and maintenance budget.

The RAS pipe, valves, fittings, and flow meters appear to be in good condition per visual observation. Replacement of any of these components are intended to be handled using the operations and maintenance budget.

The RAS system design summary is included in **Table 7-9**.

Table 7-9

Existing RAS System Design Summary

RAS Pump Stations	
Number of Pump Stations, per Clarifier	1
Number of Pumps, per Pump Station	1 Duty, 1 Standby
Pump Type	Submersible
Drive Type	Variable Frequency
Capacity, each Pump (gpm @ ft TDH)	1,740 @ 26
Motor Nameplate Horsepower	25

The future activated sludge system improvements described in **Chapter 9** may necessitate an average RAS rate of 75 percent of influent. Assuming an approximate diurnal factor of 2:1 at the projected 2040 maximum month average flow rate of 2.56 MGD, a RAS rate of 3.84 MGD would be required to provide 75 percent of the peak diurnal influent flow rate. Each RAS pump has a capacity of approximately 2.5 MGD. However, at similar future conditions, multiple options exist for operating the existing RAS pumps:

- If in single clarifier operation, operate both RAS pumps. The offline clarifier RAS pumps will provide redundancy.
- Operate two clarifiers with a single RAS pump online for each, with the offline pump in each clarifier providing redundancy.
- Reduce the total RAS rate during the peak portion of the day. This likely will be allowable once the activated sludge system improvements described in **Chapter 9** are completed, as RAS settling is expected to be significantly improved. A higher concentration of RAS can allow for a reduced flow rate.

As such, an increase in RAS pumping capacity or reconfiguration of these pumps is not expected to be necessary during the planning period.

Activated Sludge System Deficiencies

The activated sludge system exhibits process-related deficiencies as described further in this section.

Excessive Filamentous Bacterial Growth

In 2018, RH2, with input from Dr. H. David Stensel, analyzed the oxidation ditch operations and options for potential upgrades. The analyses included photomicrographs of mixed liquor from the WRF, which showed good populations of phosphorus accumulating organisms. The photomicrographs also showed excessive population of filamentous bacteria, which adversely affects the settling properties of the mixed liquor.

In an activated sludge system, excessive filamentous bacteria growth reduces the settleability of the mixed liquor, which limits the capacity of the secondary clarifiers. Table T3-2 in the Washington State Department of Ecology's (Ecology) *Criteria for Sewage Works Design* (commonly known as the Orange Book) lists the typical sludge volume indices (SVIs) for various secondary processes.

Mixed liquor with good settling characteristics has a lower SVI. The table lists an SVI of 150 milliliters per gram (mL/g) for an oxidation ditch. However, the WRF mixed liquor typically has an SVI of 200 mL/g or higher, which indicates very poor settling. Wastewater treatment plants that use an EBPR process flow scheme with an anaerobic zone followed by anoxic and aerobic zones typically have good settling mixed liquor with an SVI of less than 120 mL/g. Well performing EBPR processes can achieve SVIs in the 50 to 75 mL/g range.

Filamentous bacteria generally are favored by low DO and low food to mass (F/M) ratios. The filaments identified at the WRF are Type 1851, which also generally is associated with aerobic conditions where the F/M is low. It is likely that one or more of the following conditions are occurring within the oxidation ditches:

- Oxygen is present in the anoxic zone; and/or
- There is reduced hydraulic retention time in the anoxic zone, allowing readily degradable BOD to pass through the anoxic zone into the aerated zone, creating a low F/M condition.

Based on 2018 analyses, it is likely that two primary factors related to the oxidation ditches are creating the conditions that favor excessive filamentous bacteria growth:

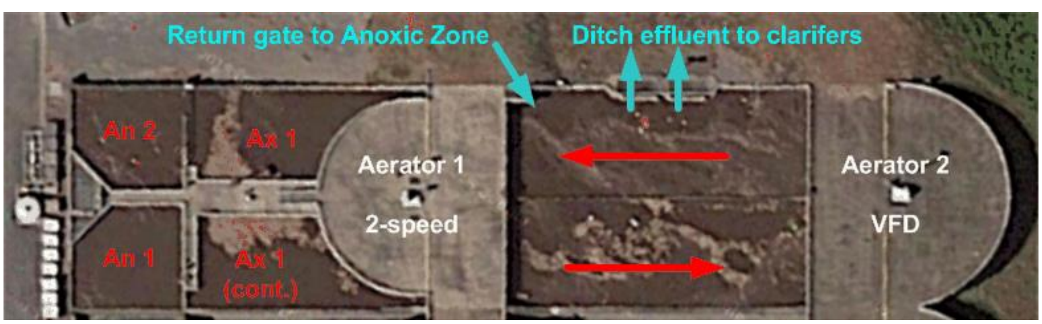
- Limitations of the internal recycle system; and
- Limitations of the aeration system.

These factors can have adverse effects on the nitrification and denitrification (NdN) and EBPR processes.

An aerial image of Oxidation Ditch No. 2 is shown in **Figure 7-5** to illustrate the configuration of the ditches. Oxidation Ditch No. 1 (not shown) is a mirror image of No. 2.

Figure 7-5

Configuration of Oxidation Ditch No. 2



Internal recycle flow between the aerated zone and the anoxic zone occurs through a channel controlled by a manually adjustable vane gate. The internal recycle rate is affected by the velocity in the oxidation ditch created by the surface aerators, which varies as the aerators are cycled on and off. As a result, the internal recycle rates vary from being much higher (12 to 15 times influent flow) than the optimal internal recycle rate of approximately 3 times influent flow when the aerators are on, to very low when the aerators are off. During periods of high internal recycle, the detention time is reduced in the anoxic zone and may allow readily degradable BOD to pass through the anoxic zone to the aerated zone where it is rapidly diluted, creating very low F/M conditions.

The internal recycle system should be upgraded as part of any future oxidation ditch improvements to provide a system that reliably recycles flow at a rate of approximately 3 times the influent flow rate.

The surface aerators in each oxidation ditch have significant limitations as outlined in the 2015 Engineering Report. Each ditch has a two-speed aerator on the inlet end of the aerated zone, with a variable-speed aerator (operated by a VFD) on the opposite end of the same zone. The aerators cannot effectively match oxygen transfer rates to the diurnal changes in oxygen demand. When oxygen transfer exceeds oxygen demand, oxygen in the internal recycle stream can enter the anoxic zone, where it can interfere with denitrification and cause growth of filamentous bacteria and have adverse effects on the NdN and EBPR processes. To decrease oxygen transfer during periods of low demand, the variable-speed aerators are turned down to the minimum speed. However, the turndown is limited by the ability of the aerator to provide mixing at lower speeds, as well as by the splash lubrication system on the aerators. The two-speed aerators are cycled on and off during periods of low demand. These measures lower the ditch velocity, which results in a sub-optimum internal recycle rate through the gate.

To address the aeration system limitations, and because of the surface aerators age, the 2015 Engineering Report recommended replacing the two-speed aerators with a newer model that can provide better turndown. The new aerators have a second impeller that is submerged below the surface aeration impeller. The lower impeller provides mixing when the aerator runs at slower speeds. The new aerators also would have a pumped lubrication system that would provide lubrication regardless of aerator speed. The new inlet-end aerators with speed control (using VFDs), rather than cycling on and off, would better facilitate matching the oxygen transfer to the demand. It also is recommended that the current variable-speed aerators be replaced as part of any future improvements for the oxidation ditches.

Activated Sludge System Biological Treatment Capacity

Currently, the activated sludge system achieves City NPDES permit limits for CBOD and ammonia. The system also achieves City NPDES permit limits for total nitrogen, which apply when the City produces reclaimed water. As such, the oxidation ditches provide BOD reduction, as well as NdN. There are not currently City NPDES permit limits for phosphorus, but the system achieves EBPR as evidenced by relatively low effluent phosphorus concentrations.

The design summary for the oxidation ditches is included in **Table 7-10**.

Table 7-10

Existing Oxidation Ditches Design Summary

Existing WRF and Activated Sludge Biological Treatment Design	
Influent Flow (MGD)	
Maximum Month Average Flow	2.15
Influent BOD_5 (ppd)	
Maximum Month Average	5,220
Oxidation Ditches	
Operating Ditches Quantity at Design Condition	2
Total Ditches Quantity	2
Structure Total Internal Length, each Ditch (ft)	256
Structure Total Internal Width, each Ditch (ft)	59
Side Water Depth (ft)	14
Volume, each Ditch (MG)	
Anaerobic Zone	0.10
Anoxic Zone	0.26
Carrousel (Aerated) Zone	1.04
Total - All Zones	1.40
Volume, Total (MG)	2.80
MLSS (mg/L)	4,000
MLVSS (%)	70
Sludge Yield (lbs TS/lbs BOD applied)	0.75
Sludge Age (days)	29
Aeration in Carrousel Zone	
Type	Surface Aerator
	Vertical Shaft
Number, per Ditch	2
Inlet-End Aerator Drive Type, each Ditch	Two-Speed
Opposite-End Aerator Drive Type, each Ditch	Variable Frequency
Motor Nameplate Horsepower, each Aerator	100

The original WRF design identifies the influent maximum month average design capacity of the two oxidation ditches operating in parallel as 2.15 MGD and 5,220 ppd BOD_5. The maximum month average flows are projected in a few years to reach 2.15 MGD and the maximum month average BOD_5 loadings are projected in a few years to exceed 5,220 ppd, which would exceed the rated capacity of two ditches operating in parallel. Outside of the maximum month conditions, the projected growth of average annual flows and BOD_5 loadings in the planning period are expected to require continuous operation of two ditches. Operating two ditches does not allow for maintenance of equipment without reducing capacity. As such, the capacity and redundancy related to the oxidation ditches will need to be increased to meet the projected flow and loading in the near term.

Activated Sludge System Effects to Secondary Clarifiers Capacity

The capacity of an activated sludge system is largely dependent upon the settleability of the mixed liquor. Increasing the mixed liquor concentration allows for increased reduction in BOD and nutrients within a given footprint. However, the increased concentration elevates the solids loading to the secondary clarifiers. Enhanced settling characteristics can allow for a higher solids inventory to be maintained in the activated sludge system without requiring increased clarifier surface area.

The secondary clarifiers design summary is included in **Table 7-11**.

Table 7-11

Existing Secondary Clarifiers Design Summary

Existing WRF and Activated Sludge Sedimentation Design	
Influent Flow (MGD)	
Average Annual Flow	1.64
Peak Hour Flow	7.30
Secondary Clarifiers	
Type	Circular
Operating Clarifiers Quantity at Design Conditions	2
Total Clarifiers Quantity	2
Diameter (ft)	70
Side Water Depth (ft)	14
Surface Area, each (sf)	3,848
Surface Loading (Overflow) Rate (gpd/sf)	
at Design Average Annual Flow	213
at Design Peak Hour Flow	948
Solids Loading Rate (ppd/sf)	
at Design Average Annual Flow	14
at Design Peak Hour Flow	39

The generally accepted design value average solids loading rate (SLR) to a secondary clarifier in an activated sludge system is 25 pounds per day per square foot (ppd/sf) and peak SLR of 40 ppd/sf. **Table 7-11** shows that two clarifiers operating in parallel are necessary to meet this requirement at the original design conditions. These solids loading rates typically assume an approximate SVI of 150 mL/g, which cannot be reliably achieved by the oxidation ditches.

Using other accepted approaches for estimating secondary clarifier capacity, such as the Daigger approach outlined in Section 9.3.2.2 of Water Environment Federation *Design of Water Resource Recovery Facilities,* Manual of Practice No. 8 (commonly known as MOP 8), the allowable average SLR can be estimated as a function of SVI. **Table 7-12** shows a correlation of SLR to SVI to demonstrate the relative importance that SVI has on the capacity of the activated sludge system. Within the table, recommended average secondary clarifier SLR values at various SVIs are compared to the actual SLR at various influent flows. The table demonstrates example conditions similar to the WRF, assuming a single 70-foot-diameter circular clarifier is in operation, the mixed liquor concentration is 4,000 mg/L, and the RAS rate is 75 percent of influent. The bold cells denote the approximate influent flow at which the recommended SLR will be exceeded.

Table 7-12

Correlation of SLR to SVI Specific to the WRF

SVI (mL/g)	200	150	100	75
Recommended SLR (ppd/sf)	20	25	32	40
Influent (MGD)	**Actual SLR (ppd/sf)**[1]			
1.25	19.0	19.0	19.0	19.0
1.50	**22.8**	22.8	22.8	22.8
1.75	26.5	**26.5**	26.5	26.5
2.00	30.3	30.3	30.3	30.3
2.25	34.1	34.1	**34.1**	34.1
2.50	37.9	37.9	37.9	37.9
2.75	41.7	41.7	41.7	**41.7**
3.00	45.5	45.5	45.5	45.5

1 = Bold values represent when the recommended SLR is first exceeded.

The oxidation ditches, as configured, produce a mixed liquor with an SVI of 200 mL/g or higher. At an SVI of 200 mL/g, the recommended average SLR is 20 ppd/sf as shown in **Table 7-12**. With a single secondary clarifier in operation at 1.5 MGD, the actual SLR is estimated to be 22.8 ppd/sf, which is above the recommended value. Current influent maximum month average flow at the WRF exceeds 1.5 MGD. If the oxidation ditches remain as configured, it is recommended that a third secondary clarifier be built immediately to provide a redundant clarifier during periods when the existing two clarifiers are operated in parallel to meet the recommended SLR.

For comparison, the correlation in **Table 7-12** shows that a well-performing activated sludge system producing a mixed liquor with an SVI of 75 mL/g may allow for an average SLR of 40 ppd/sf. With a single secondary clarifier in operation, this is estimated to allow for an influent flow of 2.5 to 2.75 MGD. As demonstrated, the settleability of mixed liquor significantly impacts the capacity of the activated sludge system, and as such, process upgrades that increase this settleability should be prioritized as part of WRF improvements.

Future Nutrient Limit Addition to City NPDES Permit

Refer to **Chapter 2** for a discussion of additional City NPDES permit nutrient effluent limits that are anticipated to be developed in the future for the City's WRF discharge to the Snoqualmie River (Outfall No. 001). As such, it is prudent to maintain reliable NdN and EBPR processes at the WRF as a key part of any future improvements.

Summary of Evaluation

Improvements should be implemented for the activated sludge system to address the deficiencies and achieve the following recommended biological treatment process objectives:

- Increase the capacity of the biological treatment process to meet the projected flow and loading through 2040.
- Provide stability for the NdN and EBPR processes.

- Significantly reduce filamentous bacteria growth to increase the capacity of the activated sludge system.

Scum Pump Stations

Description

Each secondary clarifier structure has a scum sump structure integrated into and adjacent to part of the sidewall exterior and the RAS pump station. Originally, there was no scum pump. Buried pipelines leaving the structure included drain piping and scum gravity discharge piping. In 2019, the structure was converted to a wet well pump station with a submersible pump and new discharge piping. Concrete fill was added to raise the floor inside the structure, and the original pipelines were sealed or disconnected and capped near the structure.

The scum inlet pipe is routed through the clarifier sidewall from the scum box/trough at the clarifier interior. One submersible pump is installed within the wet well. Pumped flow from the scum pump station is discharged into the aerobic digesters. Pumped scum is conveyed through individual buried force mains from each pump station, which combine into a single buried force main that connects to thickened sludge piping at the solids handling building, which discharges into each digester. Original buried scum piping was re-used for a portion of the combined scum force main.

The Secondary Clarifier No. 2 scum force main includes provision for connection from a future third secondary clarifier.

Evaluation

The concrete scum box and hatch appear to be in good condition per visual observation. The portions of existing scum piping that were reconnected in 2019 appeared to be in good condition per visual observation and likely have an indefinite life. These components, along with the scum pumping equipment installed in 2019, are not expected to require replacement during the planning period.

The scum pump stations design summary is included in **Table 7-13**.

Table 7-13

Existing Scum Pump Stations Design Summary

Scum Pump Stations	
Number of Pump Stations, per Clarifier	1
Number of Pumps, per Pump Station	1
Pump Type	Submersible
Capacity, each Pump (gpm @ ft TDH)	150 @ 38
Motor Nameplate Horsepower	4

Secondary Effluent Control Structure

Description

The secondary effluent control structure is used to receive and measure effluent flow from the secondary clarifiers and then direct the flow to either the UV disinfection system or the reclaimed water filters. Additionally, polymer addition for the reclaimed water filters and measurement of water quality to the filters are provided at the control structure. Alum addition also is provided; however, it is not used. The original control structure and associated gates installed in 1997 have remained unchanged.

Two buried pipelines, one from each secondary clarifier, connect to a single buried pipeline that connects to the secondary effluent control structure for conveying effluent flow from the clarifiers. The effluent flow enters the bottom of the structure, flows by gravity over a V-notch weir, and then discharges through one of two buried pipelines to either the UV disinfection system or the reclaimed water filters. Manually operated (open/close) gates are used to select which downstream process to direct flow. When secondary effluent flow is directed to the filtration process, effluent is filtered with sand filters first and then flows by gravity to the UV disinfection system. In the case that an event occurs at the filters to raise the filter inlet water level too high, an overflow weir in the structure will allow excess flow to go directly to the UV disinfection system.

Flow from the secondary clarifiers is measured and recorded continuously utilizing the V-notch weir and associated ultrasonic level sensor. The flow measurement is used to measure reclaimed water production and to control the UV disinfection system. Continuous online water quality monitoring equipment installed at the secondary effluent control structure includes a DO probe and turbidimeter. A pump is installed for providing sample water to the turbidimeter. The water quality equipment is used for continuously measuring and recording filter inlet data.

Evaluation

The concrete structure and gates of the secondary effluent control structure appear to be in good condition per visual observation and have no known deficiencies. These items should have an indefinite life and are not expected to require significant improvements or replacement during the planning period.

UV Disinfection System

Description

The UV disinfection system provides disinfection for secondary effluent and reclaimed water. Additionally, sampling and/or measurement of secondary effluent water quality discharged to the river outfall and water quality of reclaimed water discharged into the clearwell are provided in this process area. Either secondary effluent or filtered effluent (normally for reclaimed water production) is directed to the UV disinfection system. Secondary effluent or filtered effluent flowing by gravity enters the common inlet box at the head of the disinfection channels, which is where the submerged UV lamps are installed. From the common inlet box, flow is directed into one or both channels, continues into the common outlet basin, and then either is discharged to the secondary effluent outfall or flows into the reclaimed water clearwell. Several types of water quality equipment at the common inlet box are used for water quality measurements. A composite sampler, with its collection tube located in the common outlet basin, takes samples for water quality analyses.

A new UV disinfection system and associated gates were installed in 2017 to replace the original system and gates. The system is designed to operate in one of two modes: 1) secondary effluent; or 2) reclaimed water. The system is installed in a concrete structure that also contains the reclaimed water filters and reclaimed water clearwell and pump station and is covered by a partially enclosed steel building. The original concrete and steel building structures are still in place. During installation of the new system, grout was placed in some areas of the disinfection channel walls and floors. The grout was used to patch small openings formed by spalling that were significant enough to allow some flow to potentially not be disinfected sufficiently. The City also coated the disinfection channel walls and floors. In 2017, water quality equipment was added or replaced upstream of the disinfection channels, and City staff installed a new composite sampler to replace the previous sampler.

Flow measurement at the secondary effluent control structure is used for overall control of the UV disinfection system for both modes of operation. Each disinfection channel has a stainless steel gate at the inlet end that is automatically operated (open/close) to either allow flow to the channel or isolate the channel. The gates are controlled by an electric actuator that is installed on each gate to automatically control and monitor the gate position (opened/closed). A stainless steel perforated flow conditioner plate is installed in each channel near the inlet end. The submerged UV lamps are installed in UV banks. Three UV banks are installed in series in each channel. At the outlet end of each channel, flow goes over an automatically modulated (up/down) weir gate into the common outlet basin. The stainless steel weir gates are controlled by an electric actuator that is installed on each gate to automatically control and monitor the gate position. Modulation of the weir gates is used to control the water level in each channel and respond to changing flows, which is especially important given all flow to the WRF headworks is pumped. Water level in each channel is measured by an ultrasonic level sensor installed directly upstream of the weir gate.

Continuous online water quality equipment installed at the common inlet box includes a DO probe, pH sensor, conductivity sensor (which also is used for temperature measurement), and turbidimeter. A pump is installed for providing sample water to the turbidimeter from the common inlet. The water quality equipment is used for continuously measuring and recording secondary effluent or filtered effluent data prior to discharge to the corresponding outfall. Water quality samples of the disinfected secondary effluent prior to discharge are collected by the composite sampler. Samples are analyzed at the on-site laboratory and manually recorded.

Secondary Effluent Disinfection and Water Quality

When the UV disinfection system is in secondary effluent mode and the City intends to discharge to the river outfall, gates in the secondary effluent control structure are set to send secondary effluent directly to the system. Secondary effluent flows by gravity through a buried pipeline from the control structure to the common inlet box. The system provides a specific dose in secondary effluent mode that meets the corresponding disinfection requirements. The inlet gate to the reclaimed water clearwell is set closed, and disinfected secondary effluent flows by gravity from the common outlet basin to the river outfall inlet weir.

Reclaimed Water Disinfection and Water Quality

During reclaimed water production, the UV disinfection system is set to reclaimed water mode, and gates in the secondary effluent control structure are set to send secondary effluent to the reclaimed water filters prior to disinfection. Following filtration, filtered effluent flows by gravity through a buried pipeline, which intersects the secondary effluent buried pipeline at a manhole between the secondary effluent control structure and the UV disinfection system. From the manhole, filtered effluent continues by gravity to the common inlet box. The system provides a specific dose in reclaimed water mode that meets the corresponding disinfection requirements. The inlet gate to the reclaimed water clearwell is set open, and filtered and disinfected effluent (reclaimed water) flows by gravity from the common outlet basin into the adjacent clearwell.

Evaluation

The concrete and steel building structures appear to be in good condition per visual observation and are not expected to require replacement or significant improvements during the planning period. Due to the recent UV disinfection system and gates improvements discussed, the equipment is expected to be suitable through the planning period. Minor repairs may occur as part of normal operations and maintenance and are intended to be handled using the operations and maintenance budget.

The UV disinfection system design summary is included in **Table 7-14**.

Table 7-14

Existing UV Disinfection System Design Summary

Existing WRF and Disinfection Design	
Secondary Effluent Flow (MGD)	
Peak Hour Flow	7.30
Secondary Effluent Disinfection Peak Flow Rating (MGD)	10
Reclaimed Water Production Flow (MGD)	
Peak Hour Flow	4.24
Filtered Effluent (Reclaimed Water) Disinfection Peak Flow Rating (MGD)	4.24
UV Disinfection System	
Type	Open Channel
Type of Lamp	Low Pressure-High Output
Orientation of Lamp	Horizontal
Number of Channels	2
Number of Banks, per Channel	3
Number of Modules, per Bank	9
Number of Lamps, per Module	6
Number of Lamps, per Channel	162
Number of Lamps, Total	324
% UV Transmittance	67.5
Secondary Effluent Disinfection	
UV Dose (mJ/cm^2)	30
Peak Design Flow, per Channel (MGD)	10
Filtered Effluent (Reclaimed Water) Disinfection	
UV Dose (mJ/cm^2)	100
Peak Design Flow, both Channels (MGD)	4.24

mJ/cm^2 = millijoules per square centimeter

The UV disinfection system common inlet box and common outlet basin were designed for at least a peak hour flow of 7.3 MGD, which is not expected to be exceeded during the planning period. Each disinfection channel has a hydraulic capacity of at least 10 MGD. The secondary effluent disinfection capacity of the UV disinfection system in a single channel is 10 MGD, with a standby redundant channel. The filtered effluent (reclaimed water) disinfection capacity of the UV disinfection system using both channels and with standby redundant UV banks in each channel is 4.24 MGD, which matches the reclaimed water peak hour flow.

Therefore, there are no known deficiencies for the UV disinfection system.

Secondary Effluent Outfall

Description

Following disinfection, secondary effluent (or the overflow or emergency diversion of reclaimed water) is discharged by gravity to the Snoqualmie River through the original secondary effluent outfall. At the common outlet basin of the UV disinfection process, disinfected effluent flows over a

V-notch weir and then into the inlet of the outfall. The outfall consists of a buried, ¼-mile-long concrete pipeline and manhole system and a submerged ductile iron single port diffuser in the Snoqualmie River. The pipeline remains buried approximately 15 feet offshore and then extends unburied for approximately another 15 feet. The pipeline is anchored to the river bottom with H pilings, wire rope, and shackles.

Disinfected effluent flow discharged to the outfall is measured and recorded continuously utilizing the V-notch weir and associated ultrasonic level sensor.

Evaluation

The inlet concrete structure appears to be in good condition per visual observation and is not expected to require replacement or significant improvements during the planning period.

The City had an outfall inspection performed on September 26, 2018 for the diffuser and submerged portion of the pipeline. The inspection was performed by Global Diving and Salvage. The inspection report identified that the pipe, joints, and anchor are serviceable and intact with no visible signs of damage. In addition, flow through the pipeline and diffuser was free and unobstructed, with no signs of sediment accumulation. The H pilings, wire rope, and shackles were intact and working as designed.

The secondary effluent outfall design summary is included in **Table 7-15**.

Table 7-15

Existing Secondary Effluent Outfall Design Summary

Existing WRF and Outfall Design	
Secondary Effluent Flow (MGD)	
Peak Hour Flow	7.30
Outfall Peak Design Flow @ 25-Year River Flood Level (MGD)	10.7
Secondary Effluent Outfall	
Total Length of Piping from WRF to Outfall (linear ft)	1,500
Pipe Diameter (in)	36
Diffuser	Submerged
Measurement of WRF Effluent Flow (at Outfall inlet)	
Type	V-Notch Weir
Number	1
Angle	90 degrees
Height (in)	30
Flow Measurement Range (MGD)	0 to 15+

At the 25-year river flood level defined in the original WRF design as-built drawings, the secondary outfall is rated for 10.7 MGD, which is not expected to be exceeded during the planning period. The V-notch weir has a flow measurement range well beyond that.

Therefore, there are no known deficiencies for the secondary effluent outfall.

In-Plant Pump Station

Description

The IPPS consists of a wet well manhole with an access hatch and two submersible pumps. The original structure, hatch, and piping are still in place. The pumps were last replaced in 2009.

The IPPS receives wastewater generated within the WRF and discharged from WRF process drains. In addition, off-site wastewater collected in the City north of the Snoqualmie River flows by gravity to the WRF and into the IPPS. Pumped flow from the IPPS is conveyed through a buried force main to the inlet of the headworks.

Evaluation

The manhole structure and piping appear to be in good condition per visual observation and are not expected to require replacement or significant improvements during the planning period. The pumps may need to be replaced during the planning period; however, that is intended to be handled using the operations and maintenance budget. Minor repairs also may occur as part of normal operations and maintenance and are intended to be handled using the operations and maintenance.

The IPPS design summary is included in **Table 7-16**.

Table 7-16

Existing IPPS Design Summary

In-Plant Pump Station	
Number of Pumps	2 Duty
Pump Type	Submersible
Capacity, each Pump (gpm @ ft TDH)	1,300 @ 51
Capacity, both Pumps (gpm @ ft TDH)	2,200 @ 57
Motor Nameplate Horsepower	25

The pumps are oversized. Therefore, when the City does replace one or both pumps, consideration should be given to downsizing, utilizing VFDs, or using a new pump technology that has integrated submersible VFDs with the pump.

Reclaimed Water Filters

Description

The reclaimed water filters provide rapid sand filtration as part of reclaimed water production. If necessary, the filters also can be used to provide tertiary treatment prior to secondary effluent disinfection and discharge to the river outfall. When the filters are in use, secondary effluent is directed to the filters from the secondary effluent control structure. Secondary effluent flowing by gravity enters the common inlet channel at the head of the three parallel filter basins. From the common inlet channel, flow is directed into one or more filter basins and continues into the common outlet channel before leaving as filtered effluent to go to the UV disinfection system.

The filters are installed in a concrete structure that also contains the UV disinfection system and reclaimed water clearwell and pump station and is covered by a partially enclosed steel building. The original concrete and steel building structures are still in place, as are all gates and all three of the original filter systems (two being constructed in 1997 and the third in 2003).

Each filter basin consists of a dedicated inlet channel, the filter media bed chamber, and a dedicated outlet chamber. Secondary effluent from the common inlet channel flows over adjustable weir plates into each dedicated filter basin inlet. Near the upstream end of each dedicated filter basin inlet is a manually operated (open/close) gate to either allow flow to the filter or isolate the filter. Flow continues through the dedicated inlet channel and through inlet ports to the filter media bed chamber (the inlet ports are circular penetrations in a shared internal wall between the channel and chamber). Flow passes vertically down through the filter media to a plenum beneath, to the dedicated outlet chamber, and over an adjustable weir plate to the common outlet channel. A single, manually operated gate (open/close) is installed at the discharge end of the common outlet. This gate, along with the applicable gate at the secondary effluent control structure, is used to entirely isolate the reclaimed water filter process when it is not in use.

Adjacent to each dedicated outlet chamber is a waste drain chamber. One purpose of this chamber is to occasionally discharge floating debris from the water surface of the filter media bed chamber. Manually operated (open/close) weir gates are installed at openings between the chambers to skim the floating debris.

The reclaimed water filter systems are the traveling hood type, which consists of a pneumatically operated hood that is suspended over the filter media bed. The area of the hood is only a partial area of the media bed and it travels the length of the bed during the backwash process, which is automated and occurs while the filter is still in forward flow operation. A backwash pump is mounted on the hood. During backwash, the hood stops over a section of media, and the pump draws water from the plenum up through the filter media, along with filtered solids, and discharges it into a trough that runs the length of the filter. From the trough, backwash residuals flow into the waste drain chamber. An open drain at the floor of the chamber directs flow to drain piping that is routed to the IPPS.

The reclaimed water filter systems also include a manual air scour process, which is separate from the backwash process. An air scour blower is installed within the blower room in the equipment building (the compressed air equipment for the traveling hood also is installed in the blower room). A common air scour pipeline is routed from the blower room, below grade, and through an exterior wall of the filter structure. The pipeline then branches out to each filter, where it further splits into two parallel pipes that run the length of the filter within the plenum.

The liquid stream polymer system is used to inject polymer at the secondary effluent control structure during reclaimed water production.

Reclaimed water production flow and filter inlet water quality measurements and recordings all are provided by equipment at the secondary effluent control structure. Filtered effluent water quality measurements and recordings all are provided by equipment at the UV disinfection system.

Evaluation

The concrete and steel building structures appear to be in good condition per visual observation and are not expected to require replacement or significant improvements during the planning period.

Two of three reclaimed water filters were installed in approximately 1997. The third filter was installed in approximately 2003. The rapid sand filters are the traveling hood type, which is a technology still used today (the traveling hood is a variant of the traveling bridge). The Dorr-Oliver/Eimco filter systems are no longer manufactured by the current manufacturer Eimco Water Technologies, which is part of Ovivo; however, Ovivo does offer repair and rebuild services to support the systems. Based on the ages and conditions of the filter systems (per visual observation and discussion with City staff), it is recommended that the City schedule replacement during the 20-year planning period. Other filtration technologies are available, and they should be evaluated for replacing the filter systems.

The reclaimed water filters design summary is included in **Table 7-17**.

Table 7-17

Existing Reclaimed Water Filters Design Summary

Existing WRF Reclaimed Water Filtration Design	
Reclaimed Water Production Flow (MGD)	
Maximum Day Flow	3.13
Reclaimed Water Filters	
Measurement of Reclaimed Water Production Flow (at Secondary Effluent Control Structure inlet)	
Type	V-Notch Weir
Number	1
Angle (degrees)	90 degrees
Height (in)	30
Flow Measurement Range (MGD)	0 to 15+
Filtration	
Type	Rapid Sand Filters
Number of Filters	3
Surface Area (sf)	870
Backwash Pumping	
Type	Traveling Hood with Pump
	Automatic Operation
Backwash Rate (gpm/sf)	20
Number of Pumps, per Filter	1
Capacity, each Pump (gpm)	355
Motor Nameplate Horsepower	7.5 (for two), 3 (for one)

Reclaimed Water Clearwell and Pump Station

Description

The reclaimed water clearwell and pump station are used to supply the City's off-site reclaimed water distribution system used for irrigation. The clearwell is part of a concrete structure that also contains the UV disinfection system and reclaimed water filters and is covered by a partially enclosed steel building. The clearwell is rectangular shaped and has an access hatch. The pump station is located on top of the clearwell and consists of two pumps and discharge piping. The original concrete and steel building structures, pumps, and piping are still in place.

The clearwell provides temporary storage of reclaimed water prior to pumping it into the distribution system. Following filtration and disinfection, reclaimed water is allowed to flow into the clearwell from the adjacent common outlet basin of the UV disinfection process. A manually operated (open/close) inlet gate, which is the original, is used for allowing flow to the clearwell or isolating it. The entire opening associated with the gate is below the invert elevation of the secondary effluent outfall inlet V-notch weir, which acts as an overflow for the clearwell. If it becomes necessary during reclaimed water production, the clearwell inlet gate can be closed and the secondary effluent outfall can be used as an emergency diversion.

The pumps are line-shaft vertical turbine pumps. Pumped flow from the reclaimed water pump station is discharged into the City's Eagle Lake storage reservoir (also known at the 9th Hole Pond) at the TPC Snoqualmie Ridge Golf Course. Pumped reclaimed water is conveyed through a single buried water main that continues offsite.

The original WRF design included space and penetrations in the clearwell top slab for two additional line-shaft vertical turbine pumps to be installed in a different location than the reclaimed water pumps. The future pumps were planned for serving as infiltration pumps. The penetrations and some of the allocated space remains; however, some of the adjacent wall space was used for electrical equipment and conduit for the newly installed UV disinfection system. At this time, it is unlikely the City will install infiltration pumps.

Evaluation

The concrete and steel building structures appear to be in good condition per visual observation and are not expected to require replacement or significant improvements during the planning period. The pumps and piping also appear to be in good condition per visual observation and any replacement needs during the planning period are intended to be handled using the operations and maintenance budget. Minor repairs also may occur as part of normal operations and maintenance and are intended to be handled using the operations and maintenance budget.

The reclaimed water pump station design summary is included in **Table 7-18**.

Table 7-18

Existing Reclaimed Water Pump Station Design Summary

Reclaimed Water Pump Station	
Pump Station Design Flow Capacity (MGD)	1.44
Number of Pumps	2 Duty
Pump Type	Vertical Turbine
	Line-Shaft
Capacity, each Pump (gpm @ ft TDH)	500 @ 587
Motor Nameplate Horsepower	100

Chemical Additions

Description

Liquid Stream Alum System

The original design of the WRF included provision for the addition of alum into the liquid stream for enhancing suspended solids removal in the secondary clarifiers and reclaimed water filters. An alum chemical storage and feed system is installed within the chemical room of the equipment building. Alum injection points are located at the mixed liquor control structure and secondary effluent control structure for the clarifiers and filters, respectively.

When in use, alum is stored in a tank and pumped to the active injection point by a metering pump and associated discharge piping. Piping to convey the alum is routed from the equipment building to each injection point. Two metering pumps, one duty and one standby, are installed. Addition of alum is rarely, if ever, used. When not in use, the storage tank is kept empty.

Liquid Stream Polymer System

Similar for alum, the original design of the WRF included provision for the addition of polymer into the liquid stream for enhancing suspended solids removal in the secondary clarifiers and reclaimed water filters. A polymer chemical storage and feed system is installed within the chemical room of the equipment building. Polymer injection points are located at the mixed liquor control structure and secondary effluent control structure for the clarifiers and filters, respectively.

When in use, neat polymer is stored in a permanent 55-gallon drum, and activated polymer is pumped to the active injection point by a metering pump and associated discharge piping. Piping to convey the activated polymer is routed from the equipment building to each injection point. Temporary 55-gallon drums of neat polymer are stored in the chemical room for refilling of the permanent drum. A single metering pump and discharge piping are installed on a skid that also contains polymer dilution and activation components. Addition of polymer is rarely, if ever, used for the clarifiers. During reclaimed water production, it is used for the filters to meet the City NPDES permit requirement for enhancing filterability.

Evaluation

Liquid Stream Alum System

If the City continues to not use alum addition, the space taken up by the bulk chemical storage tank and metering pump system may be able to be used for current or future needs, such as potential coagulant improvements associated with the reclaimed water filters replacement.

Liquid Stream Polymer System

The polymer system components appear to be in functional condition per visual observation. Any replacement needs during the planning period are intended to be handled using the operations and maintenance budget. As part of the reclaimed water filters replacement project, the polymer system will be evaluated for potential improvement or replacement.

Non-Potable Water System

Description

The non-potable water (NPW) system provides process water throughout the WRF. Water for the system is supplied through the potable water connection at the WRF. The storage and pumping parts of the NPW system are installed within the chemical room of the equipment building and generally consist of a storage tank, a pump station, and a hydropneumatic tank.

The potable water supply fills the storage tank through an air gap. Cross-connection control regulatory requirements necessitate the air gap to separate the NPW system from the potable water supply. A new air gap, storage tank, and associated components were installed in 2017 to replace the previous equipment.

From the storage tank, NPW is pumped throughout the WRF by a dedicated pump station. NPW is conveyed through a system of both above-grade and buried piping. As part of the solids handling system improvements constructed in 2008, a new NPW pump station was installed to replace the original pump station. The new pump station is a packaged skid with three end-suction centrifugal pumps controlled by VFDs, suction header and discharge header piping, a discharge pressure transducer, and a control panel. The motor on NPW Pump No. 1 has been replaced, and the motor on NPW Pump No. 2 has been rebuilt. A new hydropneumatic tank recently was installed by City staff and serves the purpose of maintaining pressure in the NPW system during low to no flow periods.

Evaluation

Due to the recent NPW air gap and storage tank improvements and hydropneumatic tank replacement, there are no related deficiencies. The storage tank can be expected to have a 20-year life. Component replacement needs most likely will arise during the planning period; however, these are intended to be handled using the operations and maintenance budget.

The non-potable water packaged pump station is approximately 12 years old. Based on visible condition and discussion with City staff, it is warranted the City schedule replacement of the pump station.

SOLIDS HANDLING EXISTING FACILITIES EVALUATION

Overview

This section summarizes the WRF solids handling processes, which also are shown schematically in **Figure 7-2**. Aerobic digesters and an entirely new solids handling building were constructed at the WRF in 2019. The associated new solids handling system was constructed to fully replace the previous sludge dewatering and (abandoned) drying system. The new system provides sludge thickening, aerobic digestion, and dewatering processes to produce Class B biosolids. Additional solids handling associated improvements implemented with the project were upgrades to the WAS pump station and relocation of the scum discharge. Associated odor control improvements also were implemented. Odor control improvements generally consisted of conveying all foul air from the digesters and building to an adjacent in-ground biofilter for treatment.

The digesters and building are integrated into a single structure. The building part of the structure includes separate thickening, blower, and dewatering rooms and a truck bay. The three aerobic digester cells are configured side by side and are located along the back wall of the building. The back wall is shared with the digester cells. The middle digester cell also shares a wall with each of the other two digester cells.

WAS Pump Station

Description

The WAS pump station serves to pump wasted sludge from the activated sludge process from the bottom of the secondary clarifiers and discharge it to the solids handling system. It consists of pumps and piping located in the original dedicated room in the equipment building; however, the pumps and the majority of the piping were replaced as part of the improvements in 2019. The original below-grade WAS valve manhole is located north of the equipment building and was not modified as part of the improvements. Sludge from each secondary clarifier sludge hopper is conveyed through buried pipes to the WAS valve manhole. Valves within the manhole allow operators to align clarifiers to individual WAS suction pipes or use the pipes to drain the clarifiers to the IPPS.

Three rotary lobe WAS pumps were installed to replace the previous two progressive cavity pumps in 2019, along with new pipes, valves, and fittings. There are four total suction pipe penetrations from the WAS valve manhole, with three connected to the WAS pumps via a common suction header. One of the three is provision for a future third secondary clarifier. The fourth penetration allows for connection to a fourth secondary clarifier. The WAS pumps discharge to a common header that is connected to three buried pipes to the following locations: 1) the solids handling building constructed in 2019; 2) an emergency on-site truck filling station; and 3) an emergency return to the oxidation ditches. Original buried WAS piping was reused for a majority of these pipes.

Evaluation

Due to the recent replacements of pumps, valves, devices, and electrical equipment for the WAS pump station, there are no major equipment replacements or other rehabilitations that are expected during the planning period. The existing buried pipe and fittings, as well as the building and WAS manhole structure that were reused during the 2019 project, should have an indefinite life beyond the planning period. Minor repairs may occur as a part of normal operations and maintenance and are intended to be handled using the operations and maintenance budget.

The WAS pump station design summary from the 2019 project is included in **Table 7-19**.

Table 7-19

Existing WAS Pump Station Design Summary

WAS Pump Station	
Number of Pumps	2 Duty, 1 Standby
Pump Type	Rotary Lobe
Capacity, each Pump (gpm @ psig)	70 @ 15
Motor Nameplate Horsepower	5

As shown in the table, two pumps operating with one pump offline for redundancy provides a nominal capacity of 140 gallons per minute (gpm) for the WAS pump station. The system was designed for a conservative future WAS concentration of 5,000 mg/L, which equates to a WAS pump station solids loading rate of 350 pounds per hour (pph) at 140 gpm. The wasting and thickening systems are designed for unmanned 24-hour per day operation, which allows for 8,400 ppd of WAS wasting at 5,000 mg/L. This provides sufficient capacity for the maximum month WAS generation during the planning period and beyond, with a factor of safety allowing for periodic decreased WAS concentration, increased WAS generation, and/or decreased wasting and thickener operational time. Further, the WAS concentration currently and historically averages 10,000 mg/L or greater, which allows for a significantly reduced daily wasting volume and reduced wasting and thickening operation.

Sludge Thickening

Description

The thickening system is installed in the thickening room of the solids handling building. The thickening system serves to increase the sludge feed concentration to the aerobic digesters to an average of 25,000 mg/L. The system includes a rotary drum thickener with an influent flocculation tank, an emulsified polymer system, and a thickened sludge pump. WAS from the WAS pump station normally is conveyed directly to the thickener prior to discharging to the digesters. However, an automated bypass valve located upstream of the thickener allows for WAS to periodically bypass the thickener and be discharged directly to the aerobic digesters. This is used to achieve the target average feed concentration to the digesters of 25,000 mg/L. An additional thickener feed pump is installed in the thickening room to allow for the digester contents to be pumped to the thickener for recuperative thickening.

Scum from the secondary clarifier scum pump stations also is conveyed to the aerobic digesters. Pumped scum is conveyed through a common force main to the solids handling building and connected to the thickened sludge pump discharge piping within the thickening room.

Filtrate from the rotary drum thickener is conveyed to the IPPS.

Evaluation

Due to the thickening system being recently installed in 2019, there are no major equipment replacements or other rehabilitations that are expected during the planning period. Minor repairs may occur as a part of normal operations and maintenance and are intended to be handled using the operations and maintenance budget.

The thickening system design summary from the 2019 project is included in **Table 7-20**.

Table 7-20

Existing Thickening System Design Summary

Thickening Equipment		
	Type	Rotary Drum
	Hydraulic Loading Capacity (gpm)	125
	Mass Loading Capacity (pph)	325
	Thickened Solids Concentration Range (%)	5 to 6
Thickened Sludge Transfer Pump		
	Type	Rotary Lobe
	Number	1
	Capacity, each Pump (gpm @ psig)	20 @ 15
	Motor Nameplate Horsepower	3

The thickening system provides a nominal hydraulic capacity of 125 gpm and a solids loading capacity of 325 pph, assuming a WAS concentration of 5,000 mg/L. This provides similar capacity to the WAS pump station and will adequately meet the projected loading in the planning period and beyond. The thickener system is sized at slightly less capacity than the WAS pump station, as the thickener normally produces greater than 30,000 mg/L thickened sludge; therefore, it requires daily downtime to allow some WAS to be bypassed directly to the digesters to achieve an average feed concentration of 25,000 mg/L.

Aerobic Digestion

Description

Solids stabilization at the WRF is via aerobic digestion that produces a Class B biosolids product suitable for land application. The three aerobic digesters include top-entering tank mixers and diffused aeration systems. Air is supplied by three blowers, which are installed in the blower room of the solids handing building. Each digester can be aerated cyclically to promote nitrification and denitrification.

The digesters are operated primarily in series, in which thickened sludge and scum are fed to the first digester in the series. The first digester spills to the second, the second to the third, through gated openings near the top of the digesters. Digested sludge is drawn off the final digester in the series for dewatering. Piping exists that can alternatively allow the digesters to be operated in parallel or batch modes of operation. Odorous air is removed from the headspace above each digester and treated via an in-ground biofilter adjacent to the solids handling building.

Evaluation

Due to the digester tankage and equipment being installed in 2019, there are no major equipment replacements or other rehabilitations that are expected during the planning period. Minor repairs may occur as a part of normal operations and maintenance and are intended to be handled using the operations and maintenance budget.

The aerobic digester and aeration system design summary from the 2019 project is included in **Table 7-21**.

Table 7-21

Existing Aerobic Digester and Aeration System Design Summary

Aerobic Digesters		
	Type	Concrete
	Number of Digesters	3
	Dimensions (L x W x H) (ft)	40 x 40 x 22.5
	Side Water Depth (ft)	20.5
	Operating Volume Each (gallons)	250,000
	Operating Volume Available (gallons)	750,000
	SRT at 20 degrees C (days)	40
	VSS Destruction (%)	50
Mixers		
	Number, per Digester	1
	Motor Nameplate Horsepower	20
Blowers		
	Type	Positive Displacement
	Number	3 (space for 4)
	Drive Type	Variable Frequency
	Capacity Range, each Blower (scfm)	160 to 620
	Discharge Pressure (psi)	10
	Motor Nameplate Horsepower	50

The aerobic digesters are designed to provide a 40-day SRT at digester temperature of 20 degrees Celsius. The three digesters provide a total of 750,000 gallons of operating volume. The original design intended for two digesters to provide a 40-day SRT up to an influent BOD loading of 3,750 ppd, with the third digester providing redundancy or additional treatment during peak conditions. However, a 2040 average annual BOD loading over 4,000 ppd is expected with the Casino expansion. This will exceed the design capacity of the digesters. **Chapter 9** provides the recommended approach to increasing the capacity of the aerobic digesters to support the Casino expansion.

Dewatering and Truck Load-Out

Description

The dewatering system serves to dewater digested sludge to approximately 20-percent cake for off-site land application. The system consists of two (primary and backup) digested sludge pumps, a polymer storage tote, two polymer feed units, two (primary and backup) centrifuges, and shaftless screw conveyors. The backup pump and centrifuge are original from the City's previous dewatering system and were relocated and integrated into the new dewatering system. The primary pump and centrifuge typically are used. If necessary, the backup pump and centrifuge can be used. The primary pump and backup centrifuge are not connected, and the backup pump and primary centrifuge are not connected. Both polymer units are new; however, one is dedicated for use with the primary centrifuge and the other is dedicated for use with the backup centrifuge.

Digested sludge from the digesters is pumped to the active centrifuge by the corresponding digested sludge pump. Polymer is injected into the digested sludge prior to it discharging into the centrifuge. Cake is conveyed by the centrifuge's collection conveyor and the common inclined transfer conveyor to the adjacent truck bay. Centrate from the centrifuges is conveyed to the IPPS.

The truck bay is an enclosed room adjacent to the dewatering room. A large roll-up door opening allows a truck to back into the bay for filling it with biosolids. A weigh bridge is installed in the floor area of the bay. Truck filling is facilitated by an overhead, horizontal, shaftless-screw distribution conveyor. Cake is conveyed from the inclined conveyor in the dewatering room to the distribution conveyor. The distribution conveyor has four discharge chutes, three of which are equipped with automatically operated (open/close) gates, to drop biosolids into the truck.

Evaluation

Due to the dewatering system being installed in 2019, there are no major equipment replacements or other rehabilitations that are expected during the planning period. Minor repairs may occur as a part of normal operations and maintenance and are intended to be handled using the operations and maintenance budget.

The dewatering system design summary from the 2019 project is included in **Table 7-22**.

Table 7-22

Existing Dewatering System Design Summary

Dewatering Equipment	
Type	Centrifuge
Number	1 Duty, 1 Standby
Type of Sludge	Aerobically Digested
Inlet Consistency (%)	1.5
Duty Unit Hydraulic Loading Capacity (gpm)	80
Duty Unit Mass Loading Capacity (lb/hr)	500
Dewatered Solids Concentration (%)	20
Digested Sludge Pumps	
Type	Rotary Lobe; Progressive Cavity
Number	1 Duty; 1 Standby
Duty Unit Capacity (gpm @ psig)	80 @ 15
Motor Nameplate Horsepower	7.5; 3
Dewatered Sludge Cake Conveyance System	
Type	Shaftless Screw Conveyor
Number	2 Collection, 1 Inclined, 1 Distribution
Rated Capacity (ton/hr wet sludge)	1.5 (for two), 3 (for two)
Motor Nameplate Horsepower	3 (for two), 5 (for two)

The primary centrifuge has a nominal solids loading capacity of 500 pph. The corresponding digested sludge pumping and cake conveyance equipment is sized to provide similar throughput. Based on the aerobic digester capacity analysis provided in the previous section, in which three digesters were in operation totaling 750,000 gallons of operational volume at an average concentration of 20,000 mg/L, the dewatering system would be required to nominally process 3,130 dry pounds of solids daily. This equates to approximately 22,000 dry pounds per week. At the nominal operating capacity of 500 pph, the primary centrifuge would be required to operate 44 hours per week. This equates to slightly more than 8 hours per day for a 5-day week. Operations could be adjusted to split shifts to provide longer centrifuge operating time or by adding a weekend shift. As such, the dewatering system has capacity to serve the loading projected for the planning period.

However, the reused Centrisys (backup) centrifuge has exceeded the recommended operating hours for multiple wear components. A maintenance overhaul of the unit is recommended to replace the wear components as a capital improvement.

ELECTRICAL AND SCADA EXISTING SYSTEMS EVALUATION

Electrical Power Supply

Description

Utility electrical service is provided to the WRF from Puget Sound Energy. The utility electrical service pad-mount transformer and associated vault at the WRF were replaced with a new pad-mount transformer and vault in 2019. The transformer reduces the 12.5 kilovolt utility power to 480/277 Volt, 3-phase power.

Reliability Evaluation

The NPDES permit for the WRF requires the City maintain Reliability Class II when discharging disinfected secondary effluent water to the Snoqualmie River (refer to the NPDES permit and U.S. Environmental Protection Agency document number 430-99-74-001 for details about the reliability class and requirements). When supplying the City's reclaimed water system, treatment reliability standards for reclaimed water production must be met (WAC 173-219-350). The standby power system at the WRF meets all applicable power reliability requirements. The new outdoor, 1,500 kilowatt (kW), diesel engine generator with load bank, outdoor above-ground fuel tank, and automatic transfer switch (ATS) were installed in 2017. The generator has the capacity to provide standby power for all electrical loads at the WRF, and the fuel tank has a 7-day capacity (the fuel tank capacity is based on the standby generator being 50-percent utilized). The standby generator capacity was sized to account for the electrical load changes for the improvements completed in 2019 and planned future electrical load changes (i.e. third secondary clarifier and oxidation ditch aerators projects). If a loss of utility power service occurs, the ATS will automatically transfer power supply to the standby generator and an alarm will notify the operators (additional generator and ATS status notifications also will be triggered). When utility power service is restored, the ATS will automatically transfer power supply back to the utility service power.

Power to the new UV disinfection system, installed in 2017, also is backed up by uninterruptible power supplies (UPS). Two 480 Volt UPSs provide backup power to the equipment at the UV channels, with each of the two channels having a dedicated UPS. One 120 Volt UPS provides backup power to the control panel and water level sensors. The purpose of the UPSs is to ensure continuous operation of the UV disinfection system during the transition from utility power loss to standby generator power supply.

There are no known electrical system deficiencies at the WRF through the planning period, and electrical improvements are limited to what is required as part of the recommended capital improvements in this GSP. All normal maintenance repairs are intended to be handled using the operations and maintenance budget.

Central SCADA

Description

The central components of the WRF SCADA system were upgraded in 2017. The main control panel was replaced with a new panel and programmable logic controller (PLC) and included redevelopment of the main control system software programming. All control system inputs from and outputs to processes throughout the WRF are connected at the main control panel. A network server and new human machine interface (HMI) computer also were installed at the WRF, which included redevelopment of the HMI software programming. The HMI computer is used for on-site monitoring, controlling, and alarming. WRF processes operation data and events are recorded and available for viewing, such as historical trending of data values. A software program is used to message, email, and call (by internet) the on-call operator for remote notification of alarms that are received at or generated by the SCADA system. The software allows remote viewing and acknowledgment of the alarms. A new backup auto-dialer was installed and connected to the telephone system at the WRF. If any alarms remain unacknowledged after 30 minutes, the auto-dialer calls by telephone to notify the on-call operator. Alarms and acknowledgments are recorded, and a history can be viewed through the HMI software.

Reliability Evaluation

Power to the HMI and main control panel PLC are backed up by UPSs to ensure continuous operation regardless of transitions from utility power loss to standby generator power supply. This meets the applicable treatment reliability standard for reclaimed water production (WAC 173-219-350). The alarm requirements for the same standards also are met.

The WRF is the central location for the City's telemetry system, which is discussed in **Chapter 2**.

There are no known SCADA system deficiencies at the WRF through the planning period, and SCADA improvements are limited to what is required as part of the recommended capital improvements in this GSP. All normal maintenance repairs are intended to be handled using the operations and maintenance budget.

GENERAL WRF SITE, ADMINISTRATION, AND NON-PROCESS INFRASTRUCTURE EVALUATION

The WRF site, administration facilities, and non-process related infrastructure are generally in good condition per visual observation. It should be noted that the WRF interior asphalt-paved roadway has been partially excavated and patched in various locations during construction of the improvements completed in 2017 and 2019. This has resulted in a non-homogeneous and less durable surface. It is recommended to grind and overlay the asphalt to provide a homogeneous and durable finished surface. No other known capital improvements are needed for these facilities during the planning period.

SUMMARY OF DEFICIENCIES

This section describes deficiencies identified through the WRF existing facilities evaluation and review of unit capacities relative to projected flow and loading during the planning period. For the purposes of this GSP, it is assumed that there are two primary categories of capital improvements:

- Major capital improvements that present multiple options for improvements and necessitate a thorough alternatives analysis; and
- Minor capital improvements consisting of repair, rehabilitation, or in-kind equipment replacement projects that do not require an alternatives analysis.

A summary list of capital improvements identified in this chapter is as follows:

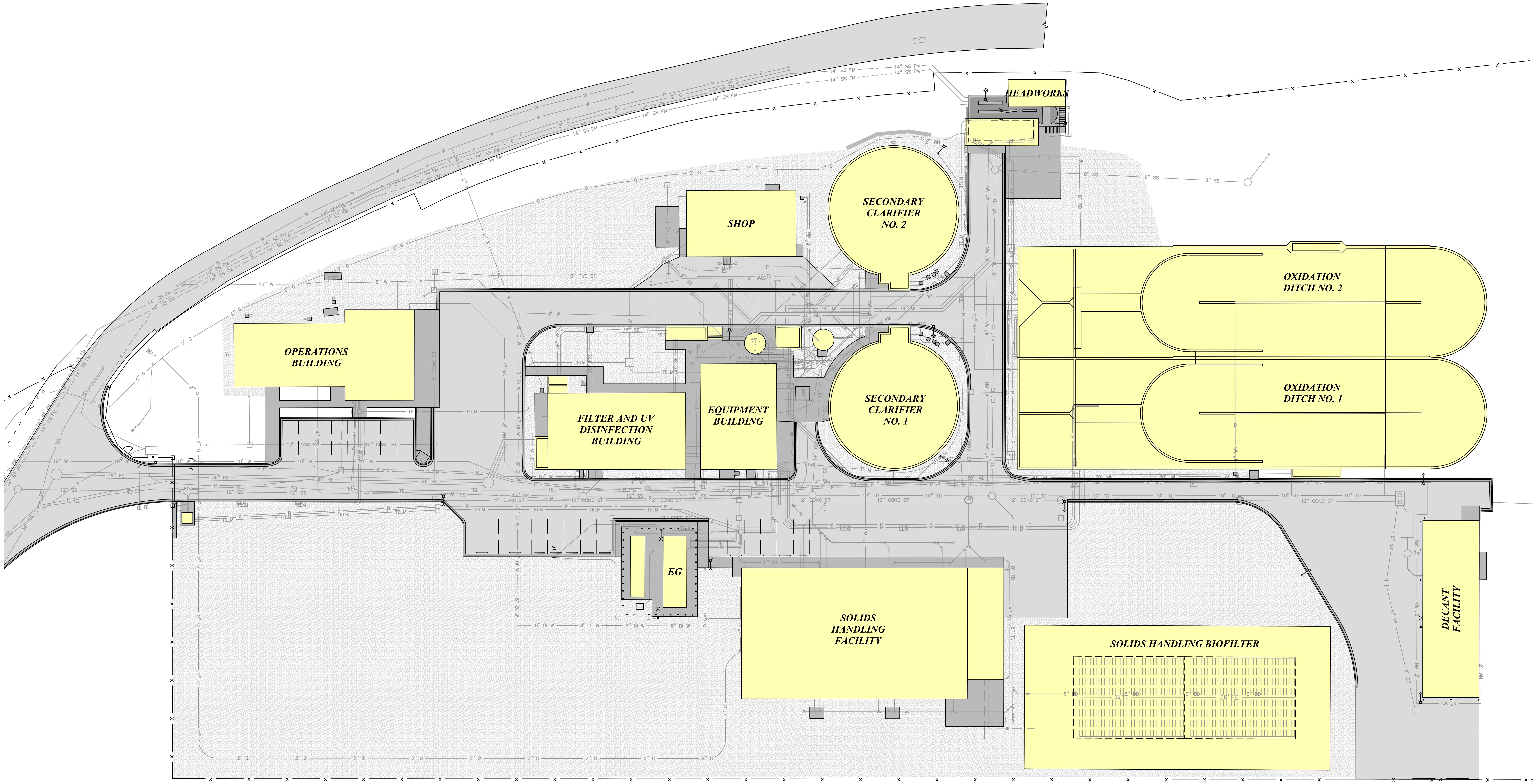
Major Improvements

- Oxidation ditches improvements.
- Third secondary clarifier (as it relates to the oxidation ditches improvements).
- Reclaimed water filters replacement.

Minor Improvements

- Headworks grit paddle drive replacement and grit chamber improvements.
- Existing secondary clarifier improvements.
- Non-potable water pump station replacement.
- Backup centrifuge rebuild.
- WRF site road grind and overlay.

Alternatives analysis for major capital improvements are presented and analyzed in **Chapter 8**, and the recommended improvements for each preferred alternative are identified in **Chapter 9**. All the minor capital improvements that do not necessitate alternatives analyses are listed in **Chapter 9** and discussed in the capital improvement projects in **Chapter 11**.



EXISTING WRF OVERALL SITE PLAN

1" = 30'

CITY OF SNOQUALMIE
GENERAL SEWER PLAN

FIGURE 7-1: EXISTING WRF OVERALL SITE PLAN

ENGINEER: ALZ | SAVE DATE: May 20, 2020 | CLIENT: SNQ | JOB NO.: 118-083
REVIEWED: SMK | PLOT DATE: May 20, 2020 | FILENAME: WWFP-E-WRF_2019.DWG

REVISIONS

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0" 1" 2"

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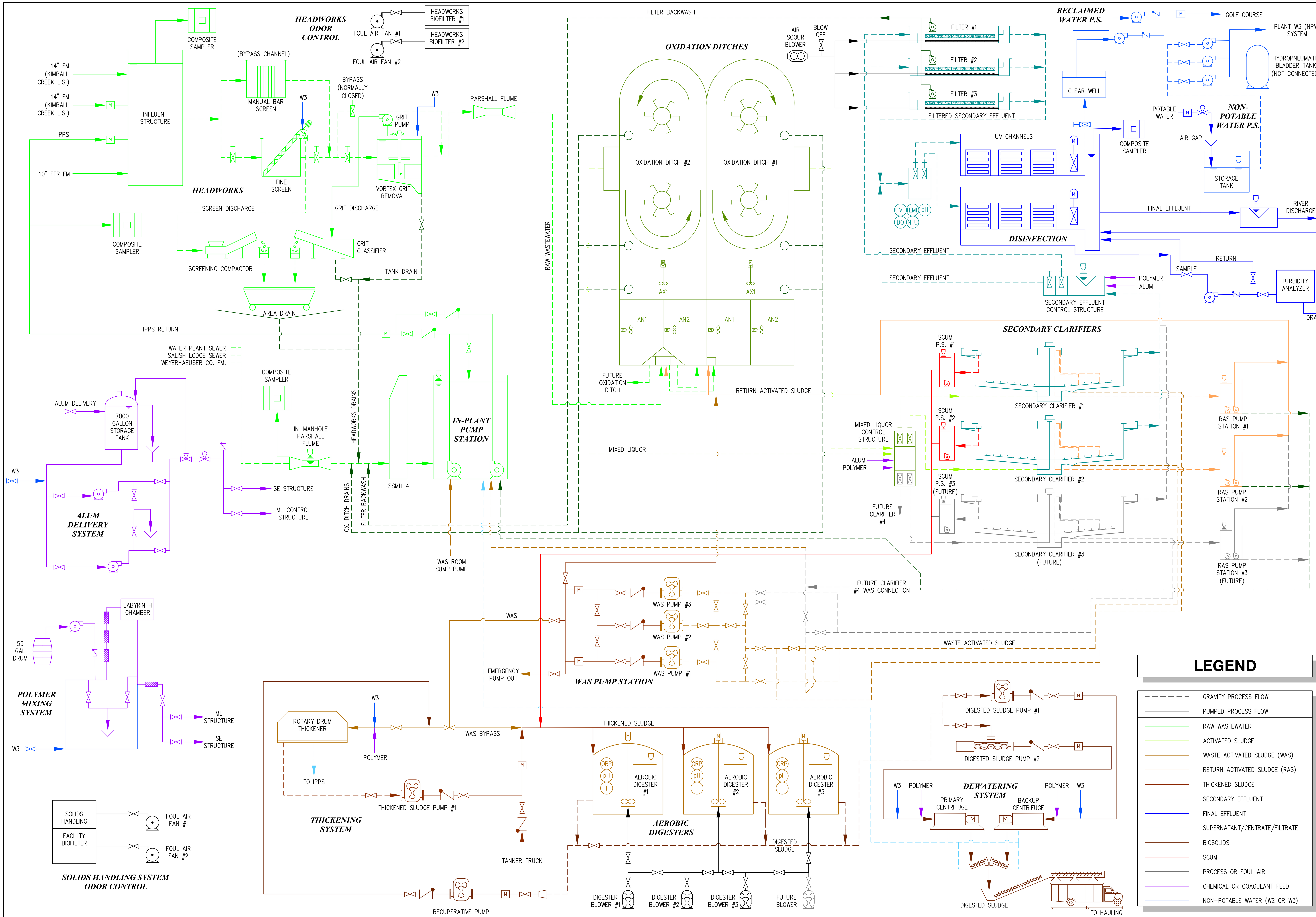
SHEET NO.: --



RH2

CITY OF SNOQUALMIE
GENERAL SEWER PLAN

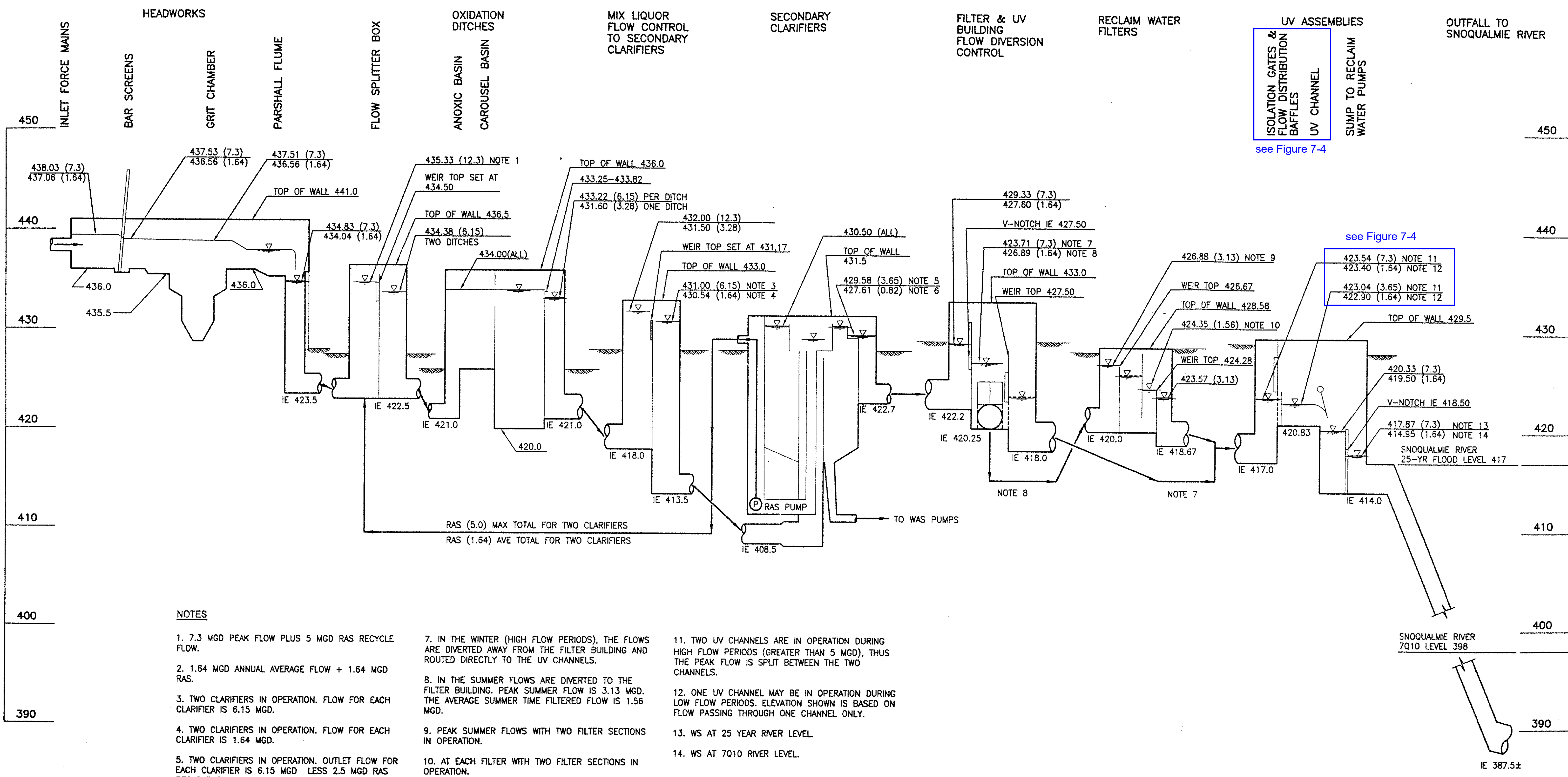
FIGURE 7-2: EXISTING WRF PROCESS SCHEMATIC

REVISIONS

ENGINEER: ALZ | REVIEWED: SMK | SAVE DATE: May 20, 2020 | PLOT DATE: May 20, 2020 | CLIENT: SNQ | FILENAME: WWFP-E-SCHEM_EX.DWG | JOB NO.: 118-083

NO. | DATE | DESCRIPTION | BY | REVIEW

DWG NO.: -- | SHEET NO.: --



NOTES

1. 7.3 MGD PEAK FLOW PLUS 5 MGD RAS RECYCLE FLOW.

2. 1.64 MGD ANNUAL AVERAGE FLOW + 1.64 MGD RAS.

3. TWO CLARIFIERS IN OPERATION. FLOW FOR EACH CLARIFIER IS 6.15 MGD.

4. TWO CLARIFIERS IN OPERATION. FLOW FOR EACH CLARIFIER IS 1.64 MGD.

5. TWO CLARIFIERS IN OPERATION. OUTLET FLOW FOR EACH CLARIFIER IS 6.15 MGD LESS 2.5 MGD RAS RECYCLE FLOW.

6. TWO CLARIFIERS IN OPERATION. OUTLET FLOW FOR EACH CLARIFIER IS 1.6 MGD LESS 0.82 MGD RAS RECYCLE FLOW.

7. IN THE WINTER (HIGH FLOW PERIODS), THE FLOWS ARE DIVERTED AWAY FROM THE FILTER BUILDING AND ROUTED DIRECTLY TO THE UV CHANNELS.

8. IN THE SUMMER FLOWS ARE DIVERTED TO THE FILTER BUILDING. PEAK SUMMER FLOW IS 3.13 MGD. THE AVERAGE SUMMER TIME FILTERED FLOW IS 1.56 MGD.

9. PEAK SUMMER FLOWS WITH TWO FILTER SECTIONS IN OPERATION.

10. AT EACH FILTER WITH TWO FILTER SECTIONS IN OPERATION.

11. TWO UV CHANNELS ARE IN OPERATION DURING HIGH FLOW PERIODS (GREATER THAN 5 MGD), THUS THE PEAK FLOW IS SPLIT BETWEEN THE TWO CHANNELS.

12. ONE UV CHANNEL MAY BE IN OPERATION DURING LOW FLOW PERIODS. ELEVATION SHOWN IS BASED ON FLOW PASSING THROUGH ONE CHANNEL ONLY.

13. WS AT 25 YEAR RIVER LEVEL.

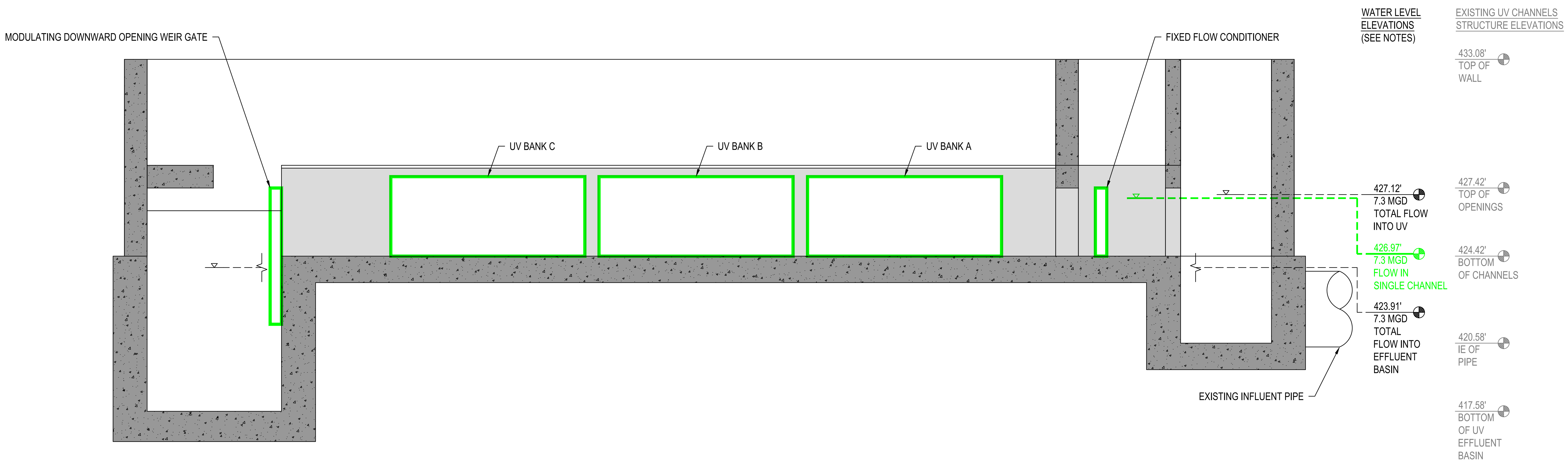
14. WS AT 7Q10 RIVER LEVEL.

File: 130047.ARC\O&M\FIG1.2-4 Date: MAR 22,2004 2:56:21 pm Scale: 1=1 Xrefs:

Tetra Tech/KCM, Inc.
1917 First Avenue
Seattle, Washington 98101
206-443-5300 Fax: 206-443-5372

City of Snoqualmie
OPERATION AND MAINTENANCE MANUAL

FIGURE 7-3: EXISTING WRF HYDRAULIC PROFILE



NOTES:
1. A SINGLE CHANNEL IS SHOWN IN THE PROFILE AND IS REPRESENTATIVE OF EACH UV CHANNEL (NO. 1 AND NO. 2).

2. PROPOSED IN-CHANNEL UV DISINFECTION SYSTEM EQUIPMENT AND DOWNSTREAM WEIR GATE FOR WATER LEVEL CONTROL ARE SHOWN SCHEMATICALLY.

PROPOSED UV DISINFECTION SYSTEM HYDRAULIC PROFILE

NOT TO SCALE

HYDRAULIC AND ELEVATION NOTES:
1. UPSTREAM AND DOWNSTREAM WATER LEVELS ARE FROM THE CITY OF SNOQUALMIE WASTEWATER TREATMENT PLANT PHASE 2 CONSTRUCTION RECORD DRAWINGS HYDRAULIC PROFILE (2002, TETRATECH/KCM, INC.) AND ARE SHOWN IN BLACK WITH THIN LINES. PROPOSED MAXIMUM WATER LEVEL CAPACITY ON THE UPSTREAM SIDE OF THE PROPOSED UV DISINFECTION SYSTEM EQUIPMENT IS SHOWN IN GREEN WITH A THICK LINE.

2. ALL ELEVATIONS SHOWN IN THIS DRAWING ARE BASED ON VERTICAL DATUM NAVD 88 (NGVD + 3.58'). CONSTRUCTION RECORD DRAWINGS SHOW ELEVATIONS BASED ON NGVD 29.

PROPOSED UV DISINFECTION SYSTEM DESIGN DATA

VALUES FROM PHASE 2 CONSTRUCTION RECORD DRAWINGS (SEE HYDRAULIC AND ELEVATION NOTES THIS SHEET)

SECONDARY EFFLUENT		RECLAIMED WATER	
WRF ANNUAL AVERAGE DAILY TOTAL FLOW	1.64 MGD	WRF RECLAIMED WATER AVERAGE FLOW	1.56 MGD
WRF AVERAGE DAILY TOTAL FLOW IN MAXIMUM MONTH	2.15 MGD		not used
WRF PEAK HOUR TOTAL FLOW	7.30 MGD	WRF RECLAIMED WATER PEAK FLOW	3.13 MGD
UV SYSTEM PEAK DESIGN FLOW	10 MGD (PER CHANNEL)	UV SYSTEM PEAK DESIGN FLOW	4.24 MGD (BOTH CHANNELS)
NUMBER OF CHANNELS	2	NUMBER OF CHANNELS	2
NUMBER OF MODULE BANKS	3 PER CHANNEL, 6 TOTAL	NUMBER OF MODULE BANKS	3 PER CHANNEL, 6 TOTAL
NUMBER OF MODULES PER BANK (PER CHANNEL)	9 (27)	NUMBER OF MODULES PER BANK (PER CHANNEL)	9 (27)
NUMBER OF LAMPS PER MODULE	6	NUMBER OF LAMPS PER MODULE	6
NUMBER OF LAMPS PER CHANNEL	162	NUMBER OF LAMPS PER CHANNEL	162
% UV TRANSMITTANCE	67.5	% UV TRANSMITTANCE	67.5
UV DOSE (MJ/cm^2)	30	UV DOSE (MJ/cm^2)	100

CITY OF SNOQUALMIE
WRF PHASE 1, NWTF AND CSF IMPROVEMENTS
SCHEDULE A: WRF UV DISINFECTION SYSTEM

FIGURE 7-4: EXISTING UV DISINFECTION SYSTEM HYDRAULIC PROFILE

RH2 ENGINEERS PLANNERS SCIENTISTS
RH2 ENGINEERING, INC. www.rh2.com 1.800.720.8052
BOTHELL, WA. 22722 29th Drive SE, Suite 210

SEAN MICHAEL KANE — SIGNED: 10/10/16
RICHARD L. BALLARD — SIGNED: 10/10/16

ENGINEER: SMK | REVIEWED: DJM | SAVE DATE: Oct 6, 2016 | PLOT DATE: Nov 1, 2018 | CLIENT: SNQ | FILENAME: WRWTF-D-05501.DWG | JOB NO.: 116-028

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW
A	3/12/18	CONFORMED FOR CONSTRUCTION RECORDS	JLH	MRJF

SCALE: SHOWN
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: G101 | SHEET NO.: 20 / 131

8 | TREATMENT FACILITY IMPROVEMENT ALTERNATIVES

INTRODUCTION

This chapter presents alternatives analyses performed for major capital improvements at the City of Snoqualmie's (City) Water Reclamation Facility (WRF). The major capital improvements address deficiencies identified in **Chapter 7** related to the existing oxidation ditches and the existing reclaimed water filters. Implementation of the recommended alternatives are further developed in **Chapter 9**. Minor capital improvements to address other deficiencies identified in **Chapter 7** consist of normal maintenance or in-kind replacements that do not warrant alternatives analyses and are presented in **Chapter 9**.

CRITERIA FOR ALTERNATIVES COMPARISON

Each alternatives analysis includes an initial screening of the alternative. Unless determined otherwise, the viable alternatives then are analyzed using the following criteria and scored for comparison. Where a criterion is broken into multiple categories, the points for that criterion are distributed as presented in the applicable sections that follow in this chapter.

1) The ability to meet water quality standards and treatment objectives and overall capacity afforded by the improvements (25 possible points possible).
2) Use of innovative and/or alternative technology (10 possible points possible).
3) Impacts to the environment and public acceptability (10 possible points possible).
4) Operational considerations, including operational flexibility and impacts to other processes (25 possible points possible).
5) Costs, including initial capital and recurring costs (30 possible points possible).

For each criterion, a higher score represents the more desirable alternative (i.e. highest capacity, most innovative, lowest cost, etc.). The most desirable alternative is the one with the highest score out of the 100 total possible points.

OXIDATION DITCHES ALTERNATIVES

Available Alternatives to Achieve Process Objectives

The following alternatives are identified for initial screening and evaluation by the City with regard to meeting the established biological treatment process objectives identified in **Chapter 7**:

1) Alternative 1 – No action.
2) Alternative 2 – Construct a third oxidation ditch and upgrade the existing oxidation ditches.

   In this alternative, a third oxidation ditch would be constructed. The third ditch would be outfitted with aeration and recycle equipment that can meet the process objectives. Additionally, the existing two oxidation ditches would be retrofitted with similar aeration and recycle equipment.

3) Alternative 3 – Convert the existing two oxidation ditches to plug flow reactors.

   In this alternative, each oxidation ditch would be converted to a plug flow reactor designed for nitrification and denitrification (NdN) and enhanced biological phosphorus removal (EBPR). The conversion would be implemented by partitioning each ditch into multiple aerobic zones with diffused aeration and a pumped internal recycle system.

Alternative 1 (No action) will limit the ability of the City to meet the National Pollutant Discharge Elimination System (NPDES) permit requirements at the projected flow and loading conditions presented in **Chapter 4**. This would lead to permit violations based on effluent water quality. As such, this alternative is not viable and has been eliminated from consideration.

Alternatives 2 and 3 are viable and further analyzed herein.

Summary of Proposed Improvements

Alternative 2 – Third Oxidation Ditch

A third oxidation ditch similar to the existing two would be necessary to provide capacity for the planned growth. Parallel operation of multiple ditches, when flow and loading conditions require, will be maintained with the addition of the third ditch. The third ditch will be approximately identical to the existing two ditches in terms of size and configuration. However, for the third ditch, both aerators would be operated on variable frequency drives (VFDs), and dissolved oxygen (DO) monitoring equipment would be installed in the ditch as feedback for controlling the aerators. An internal recycle pump would be installed with a flow meter for use in accurately returning recycle flow relative to the influent flow rate.

To address deficiencies with the existing oxidation ditches, it is recommended that this alternative also include complete replacement of all aerators at the existing two oxidation ditches. This equipment is aging, and new aerators would be driven by VFDs for improved DO control and include the dual-impeller design and pumped lubrication system. It also is recommended that this alternative include the addition of an internal recycle pump for each existing ditch to replace the manually adjustable vane gate. In addition to addressing existing deficiencies, these improvements would allow the existing ditches to be outfitted with similar equipment to the new third oxidation ditch, allowing for consistency in equipment across the three ditches.

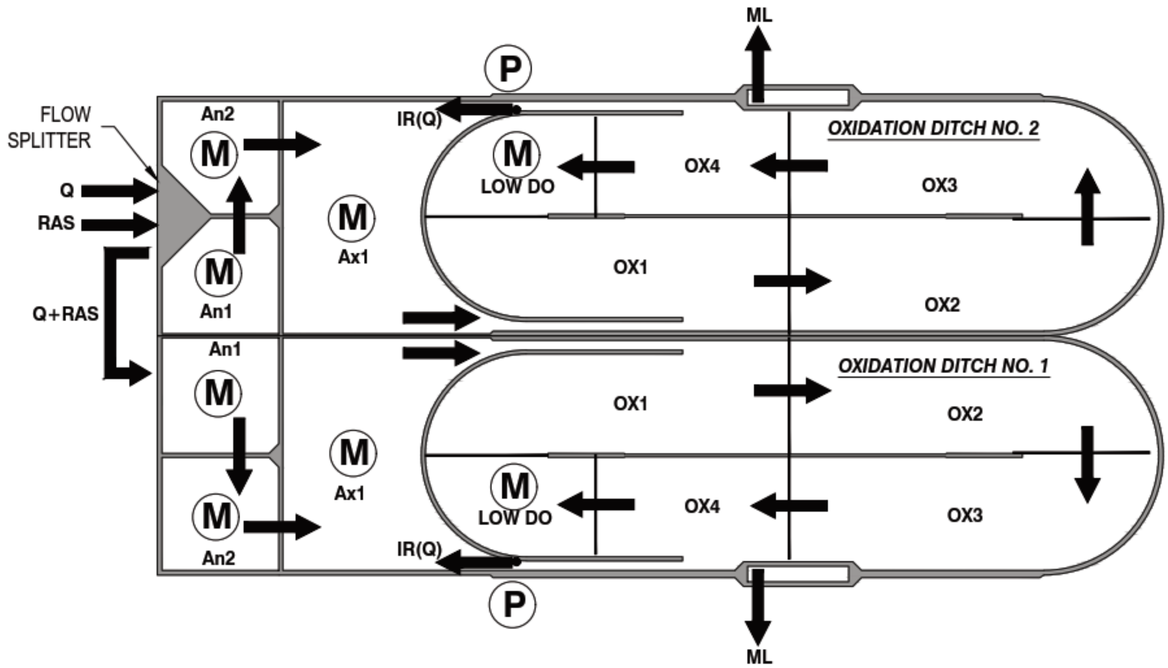
Alternative 3 – Plug Flow Conversion

Computational Modeling

BioWin® modeling software was used to analyze multiple potential configurations that could be used to convert the existing oxidation ditches to plug flow reactors. Converting the existing ditches to plug flow reactors was shown to increase the capacity of biological treatment within the existing footprint while achieving the other process objectives. **Figure 8-1** illustrates the preferred configuration of two parallel plug flow reactors converted within the footprint of the existing two parallel oxidation ditches.

Figure 8-1

Preferred Configuration for Converting the Existing Oxidation Ditches to Plug Flow Reactors



With the configuration shown in **Figure 8-1**, the existing anaerobic (An) and anoxic (Ax) zones will remain largely unchanged. Most of the changes will be related to partitioning the aerobic closed loop portion of the ditch into multiple aerobic zones (Ox1 through Ox4) and a final aerobic (Low DO) zone.

Table 8-1 shows the BioWin model results for simulations at the 2030 and 2040 maximum month average flows of 2.3 million gallons per day (MGD) and 2.6 MGD, respectively. This modeling was completed prior to finalization of projections with the Snoqualmie Casino (Casino) expansion, and as such, does not include the full projections shown in **Chapter 4**. However, these values are close to the final projections with the Casino expansion, and the model results provided in this chapter are sufficient for the purposes of analyzing secondary treatment alternatives.

Table 8-1

BioWin Model Results for the Proposed Plug Flow Reactor Configuration

WRF Maximum Month Average Flow (MGD)	WRF Maximum Month Average BOD (ppd)	SRT (days)	Temperature (°C)	MLSS (mg/L)	Effluent NH3-N (mg/L)	Clarifier SLR (ppd TSS/sf) No. of Clarifiers	
						1	2
Single Train Operation							
2.3	5,700	7	17	3,700	<0.3	32.0	16.0
2.3	5,700	10	15	5,000	<0.3	43.0	22.0
2.6	6,400	7	17	4,200	<0.3	41.0	20.0
2.6	6,400	10	15	5,600	<0.3	54.0	27.0
Dual Train Operation							
2.3	5,700	7	17	1,900	<0.3	16.0	8.0
2.3	5,700	10	17	2,500	<0.3	22.0	11.0
2.6	6,400	7	17	2,100	<0.3	21.0	10.0
2.6	6,400	10	17	2,900	<0.3	28.0	14.0

*Flow rounded to nearest 0.1 MGD; BOD and TSS to nearest 100 ppd; MLSS to nearest 100 mg/L; and SLR to nearest 1.0 ppd/sf
*Initial BioWin modeling was completed for the alternatives analysis prior to the expansion request by the Casino and are slightly different from the final projections shown in **Chapter 4**.

The table shows model simulations at varied mixed liquor temperatures and corresponding solids retention times (SRTs) necessary to achieve full nitrification, as evidenced by the reported effluent ammonia of less than 0.3 milligrams per liter (mg/L) for each dynamic simulation. The model simulations predict the mixed liquor suspended solids (MLSS) concentration for each loading condition as shown in the table. Using the influent flow rate, return activated sludge (RAS) flow rate, MLSS concentration, and operating clarifier surface area, the model calculates the clarifier solids loading rate (SLR) for each simulation as shown in the table.

Each of the model simulations shown in **Table 8-1** would provide the necessary treatment capacity for BOD reduction and provide full nitrification as discussed further in **Chapter 9**. For the flow and loading shown, this level of treatment could be provided in either one or two plug flow reactors. However, a higher mixed liquor concentration is required to provide treatment at increased BOD loading and/or increased SRT. The increased MLSS correspondingly increases the SLR to the clarifier(s) as shown in the table.

As discussed in **Chapter 7**, the clarifier SLR is often the limiting factor in terms of capacity for an activated sludge system. The settleability of the mixed liquor determines the acceptable SLR for the clarifiers. The typical average SLR design value of 25 pounds per day per square foot (ppd/sf) for the average of the maximum month correlates to an assumed sludge volume index (SVI) of approximately 150 milliliters per gram (mL/g). A new plug flow reactor is expected to achieve lower SVIs, on the order of 75 mL/g, which would be typical of other well performing plug flow reactors of similar configurations. Without being able to predict the future SVI, an acceptable average SLR to the secondary clarifiers may be assumed to be 35 to 40 ppd/sf for the average of the maximum month.

Reviewing the single train scenarios in **Table 8-1**, a single clarifier could potentially provide adequate solids loading capacity up to the 20-year projected, 17 degrees Celsius, and 7-day SRT simulations. Single train operation at the 10-year projected, 17 degrees Celsius, and 7-day SRT condition may slightly exceed the necessary SLR for single clarifier operation. In the near term, it is likely that a single plug flow reactor and single clarifier would provide adequate capacity for the majority of the City's operational conditions. For planning purposes, the third clarifier necessary to provide redundancy during two clarifier operation is not expected to be needed before 2030. Beyond 2030, two clarifier operation may be periodically necessary pending the SVI achieved by the plug flow reactors. If this is the case, the third clarifier necessary to provide redundancy during two clarifier operation should be constructed. Infrequent exceedance of the recommended SLR range also could be mitigated by operating two plug flow reactors in parallel with a single clarifier.

It may be found that the new system reliably achieves an SVI better than 75 mL/g, and as such, increased SLRs may be acceptable. In this case, construction of the third clarifier may be further delayed. These conditions also are shown in **Table 8-1**.

A detailed review of the BioWin modeling for the proposed plug flow reactor configuration is included in **Chapter 9**.

Plug Flow Reactor Components

Partitioning the existing oxidation ditch likely will consist of cast-in-place concrete walls that allow for forward flow through the reactor over the top of each partition wall. The existing aerators will be removed. A submersible recycle pump will recirculate flow from the final aerobic (Low DO) zone to the anoxic zone.

Outfitting of the aerobic zones will include a diffused aeration grid mounted to the floor of each aerated zone. A Low DO zone will include diffused aeration equipment and a mixer. The operational strategy for the Low DO zone will be to maintain a low DO to minimize DO in the internal recycle stream. In addition to the recycle pump, the last zone will include equipment to facilitate surface wasting. The existing ditch structure would remain largely unchanged, with the major additions being partition walls, new equipment, and access platforms to the new equipment.

The diffused aeration system will require new aeration blowers. These likely will be housed in a new building located to the south of the existing ditches. This building also would house the electrical equipment necessary for operating the new blowers and other equipment associated with the plug flow reactors. The building also may house pumps for transferring sludge removed via the surface wasting devices to the existing solids handling system.

Alternatives Analysis

Water Quality Standards and Overall Capacity (25 points possible)

Treatment Objectives and Level of Treatment (15 points possible)

Both the new and retrofitted oxidation ditches or new plug flow reactors will reliably meet the NDPES permit effluent limits. If implemented, upgrades to the existing oxidation ditch aerators and internal recycle systems should combat the growth of filamentous bacteria and likely increase the stability of the NdN and EBPR processes. The new plug flow reactors are expected to provide stable

NdN and EBPR processes with increased mixed liquor settleability compared to the oxidation ditches.

Alternative 2 receives 13 points for this category

Alternative 3 receives 15 points for this category

Activated Sludge System Capacity (10 points possible)

The oxidation ditches would require a larger footprint and more secondary clarifier area to provide the same approximate capacity as the plug flow reactors. The plug flow configuration allows for increased microbial growth kinetics, allowing higher biological treatment within the same footprint as an oxidation ditch. It also produces a mixed liquor with better settling characteristics. As such, three oxidation ditches (two online and one redundant offline) operating in parallel are generally required to match the capacity and redundancy provided by two parallel plug flow reactors (one online and one redundant offline). Three oxidation ditches also require a third secondary clarifier to be constructed immediately to provide capacity and redundancy (minimum of one redundant offline clarifier) at current flows, whereas two plug flow reactors allow for growth within the capacity and redundancy provided by the existing two secondary clarifiers.

Alternative 2 receives 5 points for this category

Alternative 3 receives 10 points for this category

Innovative and Alternative Technology (10 points possible)

For the City, an additional oxidation ditch represents an extension of the status quo for meeting the stated process objectives. However, converting the City’s existing oxidation ditches to plug flow reactors represents an innovative and alternate approach to achieving the City’s process objectives while increasing capacity within the existing footprint. Additionally, a plug flow reactor can implement the ultrafine bubble diffusers, which exhibit the highest oxygen transfer efficiencies for this application relative to other options. Surface wasting can be included in the last zone of the reactor to provide additional selective pressure against filamentous bacteria and other organisms with poor settling characteristics, which increases the settleability of the mixed liquor and maximizes secondary clarifier capacity.

Alternative 2 receives 0 points for this category

Alternative 3 receives 10 points for this category

Environmental Impacts and Public Acceptability (10 points possible)

Construction (2 points possible)

The third oxidation ditch would be located north of the existing two oxidation ditches. The exact location of the ditch would be determined during final design. The construction of the ditch would require removal of existing trees and reconfiguration of some drainage pathways within the existing WRF footprint. The construction of the ditch also will require significant earthmoving and structural work.

The conversion to plug flow reactors would consist of structural and mechanical construction contained within the existing oxidation ditch structures. A separate building would be constructed south of the existing ditches to house new electrical and mechanical equipment, but the footprint of this building would be substantially less than that of a third oxidation ditch.

Alternative 2 receives 1 point for this category

Alternative 3 receives 2 points for this category

Operations – Energy Usage (3 points possible)

The mechanical aerators of the oxidation ditches transfer oxygen less efficiently than the diffused aeration system provided in a plug flow reactor. Further, the configuration of an oxidation ditch provides less ability for the operator to reliably match oxygen transfer to aeration demand, increasing the likelihood of over-aeration occurring within the ditches. The plug flow reactor would consist of multiple aerobic zones with varied aeration diffuser densities, as well as automated aeration valves and DO feedback for each aerobic zone. These conditions, in conjunction with multiple blowers operated with VFDs, allow a plug flow reactor to more closely match aeration to demand, reducing overall energy usage relative to the oxidation ditch configuration.

Alternative 2 receives 1 point for this category

Alternative 3 receives 3 points for this category

Operations – Air Emissions (2 points possible)

Both the oxidation ditch configuration and the plug flow reactor configuration will foster NdN and EBPR processes. Both alternatives are expected to be low in odor and other air emissions.

Alternative 2 receives 2 points for this category

Alternative 3 receives 2 points for this category

Impacts to Public (3 points possible)

Operation of either the oxidation ditches or plug flow reactors is not expected to have substantial impacts to the public via odor or other parameters typical of domestic wastewater treatment plants. The aerators of the oxidation ditches produce more noise than the plug flow reactor configuration, which would include aeration blowers likely housed in a building allowing for sound attenuation.

Alternative 2 receives 2 points for this category

Alternative 3 receives 3 points for this category

Operational Considerations (25 points possible)

Operational Flexibility and Ease of Operation (15 points possible)

The new and retrofitted oxidation ditches will operate largely automatically, with a DO feedback loop for aerator control and automated internal recycle pumping to accurately pace the influent rate. The most significant operational complication is related to the capacity of a single oxidation ditch. Two oxidation ditches in parallel will be required to operate most of the time, with the third ditch offline for redundancy. The operation of two ditches increases the operations and maintenance (O&M) required.

A single plug flow reactor could provide capacity to treat the flow and loading projections in **Chapter 4**. Plug flow reactor operation will present less total tankage volume requiring periodic cleaning and maintenance, but will require monitoring and maintenance of additional equipment related to the blowers, diffuser systems, actuated aeration valves, and surface wasting equipment. As a result, the plug flow reactor likely will present similar recurring annual costs for O&M labor as the oxidation ditches. However, the staged aeration provided by a plug flow reactor will allow for increased flexibility in operation compared to an oxidation ditch should the influent characteristics change in the future.

Alternative 2 receives 10 points for this category

Alternative 3 receives 15 points for this category

Impacts to Existing Solids Handling System (10 points possible)

Solids are currently wasted intermittently from the existing secondary clarifier waste activated sludge (WAS) hopper and thickened prior to the existing aerobic digesters. The City achieves good concentrations of the WAS via the hopper and routinely achieved 1- to 1.5-percent thick WAS prior to thickening. The WAS and thickening process is largely automated, reducing operational time for this process. However, high SVIs and poor settling make the estimation of solids retention time more difficult and can complicate the process control.

As part of the plug flow reactor configuration, wasting from the surface of the reactor will be implemented to provide an additional selective pressure against filamentous bacteria growth. A portion of the total wasting will be from the surface of the reactor, reducing the amount of wasting required from the settled sludge in the secondary clarifiers. The sludge generated from surface wasting likely will have concentrations similar to the mixed liquor and require thickening prior to discharging to the aerobic digesters. As such, a transfer pumping system will blend the surface waste sludge with conventional WAS upstream of the thickener. Though this process will be automated, it represents an additional solids handling component.

Alternative 2 receives 7 points for this category

Alternative 3 receives 7 points for this category

Costs (30 points possible)

Capital Costs (15 points possible)

Table 8-2 shows the estimate of probable capital costs for Alternative 2.

Table 8-2

Estimate of Probable Capital Costs for Alternative 2 – Third Oxidation Ditch

Description	Cost
Third Oxidation Ditch	**$4,810,000**
Mobilization and Demobilization	$470,000
Site Work and Site Utilities	$590,000
Structural	$1,830,000
Mechanical	$910,000
Electrical	$670,000
Automatic Control	$340,000
Existing Oxidation Ditches Improvements	**$2,030,000**
Replace All Existing Aerators	$1,890,000
Internal Recycle System Improvements	$140,000
Third Secondary Clarifier	**$2,430,000**
Mobilization and Demobilization	$160,000
Site Work and Site Utilities	$1,060,000
Structural	$360,000
Mechanical	$530,000
Electrical	$230,000
Automatic Control	$90,000
Subtotal Probable Construction Cost	$9,270,000
Planning-Level Contingency (20%)	$1,860,000
Sales Tax (8.6%)	$960,000
Total Probable Construction Cost	$12,090,000
Engineering Services (30%)	$3,630,000
City Project Administration (15%)	$1,820,000
Total Probable Capital Cost	**$17,540,000**

The urgent need for a third secondary clarifier requires the costs for those improvements to be included in the full project cost of the third oxidation ditch as shown in **Table 8-2**. Additionally, replacement of the existing ditch aerators and improvements to the existing internal recycle systems are necessary to improve ditch operations and must be included in the total capital cost for this project to be comparable to a plug flow conversion.

Table 8-3 shows the estimate of probable capital costs for Alternative 3.

Table 8-3

Estimate of Probable Capital Costs for Alternative 3 – Plug Flow Conversion

Description	Cost
Mobilization and Demobilization (10% of Total)	$380,000
Site Work and Site Utilities	$160,000
Oxidation Ditch No. 1 Improvements	$750,000
Oxidation Ditch No. 2 Improvements	$750,000
Blower Building	$1,240,000
Electrical	$580,000
Automatic Control	$290,000
Subtotal Probable Construction Cost	$4,150,000
Planning-Level Contingency (20%)	$830,000
Sales Tax (8.6%)	$430,000
Total Probable Construction Cost	$5,410,000
Engineering Services (30%)	$1,630,000
City Project Administration (15%)	$820,000
Total Probable Capital Cost	**$7,860,000**

The following apply to the estimate of probable capital costs for each alternative:

- All costs are in 2019 dollars.
- Primary cost items have been rounded to the nearest $10,000.
- Engineering Services is estimated as a percentage of the Total Probable Construction Cost based on experience with projects of similar size and complexity.
- City Project Administration costs are estimated at 15 percent of the Total Probable Construction Cost, as defined by the City.
- It is assumed that all improvements will be completed as a single, standalone project.

The lowest cost alternative, Alternative 3, has an estimated project cost of $7.86 million. Alternative 2 has an estimated project cost of $17.54 million.

Alternative 2 receives 6 points for this category

Alternative 3 receives 15 points for this category

Recurring Costs (15 points possible)

Generally, the major recurring annual costs for different biological treatment processes are related to O&M, such as:

- Electrical service costs for operating the aeration systems;
- Any required chemical addition for process control; and
- Labor.

It is likely that the energy usage for the aeration system will be lower for the plug flow reactors than the oxidation ditches due to the increased oxygen transfer and ability to match aeration to demand in the reactors. From a standpoint of ranking these alternatives, the relative difference of aeration system efficiency is largely accounted for in other alternatives comparison criteria and is not additionally counted here.

Neither the oxidation ditches nor the plug flow reactors are expected to require any chemical addition specific to the process. As previously discussed in the **Operational Flexibility and Ease of Operation** category, it is expected that the O&M labor necessary for each alternative is similar.

The O&M costs for each alternative are anticipated to be substantially similar; therefore, estimated O&M and life-cycle costs are not calculated.

Alternative 2 receives 15 points for this category

Alternative 3 receives 15 points for this category

Scoring of Alternatives

Table 8-4 shows a summary of the points scored by each alternative for the comparison criteria and the resulting total scores.

Table 8-4

Oxidation Ditches Alternatives Comparison Scoring Summary

Analysis Criteria	Alt. 2	Alt. 3
Water Quality Standards and Overall Capacity (25 points possible)	**18**	**25**
Treatment Objectives and Level of Treatment (15 points possible)	13	15
Activated Sludge System Capacity (10 points possible)	5	10
Innovative and Alternative Technology (10 points possible)	**0**	**10**
Environmental Impacts and Public Acceptability (10 points possible)	**6**	**10**
Construction (2 points possible)	1	2
Operations - Energy Usage (3 points possible)	1	3
Operations - Air Emissions (2 points possible)	2	2
Impacts to Public (3 points possible)	2	3
Operational Considerations (25 points possible)	**17**	**22**
Operational Flexibility and Ease of Operation (15 points possible)	10	15
Impacts to Existing Solids Handling System (10 points possible)	7	7
Costs (30 points possible)	**21**	**30**
Capital Costs (15 points possible)	6	15
Recurring Costs (15 points possible)	15	15
Total Score	**62/100**	**97/100**

Based on this alternatives analysis, which culminates in the total scores of the alternatives as shown, Alternative 3 is recommended to the City for implementation.

RECLAIMED WATER FILTERS ALTERNATIVES

Design Criteria for Alternatives

Preliminary design criteria have been established for sizing new reclaimed water filter systems in this alternatives analysis. **Table 8-5** shows the preliminary design criteria, along with notes to identify the source or reason for each criterion. Refer to **Chapter 2** for a presentation of the City's NPDES permit and **Chapter 7** for the existing reclaimed water filters design.

Table 8-5

Reclaimed Water Filter Systems Preliminary Design Criteria for Alternatives Analysis

Parameter			Notes
Reclaimed Water Production Flow Rates (into Filters)			
Average Dry Weather Flow at Build-Out	1.04	MGD	Refer to the 2015 Engineering Report[1]
Design Maximum Month Average Flow	1.56	MGD	City NPDES Permit Outfall No. 002 Limit
Design Maximum Day Flow	3.13	MGD	Match existing and UV disinfection system
Design Peak Hour Flow	4.24	MGD	Match UV disinfection system
Design Peak Instantaneous Flow	5	MGD	Refer to the 2015 Engineering Report[1]
Filters Inlet Water Quality (from Secondary Clarifiers)			
Historical Average (of Daily Maximums) Turbidity	2.05	NTU	1/2014 to 8/2019 City Discharge Monitoring Reports (DMR) data
Historical Typical Maximum Turbidity	5	NTU	1/2014 to 8/2019 City Discharge Monitoring Reports (DMR) data
Historical Maximum Turbidity	20	NTU	1/2014 to 8/2019 City Discharge Monitoring Reports (DMR) data
Historical Average Daily TSS	4.05	mg/L	1/2014 to 8/2019 City Discharge Monitoring Reports (DMR) data
Typical Maximum Daily TSS	15	mg/L	1/2014 to 8/2019 City Discharge Monitoring Reports (DMR) data
Maximum Daily TSS	30	mg/L	City NPDES Permit Average Monthly Limit[2]
Filters Outlet Water Quality			
Historical Average (of Daily Maximums) Turbidity	0.74	NTU	Existing filters, 1/2014 to 8/2019 City DMR data
Average Monthly Turbidity Limit	2	NTU	City NPDES Permit Outfall No. 002 Limit
Instantaneous Maximum Turbidity Limit	5	NTU	City NPDES Permit Outfall No. 002 Limit
Historical Average Daily TSS	2.34	mg/L	1/2014 to 8/2019 City DMR data
Historical Maximum Daily TSS	6	mg/L	1/2014 to 8/2019 City DMR data
Redundancy			
Duty filter(s) rated for design maximum month average flow			To meet the Filtration Reliability Guidelines of Table 6-6 in Ecology's *Reclaimed Water Facilities Manual* (a.k.a. the Purple Book)
Redundant backup filter to maintain duty filter(s) rating			
Alarm systems			

1 = This parameter and value are referred to in Chapter 2 of the 2015 Engineering Report for the UV disinfection system.

2 = This limit applies to Outfall No. 001 and Outfall No. 002.

Further explanation of the peak instantaneous flow is warranted. As discussed in **Chapter 7**, all flow to the WRF headworks is pumped. Although there is some flow attenuation between the headworks and the reclaimed water filters, flow through the WRF can drop or rise quickly. This was analyzed during preparation of ultraviolet light (UV) disinfection system improvements as documented in the 2015 *Snoqualmie Water Reclamation Facility Improvements Engineering Report* by RH2 Engineering, Inc. (2015 Engineering Report). The peak instantaneous value in **Table 8-5** is taken from that analysis and accounted for in the proposed improvements.

Available Alternatives to Replace Existing Filter Systems

The following alternatives are identified for initial screening and evaluation by the City with regard to replacing the existing reclaimed water filter systems as identified in **Chapter 7**:

1) Alternative 1 – No action.
2) Alternative 2 – Replace the existing filter systems with pile cloth media disk filter systems.

   In this alternative, the existing filter system in each reclaimed water filter basin will be removed and the basins will be modified, as necessary, for the new system. The new system will be installed in the existing basins, and flow will be driven through the disk filters by gravity. There are two options available for this alternative. The options are considered in this initial screening before selecting one for evaluation with the other alternative(s).
3) Alternative 3 – Replace the existing filter systems with hollow fiber ultrafiltration (UF) membrane systems.

   In this alternative, the existing filter system in each reclaimed water filter basin will be removed and the basins will be modified, as necessary, for the new system. There are two options available for this alternative. The options are considered in this initial screening before selecting one for evaluation with the other alternative(s).

Alternative 1 (No action) will result in increased O&M costs and staff labor to maintain aging equipment. Eventually, this alternative will limit the ability for the City to meet its NPDES permit requirements for reclaimed water production. As such, this alternative is not viable and has been eliminated from consideration.

Alternative 2 includes two options for initial consideration. For the alternatives analysis, pile cloth media disk filter systems from Aqua-Aerobic Systems, Inc. (Aqua-Aerobic) were used. Aqua-Aerobic offers both a disk filter and a variation titled the AquaDiamond®. Instead of disks, the AquaDiamond has horizontal laterals, which are an extruded diamond shape and fully covered with pile cloth media, that extend the length of the filter basin. It is similar to a traveling bridge type rapid sand filter system, in that pumps and drives are mounted on a platform that moves forward and backward over the laterals (power is provided by a festoon wire system). The existing basin dimensions are sufficient to fit two AquaDiamond filter systems meeting the design criteria. However, the capital cost is roughly three times that of the disk filter option and estimated consumable material costs are nearly twice as much. As such, the AquaDiamond option is eliminated from further consideration.

Alternative 3 includes two options for initial consideration. For the alternatives analysis, hollow fiber UF membrane systems from Evoqua Water Technologies (Evoqua) and another manufacturer were reviewed. Evoqua offers a pumped system (either pressurized or vacuum depending on the application). Another option, not offered by Evoqua, utilizes flow driven by gravity through the membranes. The existing basins are sufficient to fit three gravity flow membrane systems meeting the design criteria. However, the capital cost is greater than the other Evoqua option and without O&M cost savings. As such, the gravity flow membrane option is eliminated from further consideration.

Alternatives 2 and 3 are viable and further analyzed herein.

Summary of Proposed Improvements

Alternative 2 – Cloth Media Disk Filter Systems

All components of the existing filter systems within the basins and the blower room of the WRF Equipment Building will be removed. The existing basins will be modified internally to fit the proposed improvements.

Aqua-Aerobic offers multiple disk size options, the smallest one titled Aqua MiniDisk®. The depth of the existing basins structure necessitates the Aqua MiniDisk be used. Therefore, the larger disk options are not considered. Three disk filter systems (two duty and one redundant backup) will be installed in parallel within the existing filter basins for gravity filtration. Two duty systems are sized (combined) for the maximum month average flow. Hydraulically, the modified basins and two duty filters have capacity for both the peak hour flow and peak instantaneous flow. The backwash and solids waste pumps will be installed within the basins in dry chambers (separated from wet chambers by new internal walls). Only electrical and control equipment will be installed outside of the basins. Combined, the three disk filter systems, including the pumps and discharge piping, will fit within the space of one existing filter basin. Remaining space can be used for conveying flow into and out of the new filter systems, potential equalization to lessen flow spike impacts on filtration, and potential handling of solids wasting prior to conveyance to the In-Plant Pump Station (IPPS).

Flow drive by gravity will be conveyed through an inlet channel to each of the filters. Automated inlet gates will be installed at each filter to allow for isolation of individual filters. Filtered effluent will flow out over an effluent weir at each filter and into a combined outlet channel that will convey flow to the existing outlet channel (to convey flow to the existing UV disinfection system). The filters are backwashed by pumping filtered effluent (filtrate) in reverse through the pile cloth media. The backwash residuals will be wasted to the existing waste/basin drain that flows by gravity to the IPPS. In addition, winterization will be required when the systems are offline outside of the reclaimed water production season. Winterization requires draining the filter chambers and covering the filters to prevent UV ray damage from the sun.

A coagulant may be required and will need to be determined during pilot study testing. The City already has infrastructure in place, as polymer currently is used with the existing filter systems. The infrastructure can be re-used or modified as necessary.

Alternative 3 – Hollow Fiber Ultrafiltration Membrane Systems

All components of the existing filter systems within the basins and the blower room of the WRF Equipment Building will be removed. The existing basins will be modified internally to fit the proposed improvements.

Pressurized or vacuum pumping is available for this application and will require similar equipment. The main difference between the two is where the membranes are installed. For the pressurized option, the membranes will be skid-mounted outside of the filter basins. For the vacuum option, the membranes will be installed within the filter basins. The pressurized option will require a new building to install the membrane skids, pumps, air compressors/blowers, membrane cleaning chemical storage and feed systems, electrical and control equipment, and miscellaneous equipment. Supporting equipment for the vacuum option may be able to be installed within part of the existing filter basins and the existing blower room of the WRF Equipment Building, which is currently used for existing filter systems support equipment.

For both the pressurized and vacuum pumping options, the existing filter basins will be used. In the case of the pressurized option, they will be used for peak hour flow equalization. With three duty (and one redundant backup) systems in parallel and sized (combined) for the maximum month average flow, the system will use equalization for extra volume during peak hour flow. Piping will be routed to the feed pumps, which will convey pressurized flow through the membranes and additional piping to a discharge point upstream of the UV disinfection system. The vacuum pumping option uses two duty (and one redundant backup) systems in parallel and sized (combined) for the peak hour flow. They will all be installed within the existing filter basins. Remaining space in the basins can be used for pumping equipment (with internal wall modifications to create dry space) and/or equalization volume for peak instantaneous flow events.

For both options, the membranes are backwashed by pumping filtrate in reverse through the hollow fibers. The backwash residuals will be wasted to the existing waste/basin drain that flows by gravity to the IPPS. In addition, winterization will be required for both options when the systems are offline outside of the reclaimed water production season. Winterization requires pumping 5 to 10 mg/L of chlorinated water into the membranes (to soak the hollow fibers) and circulating the water monthly to re-chlorinate.

A coagulant will not be required for this alternative.

Alternatives Analysis

Water Quality Standards and Overall Capacity (25 points possible)

Both the disk filter and UF membrane systems will reliably meet the NPDES permit reclaimed water turbidity limits. Although total suspended solids (TSS) reduction is not required by the filters, both systems are capable of reducing TSS to similar, if not lower, levels than the existing filters. The smaller pore size of a UF membrane system results in the advantage of greater turbidity and TSS reduction in comparison to a pile cloth disk filter system.

Disk filter systems sized for the design criteria fit within the existing filter basins with basin modifications limited to removing and adding some internal walls and gates. The pumps and associated discharge piping will be installed in the basins as well. Excess room within the dimensions of the basins will be used for receiving and conveying inlet flow and conveying settled solids waste. The extent of the UF membrane system improvements outside of the basins depends on a pressurized versus vacuum pumping system; however, evaluation and scoring for those improvements is addressed in the **Costs** category. For either type of UF membrane system sized for the design criteria, the existing filter basins will be reused with basin modifications limited to removing and adding some internal walls and gates. Excluding improvements outside of the basins, both the disk filter systems and UF membrane systems provide similar flow rate capacities and redundancy, which meet the design criteria without the need to enlarge the basins or add additional basins.

Alternative 2 receives 20 points for this category

Alternative 3 receives 25 points for this category

Innovative and Alternative Technology (10 points possible)

Relative to the existing filter systems, disk filters and UF membranes offer innovative and alternative approaches for this application. Relative to each other, they each offer unique innovative and alternative features. The disk filter systems have a much smaller footprint and maintain gravity filtration. For the same flow rate capacity, the UF membrane systems provide higher contaminant removal performance. The disk filter systems may require a coagulant, whereas the UF membrane systems will not.

Alternative 2 receives 10 points for this category

Alternative 3 receives 10 points for this category

Environmental Impacts and Public Acceptability (10 points possible)

The extent of the UF membrane system improvements outside of the basins depends on a pressurized versus vacuum pumping system; however, evaluation and scoring for those improvements is addressed in the **Costs** category. Excluding improvements outside of the basins, both the disk filter system and UF membrane system provide similar flow rate capacities and redundancy that meet the design criteria without the need to enlarge the basins or add additional basins. Therefore, both the disk filter systems and UF membrane systems will require minimal impact to the site besides activities during construction. Neither new process will result in noticeably more noise, odors, or air emissions than those generated by operation of the existing filter systems.

The disk filter systems operate with gravity flow and will result in less energy usage compared to the UF membrane systems. Although the UF membrane systems will not require a coagulant like the disk filter systems may, the UF membrane systems do require storage (continuous) and use (intermittent) of hazardous chemicals for cleaning of the hollow fibers, including 12.5-percent sodium hypochlorite, 50-percent citric acid, and 50-percent sulfuric acid.

Alternative 2 receives 10 point for this category

Alternative 3 receives 5 points for this category

Operational Considerations (25 points possible)

Similar to the existing filter systems, operation of online disk filter system components and UF membrane system components will be automated. Either new process will include a dedicated control system that communicates with the WRF supervisory control and data acquisition (SCADA) system.

Like the existing filter systems, both the disk filter systems and UF membrane systems use filtrate to backwash. The disk filter system includes additional wasting to remove solids that settle within the filter system rather than getting stuck on the filter material and removed during backwashing. Compared to each other, the disk filter systems waste roughly 1.5 to 3 percent of the filtrate for backwashing and solids wasting, and the UF membrane systems waste roughly 5 to 7 percent of the filtrate for backwashing.

Compared to the disk filter systems, the UF membrane systems use more and larger support equipment (such as pumps and compressors) and include storage and use of more chemicals. This results in more City O&M labor time. Because the UF membrane systems require pumping in place of the previous gravity filtration process, a level of difficulty is added with the transition from gravity to pumping and pumping back to gravity (through the UV disinfection system).

Alternative 2 receives 20 points for this category

Alternative 3 receives 10 points for this category

Costs (30 points possible)

Table 8-6 shows a comparison of the supplier-provided equipment proposal costs, anticipated life of the media type for this application, and replacement costs of the media type for Alternatives 2 and 3. Due to the significantly higher costs shown for Alternative 3 (UF membrane systems), along with the fact that associated improvement capital costs and additional O&M costs will be higher for Alternative 3 compared to Alternative 2, further cost analysis is not necessary.

Table 8-6

Costs Comparison of Reclaimed Water Filters Alternatives 2 and 3

Costs Comparison Category	Alt. 2	Alt. 3[1]
New Filter Systems Equipment Proposal Cost	$500,000	$1,400,000 - $2,200,000
Future Filter Media Replacement		
Anticipated Life for this Application[2]	7 - 15 years	10 - 20 years
Replacement Material (Pile Cloth or Hollow Fibers) Estimated Cost	$30,000	$360,000 - $930,000

1 = Cost ranges for Alternative 3 are due to inclusion of both pressurized and vacuum pumping systems.

2 = Low end represents a year-round operated system and high end represents possible life for the City's seasonally operated system.

The following apply to the estimated costs for each alternative:

- All costs are in 2019 dollars.
- Primary cost items have been rounded to the nearest $10,000.

Alternative 2 receives 30 points for this category

Alternative 3 receives 8 points for this category

Scoring of Alternatives

Table 8-7 shows a summary of the points scored by each alternative for the comparison criteria and the resulting total scores.

Table 8-7

Reclaimed Water Filters Alternatives Comparison Scoring Summary

Analysis Criteria	Alt. 2	Alt. 3
Water Quality Standards and Overall Capacity (25 points possible)	20	25
Innovative and Alternative Technology (10 points possible)	10	10
Environmental Impacts and Public Acceptability (10 points possible)	10	5
Operational Considerations (25 points possible)	20	10
Costs (30 points possible)	30	8
Total Score	**90/100**	**58/100**

Based on this alternatives analysis, which culminates in the total scores of the alternatives as shown, Alternative 2 is recommended to the City for implementation.

9 | TREATMENT FACILITY RECOMMENDED IMPROVEMENTS

INTRODUCTION

This chapter identifies the selections of the preferred alternatives following the alternatives analyses presented in **Chapter 8**, presents all recommended capital improvements for the Water Reclamation Facility (WRF), and presents proposed flow and loading design criteria for the WRF based on the improvements. The capital improvements are grouped into two categories, major and minor, and address deficiencies as identified in **Chapter 7**. Each of the capital improvements is included in the City of Snoqualmie's (City) sewer system Capital Improvement Plan, which is presented in **Chapter 11**.

The following apply to the estimates of probable capital costs included in this chapter:

- All costs are in 2019 dollars.
- Primary cost items have been rounded to the nearest $1,000.
- Engineering Services is estimated as a percentage of the Total Probable Construction Cost based on experience with projects of similar size and complexity.
- City Project Administration costs are estimated at 15 percent of the Total Probable Construction Cost, as defined by the City.
- It is assumed that each capital improvement will be completed as a single, standalone project.

RECOMMENDED MAJOR CAPITAL IMPROVEMENTS

This section presents the implementation of the preferred alternative for each major capital improvement project presented in **Chapter 8**. It includes a discussion of the implementation of a third secondary clarifier, although this project may not be necessary until 2030 or beyond after the activated sludge basin improvements are completed.

Activated Sludge Basins Improvements

As presented in detail in **Chapter 8**, three alternatives were analyzed for improvements to the oxidation ditches to address deficiencies of the biological treatment process identified in **Chapter 7**. Based on the alternatives analysis, Alternative 3 provides the best approach for achieving the biological treatment process objectives. As such, it is recommended that the City convert the existing oxidation ditches to plug flow reactors in lieu of adding a third oxidation ditch, which also includes immediately constructing a third secondary clarifier.

This section presents the details for the proposed improvements to convert the existing two oxidation ditches to two plug flow reactors. The details are provided for the purpose of fulfilling the Washington State Department of Ecology's (Ecology) Engineering Report and facility plan requirements, which then can be followed by the City initiating final design as scheduled in **Chapter 11**.

BioWin Model Analysis

General

BioWin® is a wastewater treatment process simulator that ties together biological, chemical, and physical process models. The activated sludge process model used by BioWin and similar software programs is based on a set of mathematical equations and process state variables that were developed originally by a task group of the International Water Association.

For evaluation of the City's WRF capacity with the plug flow reactor conversion, the BioWin model was run using both steady-state and dynamic simulations based on anticipated diurnal flow and loading variations.

The key criteria used to determine WRF loading capacity in the model were as follows:

1. The solids retention time (SRT) must be sufficiently long at the design temperature to provide reliable nitrification.
2. Secondary clarifier hydraulic and solids loading rates must be within accepted design criteria based on the mixed liquor suspended solids (MLSS) predicted by the model for the design conditions.
3. The aeration system (blowers and diffusers) will provide sufficient oxygen transfer as calculated by the model under the design loading conditions when meeting the criteria described above.

The model has a feature that allows the user to select a specific SRT for a simulation. For a given SRT and aeration basin temperature, the model will calculate the corresponding effluent ammonia, mixed liquor suspended solids, oxic zone oxygen requirements, and the amount of waste activated sludge (WAS) produced. The model was run for two main operating conditions: 1) meeting the seasonal ammonia permit limit from August to October; and 2) removing one train from service for aeration diffuser maintenance on the offline train when nitrification is not required. The design temperature used for the nitrification condition was 17 degrees Celsius, and the effect of using one train or two trains for nitrification also was evaluated. The design temperature used for the single train operation during diffuser maintenance was 15 degrees Celsius. **Figures 9-1** and **9-2** display the model configuration with one and two treatment train(s) in operation, respectively.

Figure 9-1

BioWin Model Graphic with One Train in Operation

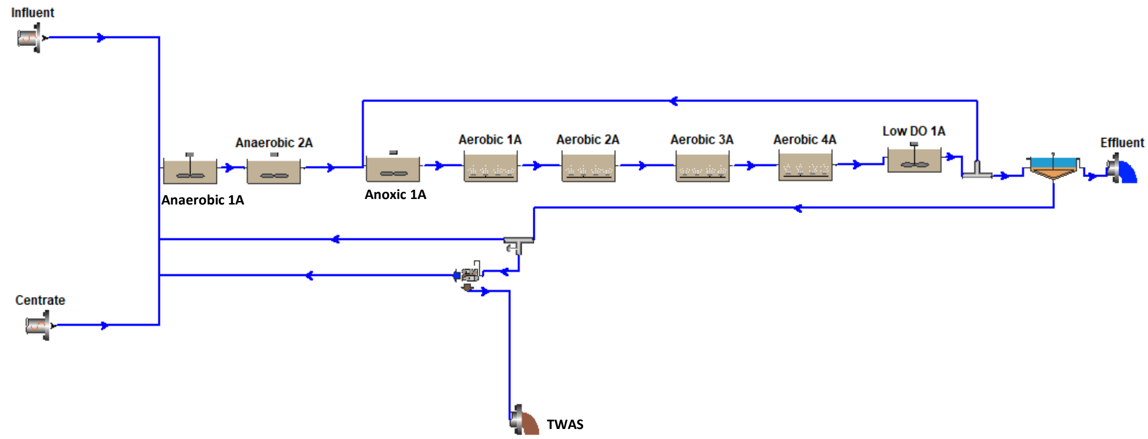
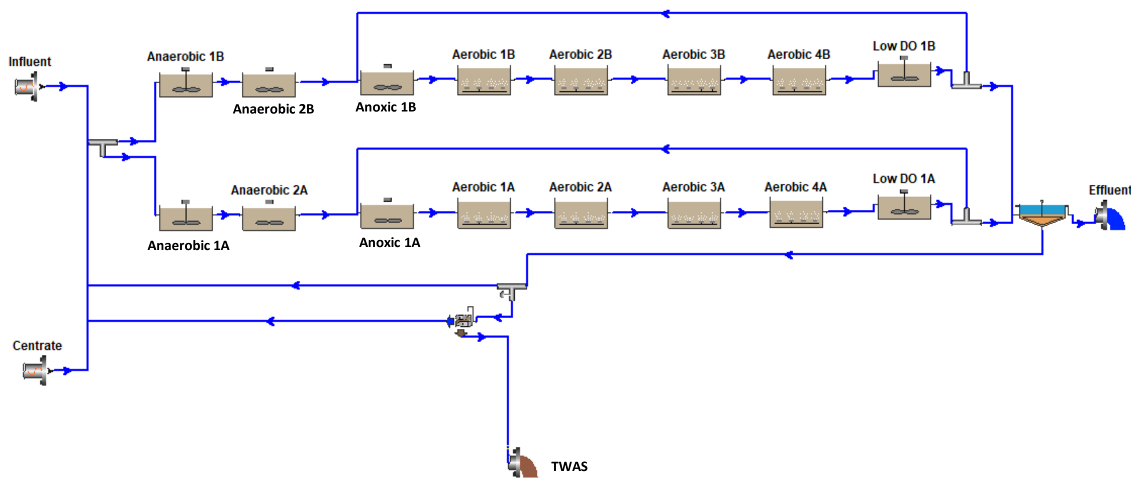


Figure 9-2

BioWin Model Graphic with Two Trains in Operation



WRF Influent and Sidestream Characteristics

Characteristics of the influent wastewater were input into the model as displayed in **Table 9-1**. The concentrations shown are calculated from the flow and loading projections in **Chapter 4**. It should be noted that total suspended solids (TSS) loading was conservatively projected as equal to biochemical oxygen demand (BOD); historically the influent BOD concentration has exceeded that of TSS. The total Kjeldahl nitrogen (TKN) concentration was estimated using a BOD to ammonia-nitrogen (NH3-N) ratio of 10 to 1 (based on historical data for the City) and a NH3-N to TKN ratio of 0.6 to 1 (based on generally accepted design values). The volatile suspended solids (VSS) concentration was estimated at approximately 85 percent of the influent TSS based on generally accepted design values. An average diurnal flow pattern was developed for the City's WRF and used with the average influent wastewater conditions for input to the model for the diurnal simulations. A typical municipal wastewater plant diurnal loading pattern was used with the average influent wastewater conditions input to the model for the diurnal simulations.

Table 9-1

Approximate Influent Modeled Characteristics (mg/L)

Parameter	2030	2040
BOD	300	290
TSS	300	290
VSS	260	250
TKN	50	50

In addition to the influent loading conditions presented in **Table 9-1**, the impact of sidestreams from the solids handling system were considered in evaluating the WRF loading capacity. The dewatering centrifuge is designed to operate approximately 8 hours per day for 5 days per week, while WRF personnel is on site, at a feed rate of 75 gallons per minute (gpm), equating to an approximate return volume of 25,700 gallons per day (gpd) of centrate (**Table 9-2**).

Table 9-2

Centrate Characteristics

Parameter	Modeled Characteristics (mg/L)
COD	512
TKN	47

WRF Flow and Loading Conditions for the Model Analyses

BioWin model simulations were carried out at the projected influent maximum month average flow conditions, which correspond to varied BOD, TSS, and TKN loading based on the concentrations in **Tables 9-1** and **9-2**. The calculated mass loading rates are displayed in **Table 9-3**. Centrate loading is included separately from WRF influent loading in the model and is not included in **Table 9-3**.

Table 9-3

WRF Influent Maximum Month Average Flow and Loading

Design Year	Flow (MGD)	BOD_5 (ppd)	TSS (ppd)	TKN (ppd)
2030	2.40	6,000	6,000	1,000
2040	2.70	6,500	6,500	1,130

*BOD_5 and TSS values are rounded to nearest 100

*TKN values rounded to nearest 10

The BioWin model simulations were carried out for scenarios with the operational conditions (projected flow, number of trains in operation, temperature, and SRT) shown in **Table 9-4**. The dynamic model simulations predict stable nitrification occurring for each of the scenarios presented in **Table 9-4**, which also shows the predicted MLSS values at these conditions.

Table 9-4

Model Results: MLSS and Ammonia

Scenario	Flow (MGD)	SRT (days)	Temperature (°C)	MLSS (mg/L)	Effluent Ammonia (mg/L)
Single Train Operation					
1A	2.40	7	17	3,600	<0.3
1B	2.40	7	15	3,700	<0.3
1C	2.40	10	15	4,800	<0.3
1D	2.70	7	17	3,900	<0.3
1E	2.70	7	15	4,000	<0.3
1F	2.70	10	15	5,200	<0.3
Dual Train Operation					
2A	2.40	7	17	1,800	<0.3
2B	2.40	10	17	2,400	<0.3
2C	2.70	7	17	2,000	<0.3
2D	2.70	10	17	2,600	<0.3

*MLSS values rounded to nearest 100

Aeration System Analysis

The four oxic zones are aerated regions within the basins. The BioWin model outputs shown in **Table 9-5** include the average oxygen transfer requirements.

Table 9-5

Average Required Oxygen Transfer Rate Predicted by Model (lb O_2/hr)

Scenario	Flow (MGD)	SRT (days)	Temperature (°C)	Oxic Zone 1	Oxic Zone 2	Oxic Zone 3	Oxic Zone 4	Total
Single Train Operation								
1A	2.4	7	17	130	110	70	40	350
1B	2.4	7	15	120	110	80	40	350
1C	2.4	10	15	140	110	80	40	370
1D	2.7	7	17	140	120	80	40	380
1E	2.7	7	15	140	120	80	40	380
1F	2.7	10	15	150	120	80	50	400
Dual Train Operation								
2A	2.4	7	17	70	50	40	20	180
2B	2.4	10	17	70	50	40	20	180
2C	2.7	7	17	70	60	40	20	190
2D	2.7	10	17	80	60	40	20	200

*AOR values rounded to nearest 10

The steady-state model simulations were based on the average daily loading conditions. The highest average daily air demand occurs at the 10-day SRT and 15 degrees Celsius and estimates an average required oxygen transfer rate of 400 pounds per hour (pph). Based on a diurnal modeling and planning-level actual oxygen requirement/standard oxygen requirement (AOR/SOR) ratio of 0.34 and a transfer efficiency of 2.0 percent per foot of depth, up to 4,500 standard cubic feet per minute (scfm) likely will be required at the peak condition. Assuming a minimum aeration flux rate of 0.12 scfm per square foot (scfm/sf) of floor area, the minimum mixing air flow necessary for the four oxic zones is approximately 1,000 scfm for a single train.

Secondary Clarifiers Analysis

Two 70-foot-diameter secondary clarifiers process the effluent from the activated sludge basins. Each clarifier has a surface area of approximately 3,848 sf. Each of the four return activated sludge (RAS) pumps have a capacity of approximately 1,740 gpm (approximately 2.5 million gallons per day (MGD)). A RAS rate of 75 percent of the WRF influent flow was assumed in calculating the clarifier solids loading rates (SLR). **Table 9-6** analyzes the solids loading rates at the conditions presented in **Table 9-4** with one or two clarifiers in operation.

Table 9-6

SLR per Secondary Clarifier from BioWin Model

Scenario	Flow (MGD)	SRT (days)	Temperature (°C)	MLSS (mg/L)	SLR - 1 Clarifier (ppd/sf)	SLR - 2 Clarifiers (ppd/sf)
Single Train Operation						
1A	2.4	7	17	3,600	32.8	16.4
1B	2.4	7	15	3,700	33.2	16.6
1C	2.4	10	15	4,800	43.4	21.7
1D	2.7	7	17	3,900	40.0	20.0
1E	2.7	7	15	4,000	40.6	20.3
1F	2.7	10	15	5,200	53.0	26.5
Dual Train Operation						
2A	2.4	7	17	1,800	16.4	8.2
2B	2.4	10	17	2,400	21.8	10.9
2C	2.7	7	17	2,000	20.0	10.0
2D	2.7	10	17	2,600	26.8	13.4

*MLSS values rounded to nearest 100

As discussed in **Chapter 8**, the sludge volume index (SVI) provided by the plug flow reactors may allow 35 to 40 pounds per day per square foot (ppd/sf) to be an acceptable range of solids loading to the clarifier(s) for the average of the maximum month. As presented in **Table 9-6**, this criterion may be met for most of the 2030 scenarios with a single train in operation, or all of the 2030 scenarios with two clarifiers operating. With two trains in operation, this criterion would always be met. As shown in **Tables 9-6** and discussed in **Chapter 8**, a third secondary clarifier may be needed in the planning period depending on the SVI produced by the plug flow reactors, but it is likely that the third clarifier will not be required until 2030 or beyond. The City's WRF will need a third secondary clarifier for redundancy when two clarifiers are needed to meet the maximum month average flow and loading. As discussed in **Chapter 8**, plug flow reactors will improve the mixed liquor settleability and lower the SVI, allowing for an increase in the acceptable solids loading rate to the clarifiers and delaying the need to construct a third secondary clarifier.

Solids Handling System Analysis

The WRF solids handling system consists of thickening, aerobic digestion, and dewatering systems. The thickening system consists of a rotary drum thickener used to pre-thicken WAS prior to discharge to the aerobic digesters. There are three equally sized aerobic digesters. Digesters 1 and 2 each include an ethylene propylene diene monomer (EPDM) tubular membrane aeration system and a hyperboloid mixer; the third digester includes a hyperboloid mixer with a sparge ring for aeration. Each digester has a dedicated blower capable of 700 standard cubic feet per minute (SCFM). The dewatering system includes the main centrifuge, as well as a smaller back-up centrifuge. The solids handling system was commissioned in 2020.

As noted in **Chapter 7**, the thickening and dewatering systems are expected to provide sufficient capacity at 2040, but the capacity of the aerobic digesters is expected to be insufficient at this condition.

The original design anticipated using two digesters to provide the required volatile solids (VS) destruction at the average annual condition. This allowed for the third digester to provide redundancy, as well as to provide equalization of sludge for the dewatering equipment. The third digester also can provide additional treatment for the maximum month condition.

The projected 2040 loading with the expansion of the Casino will cause the average annual loading to exceed the VS treatment capacity provided by two digesters. The original design criteria assumed thickening of WAS to an average concentration of 25,000 milligrams per liter (mg/L). All WAS is pre-thickened and discharged to the first digester in the series, while digested sludge is removed from the last digester in the series. In this configuration, the SRT and hydraulic retention time (HRT) are equivalent. The design retention time of 40 days at 20 degrees C is the typical criteria for aerobic digesters designed to achieve Class B biosolids. **Table 9-7** compares the effect of the increased hydraulic loading of WAS at 25,000 mg/L that is created by the Casino expansion.

Table 9-7

SRT Provided by Two Digesters at Projected 2040 Average Annual Digester Loading

Parameter	Design Criteria (2 digesters)	2040 Loading with Casino Expansion
Daily BOD (ppd)	3,750	4,028
Daily WAS TS to Digesters (ppd)	2,625	2,820
Daily Thickened WAS TS to Digesters (ppd)	25,000	25,000
Daily Thickened WAS Feed Volume (gpd)	12,590	13,523
Design Solids Retention Time (days)	40	40
Digesters Online	2	2
Volume Deficiency with Two Digesters Online (gal)	-	(50,200)

As shown, two digesters will not provide adequate volume to meet the design SRT at the design thickened WAS feed concentration of 25,000 mg/L. To meet the design SRT at the 2040 average annual loading condition, three digesters would need to be operated. If three digesters were routinely operated, a fourth digester would be needed for redundancy. Alternatively, the digestion process could be densified to provide sufficient treatment with two digesters. The capital cost of adding an additional digester and associated systems is expected to be much larger than the improvements necessary to further densify treatment in the existing tankage. As such, a fourth digester is not considered further.

The concentration of the incoming thickened WAS must be increased to densify the treatment provided by the existing digesters. If the thickened WAS concentration is incrementally increased to approximately 28,000 mg/L as shown in **Table 9-8**, the design SRT could be maintained in two digesters at the average annual condition.

Table 9-8

SRT Provided by Two Digesters at Projected 2040 Average Annual Digester Loading with Increased WAS Thickening

Parameter	Design Criteria (2 digesters)	2040 Loading with Casino Expansion
BOD (ppd)	3,750	4,028
WAS Yield (ppd TSS)	2,625	2,820
Design Thickened WAS Concentration (mg/L)	25,000	28,000
Thickened WAS Feed Volume (gpd)	12,590	12,074
Design Solids Retention Time (days)	40	40
Digesters Online (#)	2	2
Volume Deficiency with Two Digesters Online (gal)	-	-

In addition to increasing the thickened WAS concentration, the aeration system capacity must be increased. The original design criteria for actual oxygen demand (AOR) was 66 pounds of oxygen per hour (lb O_2/hr) per digester based on two digesters in service at the average annual condition. The anticipated expansion of the Casino will increase digester aeration demand at the average annual and maximum month conditions, with two and three digesters in service respectively, as shown in **Table 9-9**.

Table 9-9

Digester Aeration Capacity and Projected 2040 Demand

Parameter	Design Criteria		2040 Loading with Casino Expansion	
	Average Annual	Maximum Month	Average Annual	Maximum Month
Digesters (and blowers) Online	2	3	2	3
AOR per Digester (lb O_2/hr)	66	61	71	76

The original aeration system design AOR of 66 lb O_2/hr per digester will not provide sufficient capacity for the projected loading. Further, increasing the incoming thickened WAS concentration, and subsequently, the concentration of the digester contents, will decrease the oxygen transfer efficiency provided by the existing system. Alternate aeration options, such as jet aeration, become attractive for thicker sludges. Jet aeration is commonly used in high solids concentration applications such as autothermal thermophilic aerobic digesters (ATADs) and would increase the oxygen transfer efficiency with the existing blowers. The proposed system would add a single motive pump and jet header per digester. The motive pump recycles sludge from within the digester through the jet header, where the sludge entrains the aeration air and is forced through the jet nozzles, creating fine bubbles and high air to liquid contact. An example of such a system is shown in the photo that follows.

Courtesy of MTS (motive pump not shown)

Based on an initial proposal by Mass Transfer Systems (MTS), a digester could be outfitted with a single, bi-directional jet header, installed along the center of the digester, and a submersible motive pump. The motive pump would be able to provide mixing independent of aeration, which would allow the existing aeration system and mixer to be removed from each digester in which a jet aeration system is installed. This would replace the existing aeration system and hyperboloid mixer.

Based on the preliminary proposal by MTS, it is likely that by utilizing a 30 horsepower (hp) motive pump and 700 SCFM from the existing blower for each digester, two digesters could meet both the projected average annual and maximum month conditions with the Casino expansion. The existing mixer/aerator system could be maintained in the third digester, which would serve primarily as an equalization tank for the dewatering system. If one of the digesters with jet aeration was out of service, the third digester could be coupled with one jet-aerated digester to provide treatment.

Table 9-10 provides the estimated capital cost of replacing the existing mixers and diffuser grids in two of the digesters.

Table 9-10

Estimated Capital Cost of Aerobic Digester Aeration Improvements

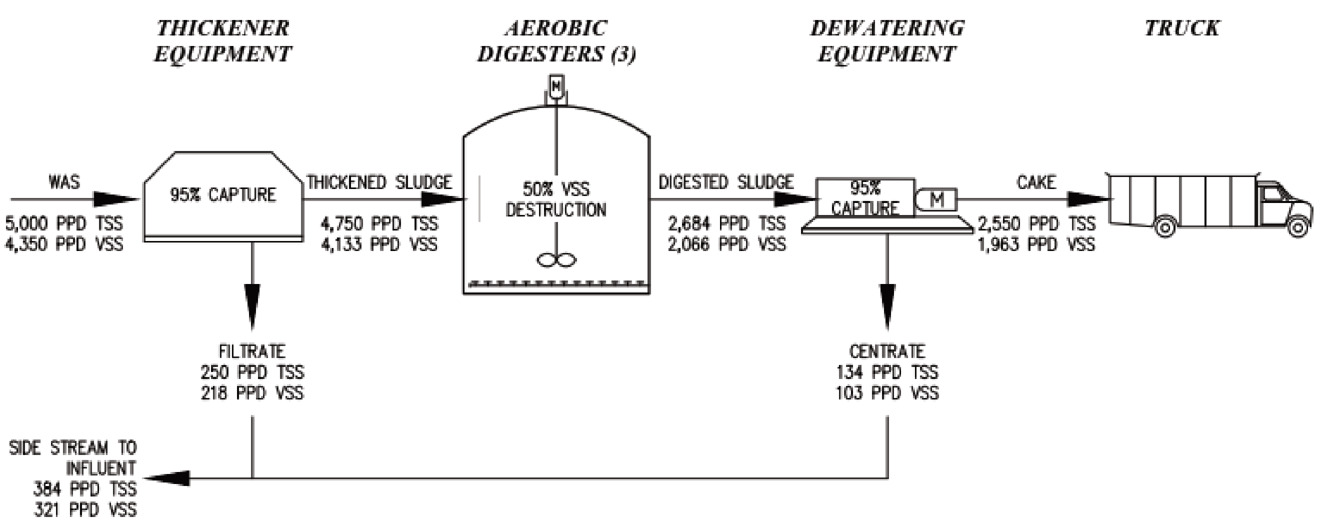
Item Description	Total Cost[1, 2]
Mobilization (10%)	$49,000
Demolition	$45,000
Mechanical and Equipment for 2 Jet Headers and Recycle Pumps	$340,000
Electrical and Automatic Control	$102,000
SUBTOTAL	**$536,000**
Sales Tax (8.6%)	$47,000
Planning-Level Contingency (30%)	$161,000
CONSTRUCTION TOTAL	**$744,000**
Indirect Costs (20%)	$149,000
PROJECT TOTAL	**$893,000**

1. All values are in 2021 dollars.
2. All values have been rounded to the nearest $1,000.

A mass balance for the solids handling system operating at the predicted 2040 maximum month average day loading is provided in **Figure 9-3.**

Figure 9-3

Solids Handling System Mass Balance at 2040 Maximum Month Average Day



Activated Sludge Basins Design Criteria

The converted plug flow reactors will be referred to as activated sludge basins in this section and the following sections of this chapter with limited exceptions.

Table 9-11 presents the design criteria for the proposed activated sludge basins. Refer to the **Proposed Flow and Loading Design Criteria** section in this chapter for additional operating and capacity discussion.

Table 9-11

Activated Sludge Basins Design Criteria

Parameter		Notes
Wastewater Flow and BOD Loading into Activated Sludge Basins		
Design Maximum Month Average Flow (MMF)	2.70 *MGD*	Projected WRF influent MMF in 2040
Design Maximum Month Average BOD_5	6,500 *ppd*	BioWin® model simulations value
Activated Sludge Basins		
Type	Plug Flow Reactor	
Operating Basins Quantity	1	At Wastewater Flow and BOD Loading above
Total Basins Quantity	2	1 duty, 1 standby
Total Volume	1.40 *MG*	Per basin
Total Aerobic Volume	1.03 *MG*	Per basin
Mixed Liquor Temperature	17 *degrees C*	
Minimum SRT	7 *days*	Per basin
Mixed Liquor Concentration	3,000 - 5,000 *mg/L*	Anticipated range
SVI	100 *mL/g*	Anticipated maximum
Anaerobic Zones (An1, An2)		
Quantity	2	Per basin
Dimensions	29x30x8.25 *ft (LxWxSWD)*	Each zone, approximate
Volume	0.05 *MG*	Each zone, approximate
Mixer Quantity (Type)	1 (Submersible)	Existing, per zone
Anoxic Zone (Ax1)		
Quantity	1	Per basin
Dimensions	59x41x14 *ft (LxWxSWD)*	Each zone, approximate
Volume	0.26 *MG*	Each zone, approximate
Mixer Quantity (Type)	1 (Top-Entering)	
Initial Aerobic Zones (Ox1, Ox2, Ox3)		
Quantity	3	Per basin
Dimensions	85x29x14 *ft (LxWxSWD)*	Each zone, approximate
Volume	0.26 *MG*	Each
Initial Aerobic Zones (Ox4)		
Quantity	1	Per basin
Dimensions	55x29x14 *ft (LxWxSWD)*	Each zone, approximate
Volume	0.17 *MG*	Each
Mixer Quantity	1	
Low DO Zone		
Quantity	1	Per basin
Dimensions	30x29x14 *ft (LxWxSWD)*	Each zone, approximate
Volume	0.09 *MG*	Each
Mixer Quantity	1	
Aeration System		
Target DO Concentration	2.00 *mg/L*	Ox1 - Ox4
Blower Quantity	3	1 large duty, 1 large standby, 1 small duty
Blower Size	150 *horsepower*	Estimated, per large blower
Diffuser Type	Fine bubble	Floor-mounted membrane diffuser grid
Peak Airflow	4,500 *scfm*	Estimated, TBD during final design
Minimum Airflow for Mixing	1,000 *scfm*	Estimated based on approximate zone sizes
Internal Recycle		
Configuration	Submersible Pump	
Quantity	1	Per basin, 1 shelf spare
Recycle Rate	3 - 6 *x influent*	Based on rolling average
Pump Size	40 *horsepower*	Estimated
Wasting System		
Configuration	Surface wasting and RAS wasting	Selective surface wasting from basins and wasting from settled clarifier blanket

Description of Improvements

Figure 9-4 is a process schematic of the WRF reflecting the proposed activated sludge basins improvements.

The proposed improvements consist primarily of work within the existing ditch structures (the structures are referred to as activated sludge basins or basins throughout the rest of this chapter), construction of a separate building structure to house equipment associated with the basins, and site work related to piping, conduit, and re-surfacing. **Figures 9-5** and **9-6** show the approximate location of the new building and site utilities. The new building will be approximately 1,400 square feet and consist of a single floor with an elevation near existing grade at the building location. The building construction will be similar in nature to the existing concrete masonry unit (CMU) buildings at the WRF. Three rooms will be created in the building to separately house the aeration blowers and piping, surface waste pumping equipment and piping, and the electrical and control equipment.

Multiple blowers likely will be necessary to efficiently provide the range of airflow projected for the 2040 condition. One possible configuration is two large blowers (approximately 150 horsepower (hp) each) as necessary to meet redundancy requirements and a smaller duty blower (approximately 100 hp). A large and small blower could be used in parallel to meet the peak condition, and a small blower alone could provide mixing airflow. All blowers will be operated on variable frequency drives (VFDs).

It is likely that all blowers will be connected to a common aeration header to the basins, which will split between both basins and have turnouts to each aerobic zone. The aeration piping, electrical system, and blower room should be sized to allow additional blowers to be added to the aeration system. The addition of blowers, as well as the expansion of the diffuser grid, will allow for increased treatment capacity without necessitating an increase in basin footprint. The exact aeration system configuration will be reviewed in detail during final design.

The in-basin work will consist of compartmentalizing the existing closed loop into multiple aerobic zones with diffused aeration in each zone. **Figure 9-7** shows the modifications to each basin. Demolition primarily will consist of removing the existing aerators and portions of the elevated concrete slabs to provide access to the new aerobic zones. The aerobic zones will be partitioned at the approximate locations shown in **Figure 9-7** with cast-in-place concrete walls. Additional elevated walkways or platforms must be added to allow access to the new aeration and mixing equipment.

Each of the four aerobic zones per basin will include an aeration diffuser grid consisting of fine bubble membrane diffusers. It is likely that diffuser density will vary from highest in the first zone to lowest in the last zone. Aeration piping likely will be routed along elevated walkways with turnouts to each aerobic zone. Each turnout will include an actuated butterfly valve and an air flow meter. Each aerobic zone will include a dissolved oxygen (DO) sensor. Air flow to each zone will be automatically controlled to closely match oxygen transfer to demand. **Table 9-11** shows the approximated aerobic zone sizes per basin and associated peak AOR values for a single activated sludge basin in operation based on recent BioWin modeling at the 2040 loading condition. It is assumed that mixing airflow will exceed the airflow required by process at the current minimum loading conditions, but this will be verified during final design.

The fourth aerobic zone will include a mixer to allow for mixing independent of aeration. Should DO levels climb in this zone, aeration can be cycled on and off. Surface wasting equipment also will be included in this zone. This equipment likely will consist of an electronically actuated gate that can periodically be lowered to allow flow off the surface of the zone into an equalization (EQ) box, possibly constructed in the existing internal recycle channel. Transfer pumps housed in the new building will pump the waste into the existing WAS pipe upstream of the existing rotary drum thickener. The EQ box will be sized such that the surface waste can be pumped to blend with the conventional WAS at a continuous, low flow rate.

A final zone will be either partitioned downstream from the fourth aerobic zone or baffled within this zone. The purpose of the final zone will be to provide a low DO mixing zone from which to pump internal recycle flow to the anoxic zone. The low DO mixing zone will include a submersible internal recycle pump and likely a dedicated mixer. The internal recycle pump will be operated with a VFD and sized to provide approximately 3 times the influent flow at current and projected conditions.

Environmental Impacts

Refer to **Chapter 2** for an evaluation of the existing environment at the WRF and impacts of the proposed improvements at the WRF that are included in this General Sewer Plan (GSP).

Design Life and Expandability

Typical design life of concrete structures like the basins reused for the proposed conversion is beyond 50 years. The oldest basin (currently Oxidation Ditch No. 1) was constructed in 1997; therefore, the design life goes beyond 2040. The City should monitor the visible condition of the basin structures over time to address any issues that could arise. The proposed equipment building will have a typical design life of beyond 50 years. The proposed equipment will have a typical design life of 20 years.

Options are available for future expansion of the activated sludge basins depending on flow and loading conditions beyond 2040. The primary options are outlined in the **Proposed Flow and Loading Design Criteria** section in this chapter.

Capital Cost

The estimate of probable capital costs for final design and construction of the improvements is totaled at $7.86 million as detailed in **Chapter 8**.

Operations and Maintenance

As identified in **Chapter 8**, the amount of operations and maintenance (O&M) labor for operating a single activated sludge basin likely will be similar to what is required for continuously operating the existing two oxidation ditches. O&M labor activities generally will consist of monitoring the process and making adjustments, calibrating instrumentation, and performing preventive maintenance on equipment, valves, and instrumentation. Periodically cleaning the basins and checking the diffusers also will be required, which will be facilitated by switching the online and offline activated sludge basins.

An increase in WRF staffing is not anticipated as a result of the proposed improvements.

Construction Phasing

Phasing for construction of the improvements will consist of removing one existing oxidation ditch from service at a time to complete the demolition, improvements, and startup of the activated sludge basin while maintaining operation of the other existing ditch. Upon successful commissioning of the first converted basin, conversion work can begin in the other ditch. Further details for phasing will be developed during final design of the improvements.

Third Secondary Clarifier

With the recommendation to convert the existing oxidation ditches to plug flow reactors, it is likely that a third secondary clarifier will not be required for redundancy at the maximum month average condition until 2030 or beyond, as discussed in **Chapter 8**. The need to construct a third clarifier will largely be dictated by the settleability of mixed liquor provided by the new activated sludge basins process and increases in influent flow rate. As such, it is prudent for the City to budget for design and construction of a third clarifier during the planning period; however, the timing for implementation will be re-evaluated as operational data from the new activated sludge basins process becomes available.

Design and construction of a third clarifier previously was proposed and scheduled in the 2015 *Snoqualmie WRF Improvements Engineering Report* by RH2 Engineering, Inc. (2015 Engineering Report). Construction was scheduled for beyond 2019. Since the completion of the 2015 Engineering Report, stress testing of the existing secondary clarifiers was performed to identify potential improvements to the existing clarifiers. As a result, Secondary Clarifier No. 1 was retrofitted with a reduced feedwell with energy dissipating inlets and a full radius scum trough. These upgrades have functioned well and are recommended to be implemented for Secondary Clarifier No. 2 (refer to the **Recommended Minor Capital Improvements** section of this chapter and **Chapter 11**). Additionally, analyses of the existing oxidation ditches performed as part of the 2015 Engineering Report yielded further insight into the plug flow reactor conversion, which likely would relieve the near-term need for a third clarifier.

The 2015 Engineering Report, which was approved by Ecology in December 2015, also included design criteria for the third secondary clarifier. A majority of that design criteria still applies; however, there have been some changes. An updated version of Table 50 from the 2015 Engineering Report is shown below as **Table 9-12** and followed by a general description of the proposed improvements.

Table 9-12

Third Secondary Clarifier Design Criteria

Parameter		**Notes**
Configuration	Circular	Cast-in-place concrete tankage
Diameter	70 *ft*	Match existing
Sidewater Depth	14 *ft*	Match existing
Surface Area	3,848 *sf*	Match existing
Launder/Baffles	TBD	Potentially inboard launders similar to existing
Inlet Configuration	Energy Dissipating	Similar to retrofit for Secondary Clarifier No. 1
RAS System		
Configuration	TBD	Potentially draft tubes similar to existing
Pump Type	Submersible	Installed in wet well attached to clarifier
Pump Quantity	2	Per clarifier (1 duty, 1 standby)
RAS Recycle Rate	0.5-1.0 *x influent*	Based on rolling average
Pump Size	25 *horsepower*	Nominal, Each
Scum Removal System		
Configuration	Full Radius Scum Trough	Discharges to wet well
Pump Type	Submersible	Installed in wet well attached to clarifier
Pump Quantity	1	Per clarifier
Pump Size	5 *horsepower*	Nominal

The third clarifier is expected to be located directly west of the existing shop building as shown on **Figure 9-5**. The clarifier will include a feedwell with energy dissipating inlets and full radius scum trough similar to those retrofitted onto existing Secondary Clarifier No. 1 (refer to the **Recommended Minor Capital Improvements** section of this chapter and **Chapter 11** for future retrofitting of the existing Secondary Clarifier No. 2). It also will include an effluent launder with covers (to combat algae growth), and RAS and scum pump stations oriented similarly to the existing clarifiers.

Construction of the third clarifier will include substantial civil site work related to the excavation for the clarifier structure and shoring of the slope, including a permanent retaining wall between the clarifier location and the driveway to the north (extends to the City's Public Works Office). Mixed liquor, RAS, WAS, scum, secondary effluent, and drain piping will need to be installed within the WRF interior roadway, which represents a complex piping corridor. Pipes were stubbed out from associated structures when the original WRF was constructed in anticipation of up to two future secondary clarifiers near to this location.

Structural work will be related to the concrete tankage and pump stations. Mechanical installation will include the clarifier mechanism and pump station equipment and piping. Electrical and control equipment for the third clarifier and associated pump stations will be housed in a new electrical room created in the existing shop building.

Table 9-13 shows the estimate of probable capital costs for the third secondary clarifier.

Table 9-13

Estimate of Probable Capital Costs for Third Secondary Clarifier

Description	Cost
Mobilization and Demobilization (7% of Total)	$160,000
Site Work	$792,000
Site Utilities	$264,000
Structural	$360,000
Mechanical	$528,000
Electrical	$230,000
Automatic Control	$90,000
Subtotal Probable Construction Cost	$2,424,000
Planning-Level Contingency (7.5%)	$190,000
Sales Tax (8.6%)	$230,000
Total Probable Construction Cost	$2,844,000
Engineering Services (20%)	$570,000
City Project Administration (15%)	$430,000
Total Probable Capital Cost	**$3,844,000**

Reclaimed Water Filters Replacement

As presented in **Chapter 8**, three alternatives were analyzed for improvements to replace the reclaimed water filters to address the age and condition deficiency of the existing filter systems as identified in **Chapter 7**. Based on the alternatives analysis, Alternative 2 provides the best approach for replacing the existing filters. As such, it is recommended that the City replace the existing filter systems with cloth media disk filter systems.

This section presents details for the proposed improvements to replace the existing reclaimed water filters. The details are provided for the purpose of fulfilling Ecology's Engineering Report and facility plan requirements, which then can be followed by the City initiating design as scheduled in **Chapter 11**.

Table 9-14 presents the preliminary design criteria for the proposed reclaimed water filter systems. As part of the future design of the improvements, a pilot study needs to be performed to prove performance at the WRF and finalize the design criteria.

Table 9-14

Reclaimed Water Filter Systems Preliminary Design Criteria

Parameter			Notes
Reclaimed Water Production Flow Rates (into Filters)			
Average Dry Weather Flow at Build-Out	1.04	*MGD*	Refer to the 2015 Engineering Report[1]
Design Maximum Month Average Flow	1.56	*MGD*	City NPDES Permit Outfall No. 002 Limit
Design Maximum Day Flow	3.13	*MGD*	Match existing and UV disinfection system
Design Peak Hour Flow	4.24	*MGD*	Match UV disinfection system
Design Peak Instantaneous Flow	5	*MGD*	Refer to the 2015 Engineering Report[1]
Filters Inlet Water Quality (from Secondary Clarifiers)			
Typical Maximum Turbidity	5	*NTU*	
Maximum Turbidity	20	*NTU*	
Average Daily TSS	5	*mg/L*	
Typical Maximum Daily TSS	15	*mg/L*	
Maximum Daily TSS	30	*mg/L*	City NPDES Permit Average Monthly Limit[2]
Filters Outlet Water Quality			
Average Monthly Turbidity Limit	2	*NTU*	City NPDES Permit Outfall No. 002 Limit
Instantaneous Maximum Turbidity Limit	5	*NTU*	City NPDES Permit Outfall No. 002 Limit
Historical Average Daily TSS	2.34	*mg/L*	1/2014 to 8/2019 City Discharge Monitoring Report data
Historical Maximum Daily TSS	6	*mg/L*	1/2014 to 8/2019 City Discharge Monitoring Report data
Redundancy			
Duty filter(s) rated for design maximum month average flow			To meet the Filtration Reliability Guidelines of Table 6-6 in Ecology's *Reclaimed Water Facilities Manua* l (a.k.a. the Purple Book)
Redundant backup filter to maintain duty filter(s) rating			
Alarm Systems			
Filters			
Driving Force for Flow	Gravity		To fit within existing filters hydraulic profile
Operating Configuration (to each other)	Parallel		
Number	3		2 duty, 1 redundant backup
Type	Vertical Disk		
Media	Cloth		
Number of Disks, per Filter	20		
Surface Area, per Disk	10.8	*sf*	
Total Surface Area of Duty Filters	432	*sf*	2 duty filters
Average Hydraulic Loading Rate of Duty Filters	2.51	*gpm/sf*	At design maximum month average flow
Maximum Hydraulic Loading Rate of Duty Filters	5.03	*gpm/sf*	At design maximum day flow
Peak Instantaneous Hydraulic Loading Rate of Duty Filters	8.04	*gpm/sf*	At design peak instantaneous flow
Backwash/Solids Waste System[3]			
Pump Quantity, per Filter	1		
Pump Capacity, each Pump (gpm @ ft TDH)	130 @ 23		
Pump Size	2	*Hp*	
Coagulant Chemical Storage and Feed System			
Need for Coagulant will be determined during Pilot Study			

1 = This parameter and value are referred to in Chapter 2 of the 2015 Engineering Report for the UV disinfection system.
2 = This limit applies to Outfall No. 001 and Outfall No. 002.
3 = A single pump is used for the separate processes of backwashing and solids wasting.

As part of the reclaimed water filters replacement, all components of the existing filter systems within the basins and the blower room of the WRF equipment building will be removed. The existing basins will be modified internally to fit the proposed improvements. A coagulant may be required for the new filter systems, which will be determined during pilot study testing. The City already has infrastructure in place, as polymer currently is used with the existing filter systems. The infrastructure can be reused, modified, or replaced as necessary.

A preliminary design summary and preliminary layout drawing for three cloth media disk filter systems at the WRF were provided by Aqua-Aerobic Systems, Inc. (Aqua-Aerobic) and are included as **Appendix I**, along with some standard product drawings. The design utilizes Aqua-Aerobic's pile cloth media, mini-sized disk product, the Aqua MiniDisk®. Aqua-Aerobic's product is used for the purposes of this GSP; however, other cloth media filter manufacturers can be considered by the City during design.

As shown in the layout drawing, the filter systems are much smaller than the existing filters, and all three can fit within the area of one existing filter basin. The filters operate within the gravity flow hydraulic profile of the existing reclaimed water filters process (at the corresponding flow rates), which is shown in **Chapter 7**. Flow from the existing secondary effluent flow control structure will be conveyed to the existing filter basins as it is now. Filtered effluent flow from the existing filter basins to the ultraviolet light (UV) disinfection system also will be conveyed as it is now. Inlet and outlet flow conveyance within the existing filter basins will be evaluated during design; however, one concept is shown in Aqua-Aerobic's preliminary layout drawing. From the filter basins inlet, flow will be directed into each filter via an opening at the top of the internal inlet wall, which will include an automated weir gate (open/close). In the filters, flow passes outside to inside through the pile cloth covered disks, through a centertube, and over an effluent weir assembly to a common outlet shared with all three filters.

As identified in **Table 9-14**, normal operation is two duty filters online and one redundant backup. Hydraulically, the filters (and inlet and outlet modifications to the existing basins) are designed for receiving design peak hour and peak instantaneous flows that occur over the corresponding time periods (refer to **Chapter 8** for additional discussion on peak flows at the filters). Extra space remaining in the existing filter basins can be considered for some amount of equalization to lessen flow spike impacts on filtration.

The backwash and solids wasting processes utilize a shared pump for each filter. As shown in the layout drawing, the backwash/solids waste pumps will be installed within the basins in dry chambers (adjacent to the wet filter chambers by new internal walls). Each disk is backwashed one at a time. Backwashing uses filtered effluent (filtrate) with pumped reverse flow through the filter disk/media to remove the filtered solids. Backwash residuals will be conveyed by the piping to an existing waste/basin drain that flows by gravity to the In-Plant Pump Station (IPPS). During the filtration process, some solids will settle to the bottom of the filter chambers. The solids wasting process is used to pump out the settled solids. During design, discharge of the settled solids will be evaluated and will account for associated data from the pilot study and anticipated percent solids. Preferably, the settled solids will be such that they can be discharged to the IPPS (i.e. to the WRF headworks). One related option for the extra space remaining in the existing filter basins is using some of it for handling the pumped solids, as needed, so they can be discharged to the IPPS.

The filters will continue to be operated seasonally for reclaimed water production; however, the City can consider using them on an as-needed basis for tertiary treatment of secondary effluent. When the filters are shut down outside of the reclaimed water production season, some winterization measures are required. Required measures include draining the filter chambers and covering the filter disks to prevent damage to the pile cloth media from the sun's UV rays.

As part of the reclaimed water filters replacement improvements, it is recommended to replace and automate the existing gates at the secondary effluent control structure and reclaimed water clearwell. Each of the two outlet gates at the secondary effluent control structure should be replaced in-kind with modern, leak-tight gates and upgraded with an electric actuator (for open/close). The single inlet gate at the reclaimed water clearwell should be replaced in-kind with a modern, leak-tight gate and upgraded with an electric actuator (for open/close).

Each filter system includes a dedicated control panel. The panels will be outdoor-rated and installed next to the filters under the existing covered structure. The panels will be connected to the existing WRF supervisory control and data acquisition (SCADA) system. In addition to the backwash/solids waste pump motors, the filter assembly drive motors, automated valves, instrumentation, and various automated gates will all require power. The automatic control scheme and electrical supply to powered components will be developed during design.

Table 9-15 shows the estimate of probable capital costs for the reclaimed water filters replacement.

Table 9-15

Estimate of Probable Capital Costs for Reclaimed Water Filters Replacement

Description	Cost
Mobilization and Demobilization (10% of Total)	$145,000
Structural	$164,000
Mechanical	$977,000
Electrical & Automatic Control	$300,000
Subtotal Probable Construction Cost	$1,586,000
Planning-Level Contingency (20%)	$318,000
Sales Tax (8.6%)	$164,000
Total Probable Construction Cost	$2,068,000
Engineering Services (30%)	$621,000
City Project Administration (15%)	$311,000
Total Probable Capital Cost	**$3,000,000**

RECOMMENDED MINOR CAPITAL IMPROVEMENTS

As identified in **Chapter 7**, there are additional deficiencies at the WRF that necessitate normal maintenance or in-kind replacements that the City would like to include in the capital budget. The group of applicable improvements being proposed is referred to as minor capital improvements. The grouping differentiates the improvements from the major capital improvements presented in the previous section of this chapter while also designating them for inclusion in the City's sewer system Capital Improvement Plan. The improvements that fall into the minor capital improvements grouping are listed below and described in **Chapter 11.**

- Existing Secondary Clarifier Improvements
- Centrifuge Components Replacement
- WRF Interior Road Grind and Overlay
- Non-Potable Water Pump Station Replacement
- Grit Removal System Improvements

PROPOSED FLOW AND LOADING DESIGN CRITERIA

WRF Proposed Design Criteria

The existing WRF design criteria, projected 2040 flow and loading conditions, and WRF proposed design criteria based on improvements recommended in this GSP are presented in **Table 9-16**.

Table 9-16

WRF Proposed Flow and Loading Design Criteria

Parameter	Existing WRF Design Criteria	Projected Flow and Loading 2040 (+20 years)	WRF Proposed Design Criteria[2]	Units
Population				
Sewer System Population	10,040	15,499	15,499	N/A
Sewer System Employment	-	8,103	8,103	N/A
WRF Influent Flow and Loading				
Average Annual Flow (AAF)	1.64	1.74	1.80	MGD
Maximum Month Average Flow (MMF)	2.15[1]	2.69	2.70	MGD
Maximum Day Flow (MDF)	-	6.17	6.20	MGD
Peak Hour Flow (PHF)	7.30	6.70	7.30	MGD
Average Annual BOD_5	3,750	4,028	4,100	ppd
Maximum Month Average BOD_5	5,220[1]	6,484	6,500	ppd
Average Annual TSS	3,750	4,028	4,100	ppd
Maximum Month Average TSS	5,220[1]	6,484	6,500	ppd
Activated Sludge System Operation[3]				
Activated Sludge Basins[4] Required	2	1	1	N/A
Redundant Activated Sludge Basins[4]	0	-	1	N/A
Secondary Clarifiers Required	2	2	2	N/A
Redundant Secondary Clarifiers	0	-	1	N/A

1 = City NPDES permit Design Criteria value.
2 = Expansion of the activated sludge basins aeration system or other measures can allow for treatment of significantly increased future loading in excess of the proposed design criteria shown here without increasing the activated sludge system footprint.
3 = Required units in operation to treat flow and loading condition.
4 = Oxidation ditches for existing WRF.
The TSS projections and design criteria are conservatively assumed to be equal to BOD.

As shown in the table, the existing WRF is rated for a maximum month average flow and loading of 2.15 MGD and 5,220 ppd BOD_5, which requires both existing oxidation ditches and both existing secondary clarifiers to be in operation to treat this loading condition. The design criteria necessary to support the projected 2040 maximum month average flow and loading is rounded to 2.7 MGD and 6,500 ppd BOD_5. With completion of the recommended activated sludge basins improvements and construction of the third secondary clarifier, the WRF will be able to treat the projected 2040 loading by operating a single activated sludge basin with two secondary clarifiers.

A summary of the WRF proposed design criteria for the improvements recommended in this GSP also is shown in **Table 9-16**. New equipment, such as the activated sludge basins aeration equipment, will be designed in a manner that provides turndown to the current minimum conditions while ensuring capacity to meet the projected 2040 condition. However, the activated sludge basins also will provide expandability, allowing for treatment of loading significantly in excess of the WRF proposed design criteria shown in the table. The primary expansions related to the activated sludge basins and approximate increase in activated sludge system (the basins and secondary clarifiers) nominal loading capacities are listed in the section that follows. Solids handling system improvements and upgrades to other ancillary systems also may be necessary to support treatment of such expansions.

Activated Sludge System Capacity and Expandability

Activated Sludge Basins Aeration System

The proposed blowers and diffuser grid should be sized for approximately the 2040 loading condition while providing turndown for current conditions. However, the proposed blower building, electrical system, and aeration piping should be sized for provision of significantly higher future airflow rates if dictated by future BOD_5 loading. The ability to add additional blowers and aeration diffusers will ensure that the aeration system will not limit future treatment capacity for the activated sludge system.

Secondary Clarifiers

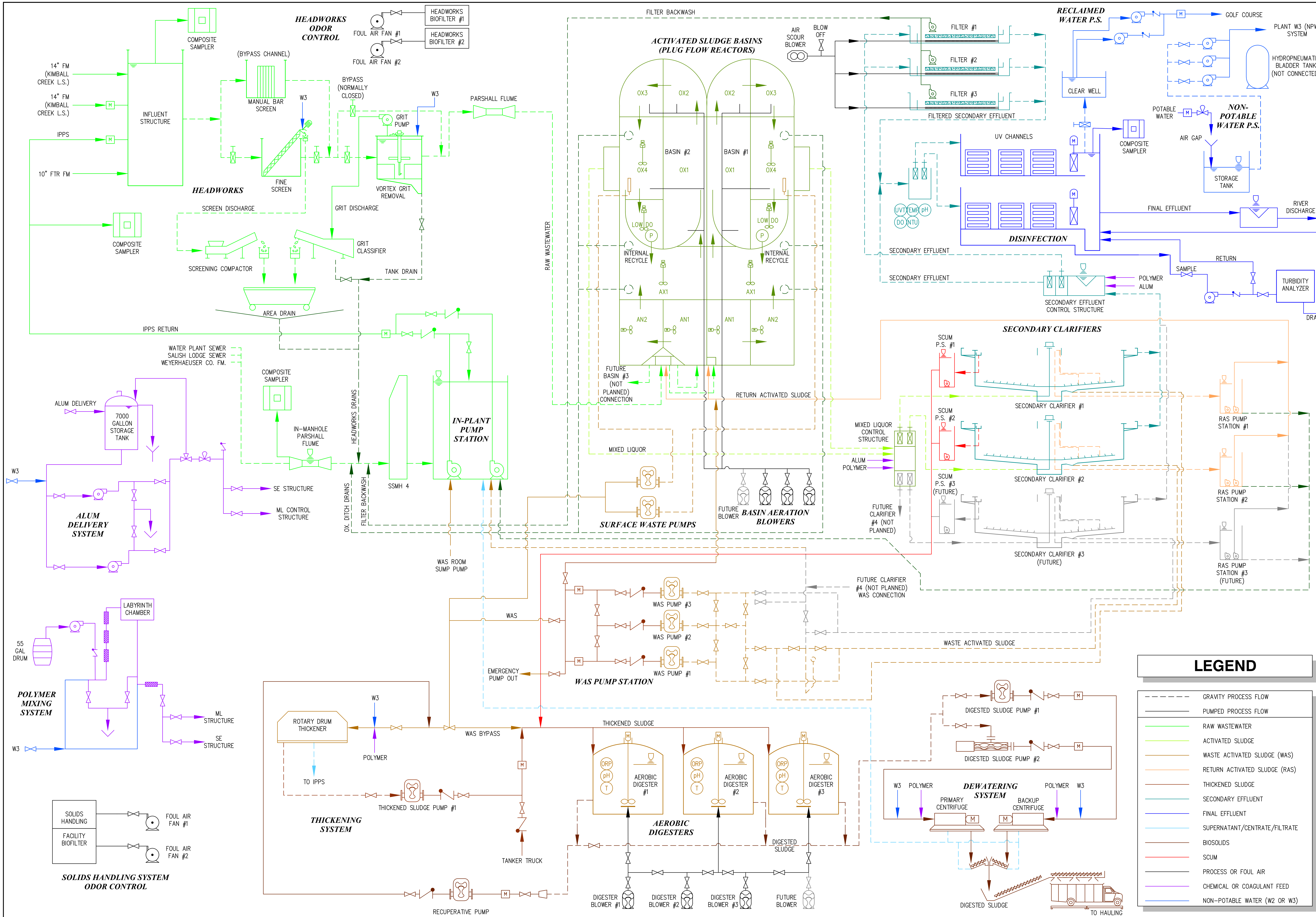
As previously discussed, the mixed liquor SVI achieved by the activated sludge basins will dictate the acceptable SLR to the secondary clarifiers, and subsequently the number of clarifiers necessary for operation at future loading conditions. It is recommended that the third secondary clarifier be planned for construction in the second half of the planning period, after which two clarifiers can be operated continuously as needed. With two clarifiers in operation and an SVI that is reliably below 100, the secondary clarifier system will allow for loading in excess of the projected 2040 condition. With a single activated sludge basin in operation at an SVI of 100 or less, initial BioWin model simulations suggest that two clarifiers likely could allow for maximum month average flow and loading conditions in excess of 2.8 MGD and 7,000 ppd BOD_5.

Parallel Activated Sludge Basins Operation

Further increase in treatment capacity is afforded by operating both activated sludge basins. With two basins operated in parallel, the required MLSS concentration is reduced significantly, as is the corresponding secondary clarifier SLR. If aeration system upgrades and other ancillary system improvements were completed to support such loading, and an SVI of 100 or less is reliably achievable, initial BioWin model simulations suggest that two basins and two clarifiers could treat a maximum month average flow and loading of 4 MGD and 10,000 ppd of BOD_5.

Summary

In summary, the recommended activated sludge basins improvements and construction of the third secondary clarifier will allow for treatment of the proposed 2040 loading condition with a single basin and two clarifiers in operation. The activated sludge basins will allow for significantly expanded future capacity via equipment replacement without requiring an increase in the activated sludge system footprint.



RH2

CITY OF SNOQUALMIE
GENERAL SEWER PLAN

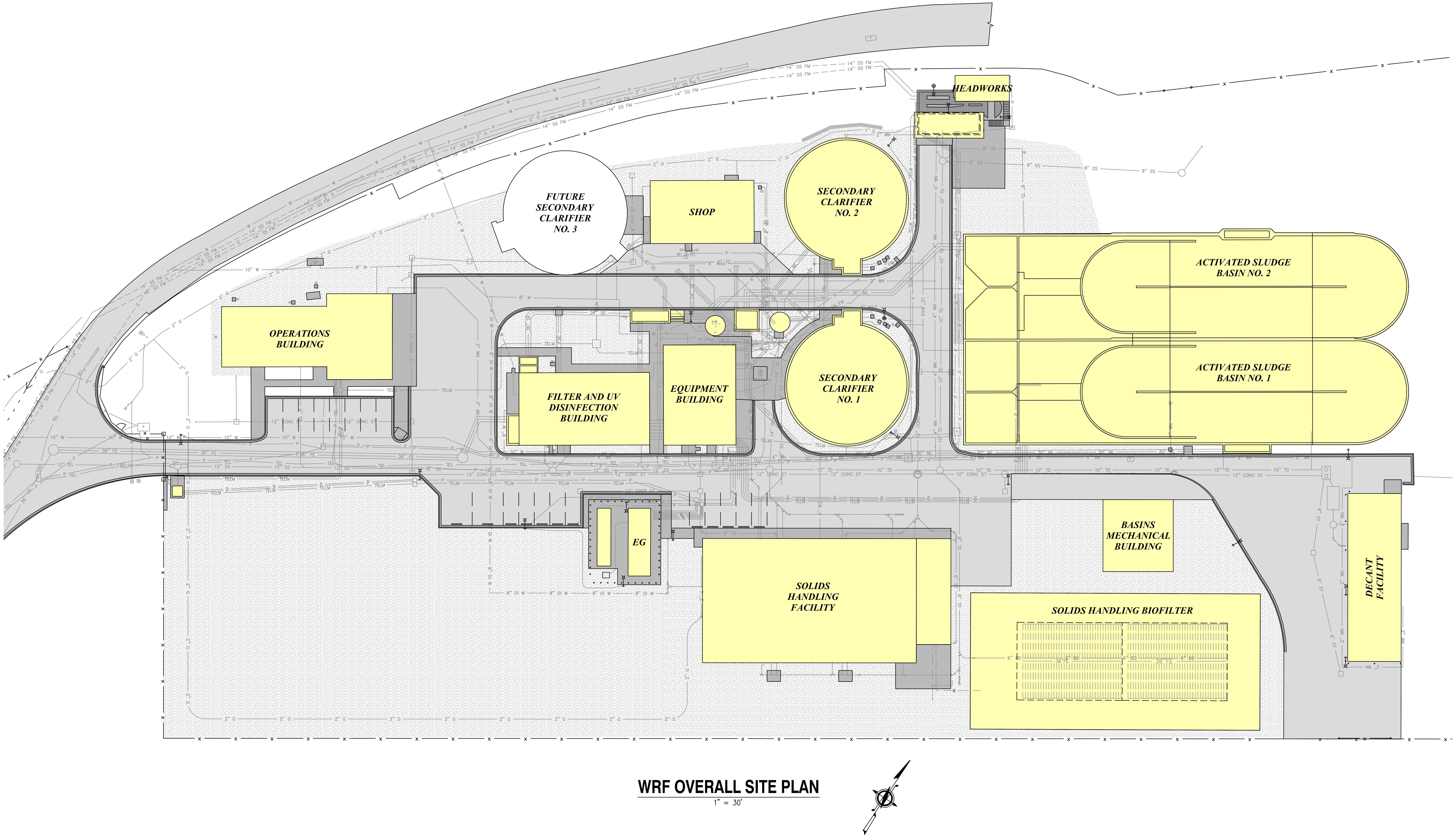
FIGURE 9-4: WRF PROCESS SCHEMATIC W/ ACTIVATED SLUDGE BASINS IMPROVEMENTS

REVISIONS

NO. | DATE | DESCRIPTION | BY | REVIEW

ENGINEER: XXX REVIEWED: XXX
SAVE DATE: May 20, 2020 PLOT DATE: May 20, 2020
CLIENT: SNQ FILENAME: WWFP-E-SCHEM_PR.DWG
JOB NO.: 118-083

DWG NO.: --
SHEET NO.: --



WRF OVERALL SITE PLAN

1" = 30'

CITY OF SNOQUALMIE
GENERAL SEWER PLAN

FIGURE 9-5: WRF OVERALL SITE PLAN W/ ACTIVATED SLUDGE BASINS IMPROVEMENTS

RH2

ENGINEER: ALZ | SAVE DATE: May 20, 2020 | CLIENT: SNQ | JOB NO.: 118-083
REVIEWED: SMK | PLOT DATE: May 20, 2020 | FILENAME: WWFP-E-WRF_SITE_PR.DWG

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW

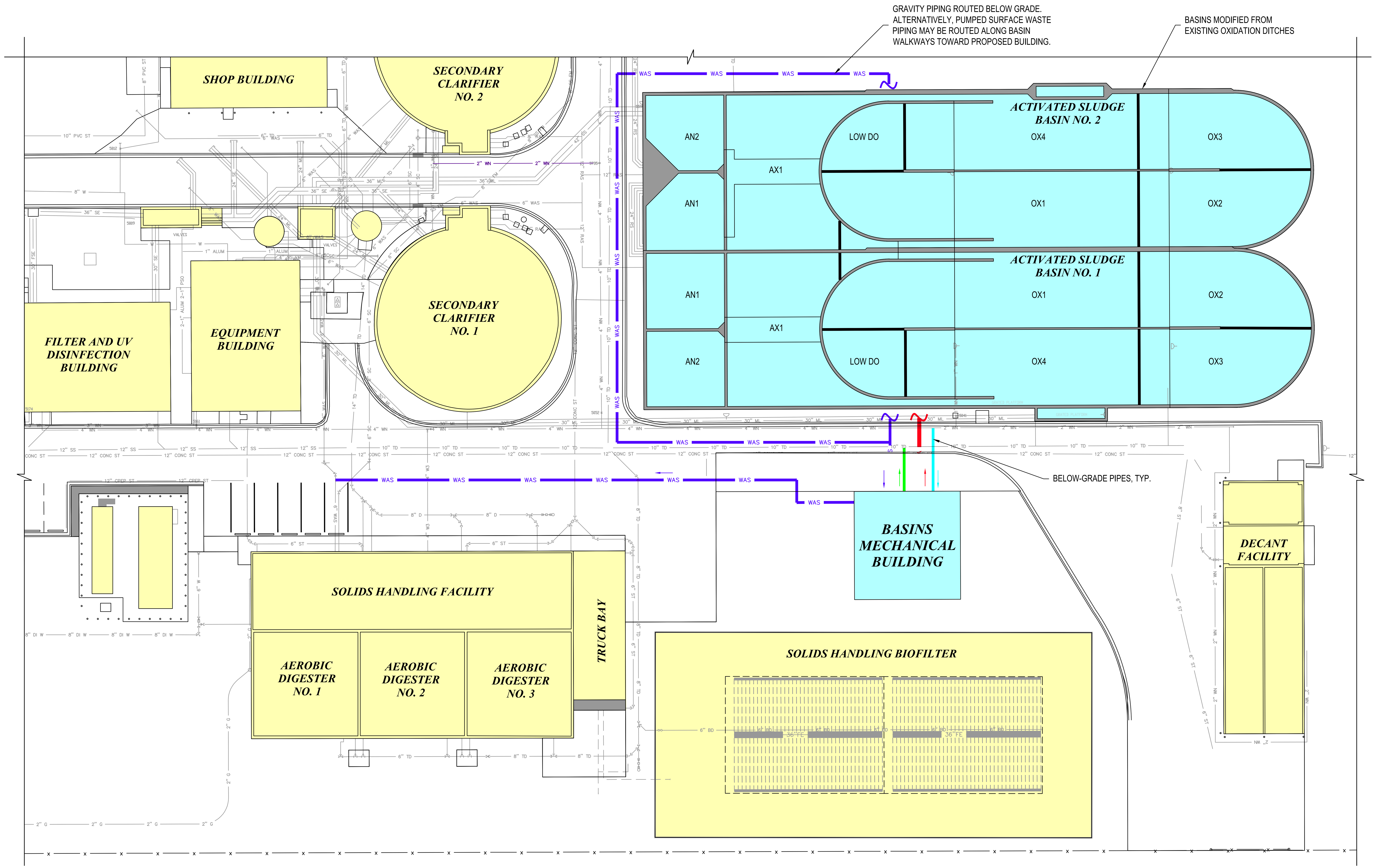
SCALE: SHOWN

0" 1" 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: --

SHEET NO.: --



WRF ACTIVATED SLUDGE BASINS IMPROVEMENTS SITE PLAN

1" = 20'

EXISTING CONTOURS AND SURFACING OMITTED IN THIS VIEW FOR CLARITY

RH2

CITY OF SNOQUALMIE
GENERAL SEWER PLAN

FIGURE 9-6: WRF ACTIVATED SLUDGE BASINS IMPROVEMENTS SITE PLAN

ENGINEER: ALZ
REVIEWED: SMK
SAVE DATE: May 20, 2020
PLOT DATE: May 20, 2020
CLIENT: SNQ
FILENAME: WWFP-E-EXHIBITA.DWG
JOB NO.: 118-083

REVISIONS

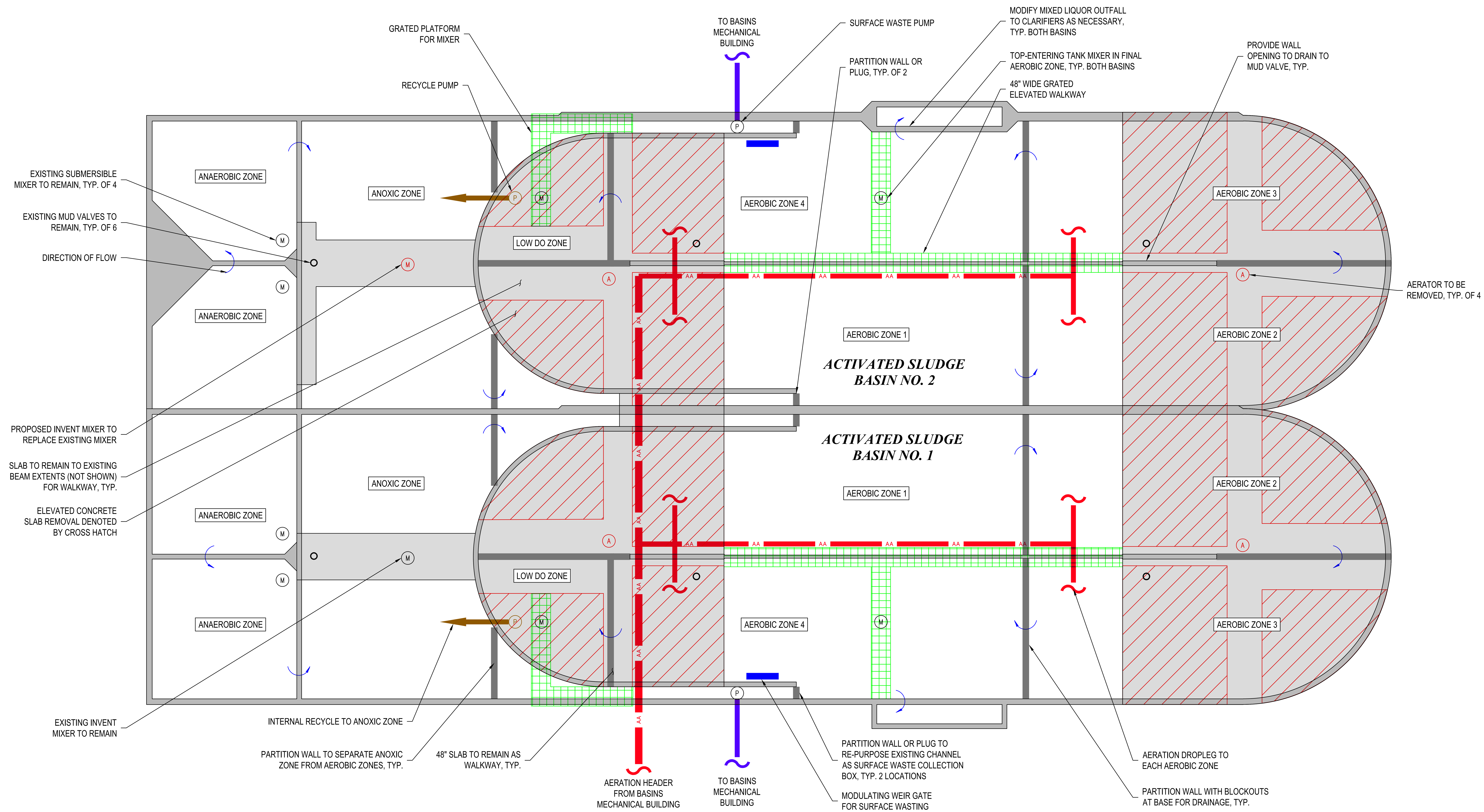
NO.	DATE	DESCRIPTION	BY	REVIEW

SCALE: SHOWN

0" 1" 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: --
SHEET NO.: --



WRF ACTIVATED SLUDGE BASINS IMPROVEMENTS
BASIN MODIFICATIONS

3/32" = 1'-0"

RH2

CITY OF SNOQUALMIE
GENERAL SEWER PLAN

FIGURE 9-7: WRF ACTIVATED SLUDGE BASINS IMPROVEMENTS BASIN MODIFICATIONS

JOB NO.: 118-083
CLIENT: SNQ
FILENAME: WWFP-E-EXHIBITB.DWG
SAVE DATE: May 20, 2020
PLOT DATE: May 20, 2020
ENGINEER: ALZ
REVIEWED: SMK

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW

SCALE: SHOWN
0" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"
DWG NO.: --
SHEET NO.: --

10 | OPERATIONS AND MAINTENANCE

INTRODUCTION

The City of Snoqualmie's (City) wastewater operations and maintenance (O&M) program consists of the following elements:

1. Normal operation of the wastewater collection system and water reclamation facility.
2. Emergency operation of the wastewater collection system and water reclamation facility, when one or more of the components is not available for normal use due to natural or man-made events.
3. A preventive maintenance program to ensure that the wastewater system is receiving maintenance in accordance with generally accepted standards.
4. Daily maintenance of the wastewater collection system and water reclamation facility.

NORMAL OPERATIONS

City Personnel

The City's wastewater division functions under the provisions of the City's National Pollutant Discharge Elimination System (NPDES) permit and Direction of the Parks & Public Works Director. The Wastewater Superintendent oversees the publicly owned treatment works (POTW) and directly or indirectly supervises all staff assigned to the sewer utility. The Wastewater Superintendent reports to the Utility Operations Manager as shown on the Organization Chart (**Figure 10-1**). Wastewater treatment plants have special employment requirements for staff as outlined in Chapter 70A.212 Revised Code of Washington (RCW).

In accordance with the RCW, it shall be unlawful for any person, firm, corporation, municipal corporation, or other governmental subdivision or agency to operate or maintain a wastewater treatment plant unless the individual persons performing the duties of an operator as defined in the NPDES permit S.5.3.B, or in any lawful rule, order, or regulation without being duly certified under the provisions of the chapter.

The municipality is required to designate a person on site at its wastewater treatment plant as the operator in responsible command of the operation and maintenance of the POTW. This person is required to be certified at a level equal to or higher than the classification rating of the facility, or Level III for the City.

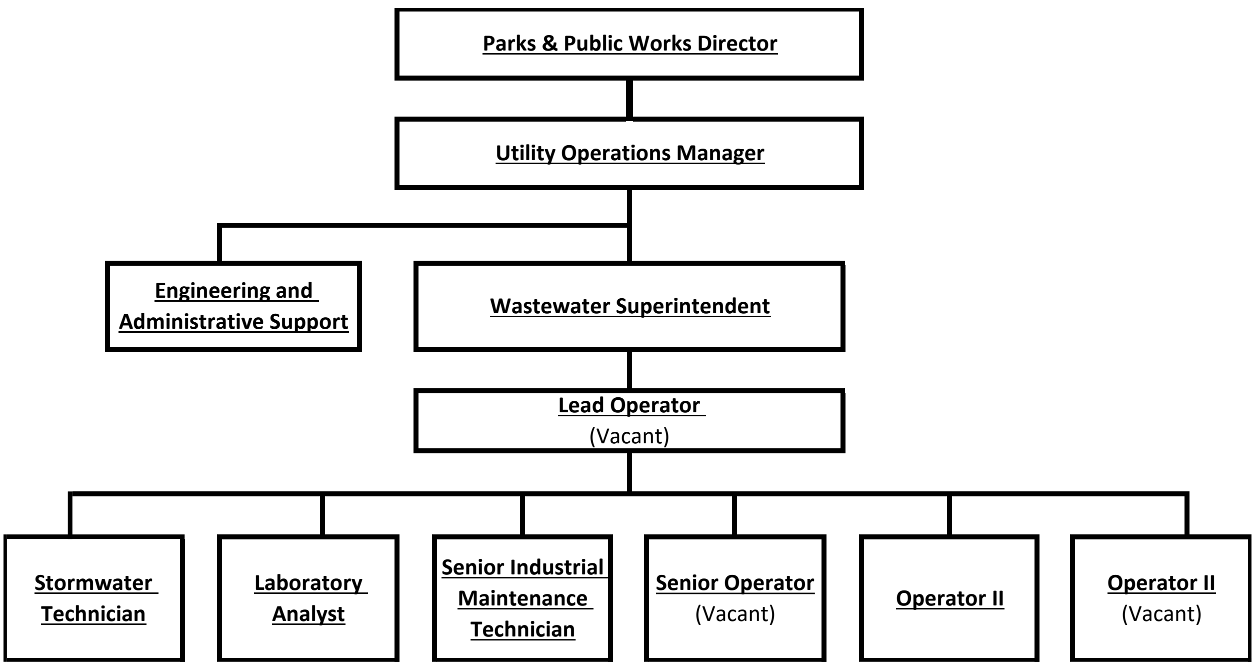
The wastewater treatment plant also is required, while staffed on more than one daily shift, to have a shift supervisor designated in charge of each shift at a level no lower than one level lower than the classification rating of II for the City. Based on the RCW, all staff shall be subordinate to the operator in responsible charge or wastewater superintendent.

The current wastewater department organization structure is as shown in **Figure 10-1**. Staff must:

1. Institute adequate operation and maintenance programs for the entire sewage system.
2. Keep maintenance records on all major electrical, supervisory control and data acquisition (SCADA), and mechanical components of the treatment plant, as well as the sewage system and pumping stations. Such records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed.
3. Ensure all operations and maintenance tasks done on Water Reclamation Facility (WRF) process equipment or systems are operated or supervised by an operator certified by the State of Washington. The Permittee may allow qualified mechanics, programmers, network engineers, electricians, or other trained tradespersons appropriate for specific tasks to perform work on equipment as long as a certified operator is on site to supervise, authorize, and verify that the work performed does not adversely impact facility operations, effluent quality, or process monitoring and alarm reliability.
4. Make maintenance records available for inspection at all times.

Figure 10-1

Wastewater Division Organization Chart



Personnel Responsibilities

The key responsibilities of the wastewater O&M staff are summarized as follows.

Parks & Public Works Director – Under the direction of the City Administrator, the Parks & Public Works Director leads or facilitates planning, implements capital improvement projects, and directs the long-term programs of the Department, including engineering and consultant engineering services, Parks, Streets, Stormwater, Wastewater, Water, and Fleet & Facilities Divisions.

Utility Operations Manager – Under the direction of the Parks & Public Works Director, the Utility Operations Manager provides oversight and management of the City's Water, Wastewater, and Stormwater Utilities. The position coordinates planning objectives, Capital Improvement projects, and operations and maintenance plans to implement City defined objectives for all utility divisions. The Utility Operations Manager coordinates closely with other divisions and City departments to develop operational strategies, budgets, and long-range planning efforts.

Engineering and Administrative Support – The Engineering and Administrative Support operates under the direction of the Utility Operations Manager and is responsible for overseeing the new development and construction review processes to ensure compliance with water, sewer, and stormwater regulations, City standards and specifications, and customer billing functions.

Wastewater Superintendent – This position serves as the City's RCW 70A.212.030 required Operator in Responsible Command (OIC). The position manages and develops the sewer utility objectives and annual budget to meet effluent standards and improve efficiencies and productivity via continuous quality improvement and strategic planning. The Wastewater Superintendent (plant manager) organizes operations, maintenance, and support activities to maximize efficient use of available staff, equipment, and materials, and is expected to analyze and evaluate operations, maintenance, and support functions while initiating new or improved practices as necessary.

Lead Operator – The Lead Operator serves to assist the Wastewater Superintendent in the leadership and management of the sewer utility. This position provides backup and support when the Wastewater Superintendent is unavailable or on leave.

Senior Operator – The Senior Operator is a fully skilled journey level position capable of operating and maintaining all functional areas of the system with minimal guidance or direction.

Operator II – Operator II is the entry level operator position within the wastewater division's management structure. These positions operate and maintain equipment as directed.

Senior Industrial Maintenance Technician – The Senior Industrial Technician is a journey level position capable of performing highly skilled and technical work with specialized wastewater related mechanical, electrical, and fabrication training.

Laboratory Analyst – The Laboratory Analyst is a fully educated professional laboratory position preforming analytical testing in wastewater and solid waste matrices in conventional chemistry and microbiological disciplines in a state accredited laboratory.

Stormwater Technician – The Stormwater Technician is an entry level position capable of performing highly skilled and technical work with specialized stormwater related mechanical, electrical, and fabrication training.

Certification of Personnel

Table 10-1 shows the current certifications of the City's wastewater O&M staff.

Table 10-1
Personnel Certification

Last Name	First Name	Certificate Number	Group	Expiration Date	Certificate Status	Renewal Status
Beach	Lyle T.	7543	III	12/31/2022	Valid	Renewing
Dalziel	Ryan A.	8623	II	12/31/2022	Valid	Renewing
George	Jason	9277	II	12/31/2022	Valid	Renewing
Holmes	Thomas E.	6854	IV	12/31/2022	Valid	Renewing
Mechanic Vacant						
Lead Vacant						
Operator Vacant						
Operator Vacant						

It is City policy to maintain a well-qualified, technically trained staff. The City annually allocates funds for personnel training, certification, and membership in professional organizations. The City believes that the time and money invested in training, certification, and professional organizations are necessary to provide safety and meet permit compliance.

Available Equipment

The wastewater department has several types of equipment available for daily routine O&M of the wastewater system. The equipment is stored at the City's WRF. If additional equipment is required for specific projects, the City will rent or contract with a local contractor for the services needed. A stock of supplies in sufficient quantities for normal system O&M and anticipated emergencies is stored at the WRF. A list of major equipment and chemicals used in the normal operation of the wastewater system can be found in the WRF operational logs.

Service, Equipment, and Supply Vendors

The list in **Table 10-2** identifies the typical vendors for service, materials, supplies, and chemicals. The City maintains adequate supplies and materials for normal operation. The suppliers maintain adequate materials for unusual needs.

Table 10-2
Service, Equipment, and Supply Vendors List

Name	Address	Phone	Products
Engineering and Technical Services			
RH2 Engineering, Inc.	22722 29th Drive SE, Suite 210 Bothell, WA 98021	(425) 951-5400 (800) 720-8052	Engineering and SCADA Support
Technical Systems, Inc.	2303 196th Street SW Lynnwood, WA 98036	(425) 775-5696	Control Systems (SCADA)
Quality Controls Corporation	5015 208th Street, Suite 1B Lynnwood, WA 98036	(425) 778-8280	Control Systems (SCADA)
Laboratory and Analytical Services			
AmTest Laboratories	13600 NE 126th Place, Suite C Kirkland, WA 98034	(425) 885-1664	Lab Testing
Materials and Supplies			
Hach Company	PO Box 389 Loveland, CO 80539-0389	(800) 227-4224	Lab Supplies
VWR	100 Matsonford Road Radnor, PA 19087-8660	Online	Lab Supplies
Scientific Supply and Equipment, Inc.	926 Poplar Place South Seattle, WA 98144	(206) 324-8550	Lab Supplies
Equipment and Service			
Beckwith and Kuffel	5930 1st Avenue S Seattle, WA 98108	(206) 767-6700	Equipment and Service (Pump and Motor Repair)
Cascade Machinery	4600 E Marginal Way S Seattle, WA 98134	(206) 762-0500	Equipment and Service (Pump and Motor Repair)
Rain for Rent	19430 59th Avenue NE Arlington, WA 98223	(360) 403-8672	Emergency Pumping Equipment

Routine Operations

Routine operations involve the analysis, formulation, and implementation of procedures to ensure that the facilities are functioning efficiently and treating sewer to meet discharge standards.

Continuity of Service

As the local sewer authority and publicly owned treatment works, the City shall maintain a structure of authority and responsibility to ensure that wastewater service is continuous. For example, changes in City Council or staff shall not have a pronounced effect on the City's level of treatment in terms of meeting the requirements of the NPDES permit and water quality standards.

Routine Wastewater Quality Sampling

The Washington State Department of Ecology (Ecology) has adopted federal regulations that specify minimum monitoring requirements for the wastewater system. There are two types of reporting at the treatment facility: process and compliance reporting. Process reporting involves collecting data by analyzing samples collected in the facility and reporting the data to the operations team. The data is used by the operations team to evaluate the facilities performance, monitor trends, and make appropriate daily adjustments. These minor daily adjustments ensure the facility is continuously operated meeting the discharge limits identified in the NPDES permit. Compliance testing includes analytical and record data reported to Ecology that demonstrates the City is compliant with the discharge limits. Reporting requirements are contained in the NPDES Waste Discharge Permit, a copy of which is included in **Appendix A**.

Operations and Maintenance Records

Facilities Operations and Maintenance Manuals

O&M manuals are available for staff members' reference. These manuals are kept on file at the WRF. The City intends to maintain its policies of requiring complete O&M manuals for all new equipment and facilities. In addition to equipment O&M manuals, the City has laboratory standard operating procedures kept at the WRF.

Mapping and As-Built Drawing Records

As-built records are essential to maintenance crews, City planners, engineers, developers, and anyone else needing to know how the wastewater system is laid out throughout the City. The drawing records are stored in files at City Hall and/or Public Works, and some are at the WRF.

Operations and Maintenance Records

Records are stored at the WRF for the following items.

1. Daily Operating Log
    a. Routine operational duties
    b. Wastewater system component maintenance
    c. Unusual operating conditions
    d. Sludge data
    e. Flow totalizer information
    f. Oxidation ditch status
    g. Rainfall data
    h. Documentation of bypasses, including time and duration
    i. SCADA historical server and data
2. Laboratory Records
    a. Lab tests summary
    b. Sampling time and location
    c. Unusual conditions documentation
    d. Chemical reagent preparation summary

   e. Laboratory work sheets
   f. Process computations, test results, and flow rate summary
3. Monthly Operating Report
   a. Submitted to Ecology in the format as required
4. Miscellaneous Reports
   a. Waste control
   b. Maintenance rounds
   c. Lift station data
5. Personnel Records
6. Emergency Conditions Records

A copy of the common forms used by the WRF staff is included in **Appendix J**.

Safety Procedures and Equipment

Safety is the concern and responsibility of all wastewater O&M staff. The following publications provide additional information regarding WRF safety:

1. *Safety, Health, and Security in Wastewater Systems,* Water Environment Federation (WEF) Manual of Practice No. 1, Sixth Edition.
2. *Operation of Water Resource Recovery Facilities*, WEF Manual of Practice No. 11, Seventh Edition.
3. *Simplified Laboratory Procedures for Wastewater Examination,* Water Pollution Control Federation (WPCF) Publication No. 18, 1985.

To maintain the highest level of safety, the City has taken steps toward educating its staff and providing resources to ensure a safe working environment. The City continuously improves the safety program as the requirements and affected operations change. Operating and field personnel are required to complete a safety program as an initial condition of employment. Weekly and monthly safety talks and training are conducted by the wastewater staff at the WRF. Copies of Material Safety Data Sheets (MSDS) for all chemicals used for water reclamation are on file at the WRF office.

The following identifies procedures to be followed for O&M tasks that involve the most common potential workplace hazards in the wastewater system.

Use of Chlorine or Chlorine Products

Standard Procedure – Handle with care, provide adequate ventilation, wear safety glasses and rubber gloves, and follow MSDS and facility standard operating procedures.

Use of Wastewater Treatment Chemicals

Standard Procedure – Follow MSDS and facility standard operating procedures.

Working in Confined Spaces

Standard Procedure – Follow State requirements for confined space entry.

Working around Heavy Equipment

Standard Procedure – Obtain proper training and follow all safety procedures. Use all appropriate personal protection equipment.

Working in Traffic Areas

Standard Procedure – Wear proper clothing and provide adequate signage and flagging for work area. Certified flaggers are to be used when traffic management requires flagging around a work site.

Working on or Around Tall or Deep Structures

Standard Procedure – Follow proper safety harness procedures for working on tall or deep structures and follow standard Labor and Industries safety procedures.

Working in or Around Pump Stations

Standard Procedure – Obtain proper training and follow all safety procedures for working on pumps and electrical equipment. Use all appropriate personal protection equipment.

Personal Protection Equipment

Standard Procedure – Wear all appropriate safety gear for the work activity.

Blood Borne Pathogen and Infectious Disease Control Training

Standard Procedure – Training and practice techniques to eliminate exposure and how to report exposure.

Self-Contained Breathing Apparatus Training

Standard Procedure – Fit test and how to use self-contained breathing apparatus.

Control of Hazardous Energy Training

Standard Procedure – Training and practice techniques to control hazardous energy.

Powered Industrial Lift Truck Training

Standard Procedure – Training and practice procedures to maintain safe operation.

General Safety Awareness Training

Standard Procedure – Safety talks on all subjects.

Sewer utility personnel are required to take recurrent training courses regarding the following topics: confined spaces; fall protection; competent persons; heavy equipment operation; CPR; first aid; traffic flagging; lockout-tagout; and blood-borne pathogens.

The City's facilities are equipped with confined space entry equipment and lockout-tagout equipment. Each City vehicle is equipped with first aid and blood-borne handling kits. The utility also owns flagging signs and equipment for safe operations in traffic. The City also owns two oxygen-gas detectors for staff use.

The Public Works Department follows all appropriate Occupational Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) regulations in its day-to-day operations and complies with the following State requirements:

- Chapter 296-809 Washington Administrative Code (WAC) – Confined spaces.
- WAC 296-155-650 to 66411 Part N – Excavation, trenching, and shoring.
- WAC 296-155-429 – Lockout-tagout for work on energized or de-energized equipment or circuits.
- Chapter 296-155 WAC, Part C1 – Fall restraint and fall arrest.
- *Manual on Uniform Traffic Control Devices* (MUTCD) – Traffic control for work in the public right-of-way.

EMERGENCY OPERATIONS

Capabilities

The City is well equipped to accommodate short-term system failures and abnormalities. Its capabilities are as follows.

Emergency Equipment

The City is equipped with the necessary tools to deal with common emergencies. If a more serious emergency should develop, the City will hire a local contractor who has a stock of spare parts necessary to make repairs to alleviate the emergency condition.

Emergency Telephone

The wastewater department has an emergency phone number for public or City staff to directly contact sewer department personnel after normal business hours. The number is (425) 888-8015.

Standby Personnel

The designated standby person can generally respond to a call within 45 minutes. A list of emergency telephone numbers is provided to each on-call employee. New employees are not placed on standby until they request a review of their candidacy and are determined to be qualified by the Wastewater Superintendent.

Contacts

The City maintains a list of utility and agency contacts for routine and emergency use as shown in **Table 10-3**.

Table 10-3

Utility and Agency Contacts

Agency	Contact	Phone
Utility Contacts		
Puget Sound Energy		(888) 225-5773
City of Snoqualmie Water Department	On-Call	(425) 888-8020
Storm and Drainage Issues	On-Call	(425) 888-8011
City of North Bend WWTP		(425) 888-7075
Agency Contacts		
Puget Sound Clean Air	Main Number	(206) 343-8800
Seattle/King County Public Health	Compliance Hotline	(206) 263-8255
Ecology NW Regional Office	Main Number	(425) 594-0000
Department of Health Reuse Water	Main Number	(509) 329-2148
Ecology NW Region Biosolids Coordinator	Coordinator	(360) 255-4406

Material Readiness

Some critical repair parts, tools, and equipment are on-hand and kept in fully operational condition. As repair parts are used, they are re-ordered. Inventories are kept current and adequate for most common emergencies that reasonably can be anticipated. The City has ready access to an inventory of repair parts, including parts required for repair of each type and size of pipe within the service area. Additionally, the City has been provided with after-hours emergency contact phone numbers for key material suppliers, which gives the City 24-hour access to parts not kept in inventory.

PREVENTIVE MAINTENANCE

Maintenance schedules that meet or exceed manufacturer's recommendations have been established for all critical components in the City's wastewater system. The following schedule is used as a minimum for preventive maintenance; the manufacturer's recommendations should be followed where conflict exists.

Collection System

Sewer Pipe

Frequency	***Task or Activity***
Ongoing	Conduct leak surveys on force mains and inflow and infiltration surveys on gravity pipes when hours are available for the program.
Ongoing	Inspect, clean, and evaluate manholes and sewer pipeline condition when hours are available for the program

Sewage Lift Stations

Frequency	***Task or Activity***
Daily	Receive and analyze telemetry readings. Log and record pump motor hours.
Weekly	Evaluate pump station reports.
Monthly	Check motor noise, temperature, and vibration.
Annually	Clean all lift station wet wells.
As Needed	Change motor oil.
As Needed	Take inventory of parts, pumps, and motors.
As Needed	Routine maintenance of lift station structures and surrounding site.

Engine Generator Sets

Frequency	***Task or Activity***
Weekly	Exercise generators under load.
As Needed	Routine maintenance in accordance with manufacturer's recommendations.
As Needed	Replace fluids and filters in accordance with manufacturer's recommendations (or more frequently depending on amount of use).
As Needed	Perform tune-up; replace parts as necessary.

Telemetry and Control System	
Frequency	***Task or Activity***
Daily	Backup program and data.
As Needed	Visually inspect cabinets and panels for damage, dust, and debris.
As Needed	Inspect inside of cabinets and panels for damage, dust, and debris.
As Needed	Vacuum clean all modules.
As Needed	Test alarm indicator units.
As Needed	Clean and flush all pressure sensitive devices.
As Needed	Visually inspect all meters to coordinate remote stations.
As Needed	Check master and remote telemetry units for proper operation; repair as necessary.

Tools and Equipment	
Frequency	***Task or Activity***
Rolling Stock	
Weekly	Check all fluid levels and brakes. Fluid levels and brakes are checked each time the equipment is used if less than weekly.
As Needed	Replace fluids and filters in accordance with manufacturer's recommendations (or more frequently depending on type of use); perform preventative maintenance per manufacturer's recommendations.
Tools	
As Needed	Clean after each use; lubricate and maintain as necessary; inspect for damage and wear before each use; perform preventative maintenance per manufacturer's recommendation.

Water Reclamation Facility

The City has a comprehensive O&M manual for the WRF, which is updated periodically and contains the O&M manual maintenance program tables for the City's WRF.

STAFFING

The preventive maintenance procedures, as well as the normal and emergency operations of the utility, are described in the previous sections. The hours of labor and supervisory activity required to effectively provide this ongoing maintenance and operations schedule forms the basis for determining adequate staffing levels.

Current Staff

As previously indicated, the City's Wastewater Division staff currently includes seven personnel assigned to the operation and maintenance of the sewer system. The staff is made up of management personnel and utility workers as shown in **Figure 10-1**.

Recommended Staffing

The City wastewater staff currently operate and maintain the WRF, as well as the City's sanitary sewer and stormwater collection systems. The estimated number of work hours necessary to provide optimum operation and maintenance of these systems is shown in **Table 10-4**.

Table 10-4

Staffing Recommendation for the WRF and Collections Systems

Operations Time Estimate		
Process/Activity/Task	**Current Operations Time (hours)**	**Unfunded Operations Time (hours)**
No. 1 – Basic and Advanced Operations and Processes	3,690	300
No. 2 – Maintenance	2,060	900
No. 3 – Laboratory Operations	1,810	0
No. 4 – Biosolids/Sludge Handling	900	0
No. 5 – Lift Stations/Sewer Mains	610	1,350
No. 6 – Facilities	440	0
No. 7 – Automation/SCADA	1,660	590
No. 8 – General Small City Work	1,130	250
No. 9 – Stormwater	2,180	620
Subtotal Recommended Staffing Level (hours)	**14,480**	**4,010**
FTE Estimate		
Annual Working Days (52 weeks/year, 5 days/week)	260	
Annual Vacation Days per FTE	21	
Annual Sick Days per FTE	7	
Annual Holidays per FTE	12	
Annual Misc Leave Days per FTE	0.5	
Subtotal Working Days per FTE	**220**	
Subtotal Working Hours per FTE	**1,756**	
Comparison of Current to Estimated Staffing Needs		
Subtotal Recommended Staffing Level (FTEs)	**8.2**	**2.28**
Current Funded Staffing Level (FTEs)	7	0
Current Funded Staffing Level (Annual Hours)	12,292	0
Estimated Staffing Shortage (Annual Hours)	2,188	4,010
Estimated Staffing Shortage (FTEs)	**1.2**	**2.3**

* Staff hours per Task Nos. 1 through 9 are rounded up to the nearest 10 hours.

This table identifies both the recommended level of staffing necessary for the current systems, as well as unfunded staffing time for additional O&M tasks or programs. In general, the recommended staffing levels for each system were estimated based on the following information:

- WRF – New England Interstate Water Pollution Control Commission (NEIWPCC) guide for treatment plant staffing and input from the City's operations staff.
- Sanitary sewer collection system – Input from the City's operations staff, which was supported by the recommended staffing hours in the WPCF Manual of Practice No. 7, *Operation and Maintenance of Wastewater Collection Systems*.
- Stormwater collection system – Input from the City's operations staff.

The staffing guides provide an approximation of staffing based on facility size and complexity for use in providing an overall recommended staffing level. Operator input is valuable in providing a more detailed analysis of staffing for individual tasks and identifying possible deficiencies. RH2 reviewed and compiled both sources and verified that, at a planning level, the estimated staffing levels are in line with other facilities and systems of similar size and complexity. A detailed breakdown of the hours listed in **Table 10-4** is provided in **Appendix K**.

The recommended total hours of labor to operate and maintain these systems is 14,480 as shown in **Table 10-4**, equating to approximately 8 full-time staff equivalents (FTEs). The City wastewater system staff, which is funded for 7 FTEs, has demonstrated the capability of adequately operating these systems while complying with the requirements of the Washington State Department of Ecology NPDES Permit. However, a sub-optimum staffing level can lead to a reduction in preventative maintenance or other deficiencies. Based on the recommended staffing requirements in **Table 10-4**, funding one additional FTE would approximately achieve optimum operation and maintenance of the sewer system.

Table 10-4 also includes a column for currently unfunded maintenance and operational tasks identified by the operations staff. These include tasks the City's operations staff currently does not have the time to include as part of their normal workload. These tasks generally include an increase and formalized inspection program for the collection systems and WRF infrastructure. A detailed breakdown of these tasks is included in **Appendix K**. Based on **Table 10-4**, approximately two additional FTEs are needed to perform these unfunded maintenance and operational tasks for the sewer system. These tasks and programs could potentially increase the useful life of critical infrastructure and delay capital improvements. The City can evaluate the potential offset in future capital or other expenses by adding operations staff.

OPERATION AND MAINTENANCE IMPROVEMENTS

Other proposed improvements not mentioned above are addressed in **Chapters 6** or **9** and included in the City's Capital Improvement Program (**Chapter 11**).

11 | CAPITAL IMPROVEMENT PLAN

INTRODUCTION

This chapter presents proposed improvements to the City of Snoqualmie's (City) sewer system that are necessary to resolve existing system deficiencies and plan for the projected sewer system growth. The sewer system improvements were identified from the results of the collection system evaluation presented in **Chapter 6**, the Water Reclamation Facility (WRF) evaluation presented in **Chapter 7**, and WRF improvements alternatives analyses presented in **Chapter 8**. The recommended WRF major capital improvements identified in the alternatives analyses are further discussed in **Chapter 9**, along with WRF minor capital improvements. The sewer system improvements were sized to meet the system's projected 2040 flow and loading conditions.

A Capital Improvement Plan number, herein referred to as a CIP number, has been assigned to each improvement. Numbers were assigned to the improvements as shown in **Figures 11-1** and **11-2**. The improvements are organized and presented in this chapter according to the following primary categories. *Note: The number symbol will be replaced with a corresponding improvement number in the descriptions.*

- Existing System Improvements
  - Water Reclamation Facility Improvements (CIP F#)
  - Lift Station Improvements (CIP WW#)
  - Sewer Main Improvements (CIP SM#)
- 2030 System Improvements (10-year capital improvements)
  - Water Reclamation Facility Improvements (CIP F#)
  - Developer-Funded Facility Improvements (CIP DF#)
- 2040 System Improvements (long-term planning capital improvements)
  - Water Reclamation Facility Improvements (CIP F#)
  - Developer-Funded Facility Improvements (CIP DF#)
- Planning Improvements
  - Miscellaneous Improvements (CIP M#)

The remainder of this chapter presents a brief description of each group of improvements, the criteria for prioritization, the basis for the cost estimates, and the schedule for implementation.

For planning purposes, the improvement projects described herein are based on one alternative route or conventional concept for providing the necessary improvement. Other methods of achieving the same result, such as obtaining flow capacity increases by adding one large gravity main versus using multiple gravity pipes, force main/gravity main combinations, or multiple force mains, should be considered during design to ensure the best and lowest cost alternative design is selected. Further evaluation should be performed when more information is available regarding when and where future developments will occur.

DESCRIPTION OF IMPROVEMENTS

This section provides a general description of each group of improvements and an overview of the system deficiencies they will resolve. Some of the improvements are necessary to resolve existing system deficiencies. These improvements are discussed in **Chapters 6**, **7**, and **9**.

Future improvements will be necessary to serve currently undeveloped areas in the City and its Urban Growth Area (UGA). The major pipe and facility improvements that will be required when development occurs in those areas are considered to be developer-funded projects, unless over-sizing of the improvements provides benefit to the existing customers. The CIP numbers for developer-funded improvements have a “DF” prefix.

Improvements also have been identified for the undeveloped areas in the UGA to illustrate the major facilities that will be required to properly serve those areas. Additional developer-funded projects include localized on-site sewer main improvements that are not associated with the existing overall sewer collection/interceptor system, but will be necessary when the property served by the sewer system is redeveloped or expanded. The costs associated with all of these improvements shall be borne by the developers, rather than the existing sewer customers. The locations of improvements in the undeveloped areas are to be used for planning purposes only and are based on one route. The improvements shall be designed in the future to fit the specific layout of the developments. The required capacity and timing of each recommended improvement is provided for budgeting and financial projection purposes only. The actual design parameters should be evaluated at the design phase of the project using the hydraulic model or another accepted engineering procedure. Updated population, employment, and flow data should be used when available to ensure the proposed facilities are sized adequately to handle build-out flows.

It is intended that this General Sewer Plan (GSP) contain an inclusive list of recommended system improvements; however, additional projects may need to be added or removed from the list as growth occurs or conditions change. The City will evaluate the capacity of the wastewater collection system and WRF as growth occurs and as development permits are received.

Existing System Improvements

The following improvements were identified by City staff, from the results of the WRF and system analyses, and from previously prepared CIPs, as discussed in **Chapters 6**, **7**, and **9**. These improvements are necessary to serve the existing sewer service area. The improvements include the major pipeline and facility construction that is required to properly serve the existing sewer service area. The improvement costs shall be borne by the existing customers unless over-sizing of the improvements provides a benefit to developers.

The existing improvements are based on existing peak hour flow rates; however, the proposed pipe diameters for recommended replacement pipelines are based on the peak hour flow projections for 2040. The existing system improvements are illustrated in **Figure 11-1**. RH2

Engineering, Inc.'s (RH2) analysis shows the best apparent replacement alignment for the collection system improvements based on information currently available. A variety of alternatives are possible for the collection system CIP projects listed, and alternatives should and will be considered during the design of each project.

Water Reclamation Facility Improvements (CIP F#)

CIP F1 – Existing Secondary Clarifier Improvements

Deficiency: The existing secondary clarifier drive units were installed in 1997. The clarifier drive units are nearing the end of the expected service life and should be replaced with either new or refurbished drives. In addition, City operations staff have to spend significant time cleaning the clarifier effluent launders due to algae growth.

Improvement: Each clarifier drive unit replacement should be scheduled separately, as one clarifier must always remain in operation. The estimated costs for replacement reflect the assumption that new drive units will be installed. However, during design of the improvements, new versus refurbished drive options can be evaluated to determine the best value for the City.

Secondary Clarifier No. 1 – Perform a stress test of the clarifier, similar to the one performed in 2015, to evaluate the completed feedwell and energy dissipating inlets improvements prior to making similar improvements on Secondary Clarifier No. 2. Replace the drive unit, and add effluent launder covers to combat algae growth and reduce operational time related to cleaning the launders.

Secondary Clarifier No. 2 – Following the stress test evaluation for Secondary Clarifier No. 1, proceed and modify, as necessary, with outfitting the clarifier with feedwell and scum removal system improvements similar to those previously completed on Secondary Clarifier No. 1 (as part of the WRF Phase 2 improvements completed in 2019 referenced in **Chapter 7**). As part of the improvements, the drive unit should be replaced, and effluent launder covers should be added.

CIP F2 – Centrifuge Components Replacement

Deficiency: The existing Centrisys centrifuge has exceeded the recommended operating hours for multiple wear components.

Improvement: Have a maintenance overhaul of the unit performed to replace worn components. The unit can be serviced without affecting WRF operations as it serves as a backup to the new Andritz centrifuge that is used for dewatering.

CIP F3 – WRF Interior Road Grind and Overlay

Deficiency: The WRF interior paved roadway has been partially excavated and patched in various locations during recent construction projects, resulting in a non-homogeneous and less durable surface.

Improvement: To provide a homogenous and durable finished surface, the existing pavement and patched areas should be planed and overlaid with approximately 2 inches of hot mix asphalt. Many utility structures will need to be temporarily lowered and then raised to the final overlay elevation as part of this project.

CIP F4 – Non-Potable Water Pump Station Replacement

Deficiency: The existing non-potable water (NPW) packaged pump station was installed in 2008 as part of solids handling system improvements. It replaced the original NPW pump station. The pump station consists of three end-suction centrifugal pumps controlled by variable frequency drives (VFDs), suction header and discharge header piping, a discharge pressure transducer, and a dedicated control panel. The condition of the pump station warrants the City schedule its replacement.

Improvement: A new packaged pump station should be installed to fully replace the existing pump station. The estimated costs for replacement reflect the assumption that the new pump station will be similar to the flow rate, pressure, power capacities, and requirements of the existing pump station. Therefore, associated piping, structural, electrical, and automatic control improvements are anticipated to be limited. Prior to replacing the pump station, operating data and facility-wide NPW demands and pressure requirements, including those for planned WRF improvements, should be evaluated to make a final determination of the pump station operating parameters and design requirements.

CIP F5 – Grit Removal System Improvements

Deficiency: The existing headworks includes a concrete vortex designed for a John Meunier MECTAN® grit removal system that was installed in 1997. Since then, the grit removal control system, grit and air piping, blowers, and classifier were replaced with a Smith and Loveless PISTA® control system, top-mounted grit pump, and vacuum priming system. Grit piping was replaced, as was the classifier, with a new WEMCO cyclone and classifier. The existing John Meunier paddle drive remained, and it should be replaced due to its age.

Improvement: A new Smith and Loveless grit mechanism should be installed and can be integrated into the existing control system. As part of this project, it is recommended that the grit chamber be upgraded to provide enhanced grit removal. This is likely to include influent and chamber baffles and potentially some concrete modifications.

CIP F6 – Reclaimed Water Filters Replacement

Deficiency: Two of three existing reclaimed water filters were installed in 1997. The third filter was installed in 2003 for additional capacity. The rapid sand filters are the traveling hood type, which is a technology still used today (the traveling hood is a variant of the traveling bridge). The existing Dorr-Oliver/Eimco filter systems are no longer manufactured by the current manufacturer Eimco Water Technologies, which is part of Ovivo; however, Ovivo does offer repair and rebuild services to support the systems. Based on the ages and conditions of the existing filter systems, the City should schedule replacement during the planning period. Other filtration technologies are available, and they have been evaluated for replacing the existing filter systems.

Improvement: An alternatives analysis was performed to develop replacement alternatives, compare them, and select the preferred one. Reclaimed water filters alternatives are presented and analyzed in **Chapter 8**, and a preferred alternative is identified in **Chapter 9**.

Design and construction of the preferred alternative should proceed. The preferred alternative is removal of the existing three filter systems and replacement with three cloth media disk filter systems. Replacement with the new disk filter systems also generally includes modifications within the existing filter basins, filter backwash residuals wasting, filter chamber settled solids wasting, automation of the outlet gates at the secondary effluent flow control structure, and automation of the reclaimed water clearwell inlet gate. Refer to **Chapter 9** for more information on the proposed improvements. As part of design of the preferred alternative, a pilot study needs to be performed to prove the performance of the preferred alternative technology at the WRF and finalize design criteria. Coagulant chemical addition upstream of the new filter systems may be required and will be determined based on the pilot study.

Lift Station Improvements (WW#)

CIP WW1 – Existing Kimball Creek Pump Station Improvements

Deficiency: The lift station was sized for full build-out conditions with the capability of meeting the 7.12 million gallons per day (MGD) (approximately 5,000 gallons per minute (gpm)) design peak hour flow (PHF) with two pumps in operation. With a nominal low speed setting of 2,000 gpm, the pumps are oversized for the current average daily dry influent flow rates that generally vary between 200 gpm and 1,400 gpm at diurnal conditions. As such, the lift station causes excessive flow cycling and spikes to the WRF. This poses operational issues for the WRF, including inconsistencies in the capture efficiency of the screening and grit removal system; reduced hydraulic retention time in the anaerobic and anoxic zones of the oxidation ditches; increased loading rates to the secondary clarifiers; and flow spikes to the ultraviolet (UV) channel that affect the efficiency of the disinfection system, as discussed in **Chapter 6**.

Improvement: Improvements should be made to the Kimball Creek Pump Station to provide better flow-pacing for influent to the WRF. Alternative 2 (as described in detail in **Chapter 6**) is the preferred alternative for upgrading the lift station, which involves replacing one existing pump with a smaller baseflow pump, along with other improvements. It is assumed that the existing pre-rotation basin is oversized for the new pump and will be replaced as well.

CIP WW2 – Pump Station No. 2 (Pickering Court) Reconstruction and Force Main Replacement

City's Existing Project No.: SWR19001CIP

Deficiency: This deficiency was identified in the City's 2012 GSP. Pump Station No. 2 was originally constructed in 1965. Several of the original lift station components are still in use and have exceeded their useful lives.

Improvement: Replace the existing piping, valves, electrical equipment, roofing, and one remaining original pump to extend the useful life of this lift station. Rehabilitate, by sliplining or lining with cured-in-place pipe, or replace the existing force main.

CIP WW3 – Pump Station No. 1 (Railroad Place) Improvements

City's Existing Project No.: SWR19002CIP

Deficiency: This deficiency was identified in the City's 2012 GSP. The pumps at Pump Station No. 1 run continuously for multiple hours during peak non-flood flows. This lift station has a firm capacity of approximately 1,800 gpm, and it is projected that the 2040 PHF to this lift station will reach approximately 2,015 gpm with the Snoqualmie Casino expansion, as discussed in **Chapter 6**.

Improvement: Upgrade the lift station capacity so it can handle at least approximately 2,015 gpm. The at Pump Station No. 1 was upgraded in 2002 and is generally in good condition. The existing force main will be replaced with 12-inch-diameter force main as discussed in **Chapter 6**.

CIP WW4 – Pump Station No. 3 Improvements

Deficiency: Pump Station No. 3 does not have a flow meter, so the City has limited capability of monitoring this lift station.

Improvement: Upgrade Pump Station No. 3 by installing a flow meter in a vault to improve the City's capability of monitoring this lift station.

CIP WW5 – Pump Station No. 4 Improvements

Deficiency: Pump Station No. 4 does not have a flow meter, so the City has limited capability of monitoring this lift station.

Improvement: Upgrade Pump Station No. 4 by installing a flow meter in a vault to improve the City's capability of monitoring this lift station.

CIP WW6 – Pump Station No. 6 Improvements

Deficiency: Pump Station No. 6 does not have a flow meter, so the City has limited capability of monitoring this lift station. In addition, the ball check valves were removed previously because they were causing the pumps to airlock.

Improvement: Upgrade Pump Station No. 6 by installing a flow meter in a vault to improve the City's capability of monitoring this lift station and installing swing check valves to prevent the pumps from recirculating flow in the lift station's wet well.

CIP WW7 – Pump Station BP Improvements

Deficiency: Pump Station BP does not have a flow meter, so the City has limited capability of monitoring this lift station.

Improvement: Upgrade Pump Station BP by installing a flow meter in a vault to improve the City's capability of monitoring this lift station.

CIP WW8 – Pump Station E Improvements

Deficiency: Pump Station E does not have a flow meter or pump rails, so the City has limited capability of monitoring this lift station and spends additional time removing and placing the pumps during maintenance.

Improvement: Upgrade Pump Station E by installing a flow meter in a vault to improve the City's capability of monitoring this lift station and installing pump rails to ease removal and placement of the pumps during maintenance.

CIP WW9 – Pump Station F Improvements

Deficiency: Pump Station F does not have a flow meter, so the City has limited capability of monitoring this lift station.

Improvement: Upgrade Pump Station F by installing a flow meter in a vault to improve the City's capability of monitoring this lift station.

CIP WW10 – Pump Station K2 Improvements

Deficiency: Pump Station K2 does not have a flow meter, so the City has limited capability of monitoring this lift station.

Improvement: Upgrade Pump Station K2 by installing a flow meter in a vault to improve the City's capability of monitoring this lift station.

CIP WW11 – Pump Station K3 Improvements

Deficiency: Pump Station K3 does not have a flow meter or pump rails, so the City has limited capability of monitoring this lift station and spends additional time removing and placing the pumps during maintenance.

Improvement: Upgrade Pump Station K3 by installing a flow meter in a vault to improve the City's capability of monitoring this lift station and installing pump rails to ease removal and placement of the pumps during maintenance.

CIP WW12 – Pump Station L Improvements

Deficiency: Pump Station L does not have a flow meter, so the City has limited capability of monitoring this lift station. The pump station also does not have pump rails, so the City spends additional time removing and placing the pumps during maintenance.

Improvement: Upgrade Pump Station L by installing a flow meter in a vault to improve the City's capability of monitoring this lift station and installing pump rails to ease removal and placement of the pumps during maintenance.

CIP WW13 – Pump Station N6 Improvements

Deficiency: Pump Station N6 does not have a flow meter, so the City has limited capability of monitoring this lift station.

Improvement: Upgrade Pump Station N6 by installing a flow meter in a vault to improve the City's capability of monitoring this lift station.

CIP WW14 – Pump Station S12A Improvements

Deficiency: Pump Station S12A does not have a flow meter, so the City has limited capability of monitoring this lift station. This lift station has no bollards installed, so there is the potential for vehicular damage to this lift station's transformer, control panel, access hatches, and gas meter. In addition, the valve vault hatch is not traffic rated and should not be driven on by any vehicles.

Improvement: Upgrade Pump Station S12A by installing a flow meter in a vault to improve the City's capability of monitoring this lift station, installing bollards around the lift station's transformer, control panel, access hatches, and gas meter, so there is less concern of vehicular damage to these features, and installing a traffic-rated hatch for the valve vault to allow the hatch to be driven on by vehicles.

CIP WW15 – Pump Station Z Improvements

Deficiency: Pump Station Z does not have a flow meter, so the City has limited capability of monitoring this lift station.

Improvement: Upgrade Pump Station Z by installing a flow meter in a vault to improve the City's capability of monitoring this lift station.

CIP WW16 – Hospital Pump Station Improvements

Deficiency: Hospital Pump Station does not have a flow meter, so the City has limited capability of monitoring this lift station.

Improvement: Upgrade the Hospital Pump Station by installing a flow meter in a vault to improve the City's capability of monitoring this lift station.

Sewer Main Improvements (SM#)

CIP SM1 – 384th Street SE Sewer Main between SE Newton Street and SE Kimball Creek Drive

City's Existing Project No.: SWR20002CIP

Deficiency: The gravity sewer mains along 384th Avenue SE between SE Newton Street and SE Kimball Creek Drive have hydraulic capacity deficiencies, and a portion of these sewer mains need to be upsized in the near future based on the hydraulic analysis of the existing collection system. A portion of these sewer mains would still be near their hydraulic capacity and were identified for upsizing in the City's 2012 GSP.

Improvement: Replace approximately 2,070 linear feet (LF) of existing 10-inch gravity pipe with new 12-inch gravity sewer pipe in accordance with the City's construction standards along 384th Avenue SE between SE Newton Street and SE Kimball Creek Drive, as shown in **Figure 11-1**.

CIP SM2 – Sewer Line Relocation at Pump Station No. 4 (Meadowbrook)

City's Existing Project No.: SWR18002CIP

Deficiency: Years of erosion at the west end of SE Walnut Street has weakened the bank along the Snoqualmie River that supports the existing gravity sewer main. During a flood, any debris coming down the river can damage the portion of the gravity main exposed and uncovered in this area, which could cause the uncontrolled release of sewage into the Snoqualmie River. This gravity sewer main needs to be replaced and relocated with gravity sewer main located further away from the Snoqualmie River to help to protect public health, protect the environment, and improve sewer system reliability.

Improvement: Replace and relocate the influent gravity sewer main to Pump Station No. 4 along the Snoqualmie River and at the west end of SE Walnut Street, with gravity sewer main in the City's access road to Pump Station No. 4, which is farther from the Snoqualmie River than the current sewer alignment, and stabilize the adjacent Snoqualmie River bank.

CIP SM3 – Pump Station No. 1 to Manhole No. 14 (SE Newton Street) Sewer Main

City's Existing Project No.: SWR20001CIP

Deficiency: The gravity sewer mains along Railroad Place SE between Pump Station No. 1 and SE Fir Street surcharge during PHFs and will need to be upsized to accommodate additional future flows based on the hydraulic analysis of the collection system. The City's 2012 GSP also identified the need for replacing gravity sewer mains along Falls Avenue NE between SE River Street and SE Newton Street.

Improvement: In accordance with the City's construction standards, replace approximately 1,640 LF of existing 15-inch gravity pipe with new 18-inch gravity sewer pipe along Railroad Place SE between Pump Station No. 1 and SE Fir Street, and 430 LF of existing 12-inch gravity pipe with new gravity sewer pipe along Falls Avenue NE between SE River Street and SE Newton Street, as shown in **Figure 11-1**. During the replacement of these gravity sewer mains, the slope of the sewer mains along Railroad Place SE should be made as consistent as possible through this alignment to improve hydraulic capacity.

CIP SM4 – Street Preservation Program – Sewer

City's Existing Project No.: PUW20002CIP and PUW16001CIP

Deficiency: Many of the roadways slated for reconstruction in the City are severely deteriorated and intersections are not Americans with Disabilities Act (ADA) compliant. Improvements to the existing streets are planned so these roadways are consistent with the City's adopted standards. These areas contain aging water mains, failing sewer piping, and storm drain systems that should be upgraded in conjunction with these roadway improvements.

Improvement: Replace or repair the failing sewer piping in areas where the City has planned roadway improvements. A preliminary design investigation should be performed, which would include video inspection, to evaluate the feasibility of rehabilitating the existing sewer main versus the need to replace the existing sewer main with 8- and 10-inch polyvinyl chloride (PVC) pipe.

CIP SM5 – SR 202 Bridge Sewer Main Replacement Project Feasibility Analysis

City's Existing Project No.: ULT22001CIP

Deficiency: Because of bridge weight limitations, the Washington State Department of Transportation (WSDOT) has restricted the size of pipelines across the State Route (SR) 202 bridge in the City. In order to meet future growth projections, improve system reliability, and reduce risks, the City needs to install larger diameter pipelines across the Snoqualmie River near the SR 202 bridge. This project will consist of two phases: 1) a feasibly analysis to determine the approach for replacing the pipelines that cross the Snoqualmie River near the SR 202 bridge; and 2) the replacement of the water, reclaimed water, and sanitary sewer pipelines currently affixed to the SR 202 Snoqualmie River Bridge.

Improvement: A feasibility analysis for the SR 202 bridge sewer main replacement will be performed by the City so that the most effective solution for the sewer main replacement may be implemented. This CIP item should be completed before **CIP SM6**.

CIP SM6 – SR 202 Bridge Sewer Main Replacement Project

City's Existing Project No.: ULT22001CIP

Deficiency: The City needs to install larger diameter pipelines across the Snoqualmie River near the SR 202 bridge.

Improvement: Replace the sewer mains that are currently affixed to the SR 202 bridge with new, larger diameter pipelines. The new pipelines may be directionally drilled under the Snoqualmie River. This CIP item should be completed after **CIP SM5**.

2030 System Improvements (10-Year Capital Improvements)

The 2030 improvements were identified from the results of the WRF and system analyses discussed in **Chapters 6** and **7** and the WRF improvements alternatives analyses presented in **Chapter 8**. These improvements are necessary to serve currently undeveloped areas of the City and the City's UGA expansion. The improvements include the major facility construction that will be required to properly serve those areas. The improvement costs are typically borne by the developers, rather than the existing customers, unless over-sizing of the improvements provides benefit to the existing customers. Additional developer-funded projects that are not described below would include localized improvements that are not associated with overall collection systems outside of the properties being developed but would be necessary to serve the development area.

No gravity sewer main upgrades for the 2030 flow projections, as developed in **Chapter 4**, were identified based on the assumption that the existing improvements are complete. The 2030 system improvements are illustrated in **Figure 11-2**. A variety of alternatives for the collection system improvements are possible, and further evaluation should be performed when more information is available regarding when and where future developments will occur.

Water Reclamation Facility Improvements (CIP F#)

CIP F8 – Activated Sludge Basins Improvements

Deficiency: The capacity of an existing single oxidation ditch is exceeded at current and projected WRF influent flow and loading conditions. Operating both existing ditches increases capacity, but does not allow for a redundant offline ditch. Furthermore, the combined capacity of both ditches will be exceeded based on projected WRF influent flow and loading conditions.

In addition, it is likely that limitations of both the internal recycle system and aeration system in each existing ditch are primary factors in creating conditions that favor excessive filamentous bacteria growth in the ditches. Excessive filamentous bacteria growth reduces the settleability of the mixed liquor, which limits the capacity of the existing two secondary clarifiers.

To address the deficiencies and achieve the recommended biological treatment process objectives, which are identified in **Chapter 7**, improvements should be implemented for the ditches.

Improvement: An alternatives analysis was performed to develop improvement alternatives, compare them, and select the preferred one. Oxidation ditches alternatives are presented and analyzed in **Chapter 8**, and a preferred alternative is identified in **Chapter 9**.

Design and construction of the preferred alternative should proceed. The preferred alternative is conversion of the existing two oxidation ditches to plug flow reactors (referred to as activated sludge basins for the proposed improvements) to increase the capacity of the biological treatment process for handling current and projected flow and loading conditions while maintaining redundancy. The conversion will include provisions for expanding capacity within the footprint of the improvements. The conversion also will address the existing operational deficiencies and provide stable and reliable nutrient removal processes, which will further benefit the City in the case additional NPDES permit nutrient effluent limits are anticipated to be developed in the future. The activated sludge basins improvements generally include major modifications for conversion of the ditches, site work and site utilities, and construction of a separate building to house equipment associated with the new process. Refer to **Chapter 9** for more information on the proposed improvements.

Lift Station Improvements (WW#)

CIP WW17 – Future Kimball Creek Pump Station Improvements – Phase I

Deficiency: Two of the existing pumps are greater than 20 years old and should be replaced during the planning period. Additionally, the single existing non-VFD motor control center (MCC) section (after the baseflow pump project improvements in CIP WW1) should be replaced with a new MCC section, including a VFD.

Improvement: Replace the two oldest two-speed pumps with new inverter duty rated pumps, likely of similar size to the existing pumps. Flow rates and required lift station capacity should be evaluated at the time of replacement to ensure proper replacement pump sizing.

CIP WW18 – Future Kimball Creek Pump Station Improvements – Phase II

Deficiency: The third existing pump will exceed 20 years of age during the planning period and should be budgeted for replacement. However, the new baseflow pump is likely to significantly decrease the operating time for the large pumps, and as such, replacement of the third existing pump should occur as necessitated by pump wear and operating time.

Improvement: Replace the third existing pump with a new inverter duty rated pump.

Developer-Funded Improvements (CIP DF#)

CIP DF1: Pump Station BP Capacity Upgrades

Deficiency: Pump Station BP has a firm capacity of approximately 750 gpm. This is insufficient for the projected 2030 peak hour flow, and the pumping capacity could be exceeded by 2030, as described in **Chapter 4**.

Improvement: Upgrade the lift station capacity so it can handle at least approximately 795 gpm. Pump Station BP was constructed in 1998 and is generally in good condition. The design capacity of each pump at this lift station is 750 gpm. Additional pump testing should be performed to evaluate if the firm capacity of this lift station is actually greater than the design capacity. These improvements may include replacement of both pumps at the lift station, new electrical gear to handle larger horsepower pumps, and a new on-site generator. The scope and cost for these improvements may be reduced depending on the improvements that are necessary to increase the capacity of this lift station.

CIP DF2: Pump Station S22 Construction

Deficiency: A facility will be required to serve new development in Plat S22.

Improvement: Construct a new lift station in future Plat S22 (which lies between SE 96th Street and approximately SE 94th Street and between 356th Avenue SE and 354th Avenue SE) with the capacity to handle peak hour flows from the development and force main as needed per City standards to connect Pump Station S22 to the City's existing sewer collection system along SE Terrace Street. Due to equipment limitations and requirements, a 125 gpm pump may be required at minimum so that a 3-inch solid can be passed.

CIP DF3: Snoqualmie Hills West Pump Station Construction

Deficiency: A facility will be required to serve new development in the Snoqualmie Hills West planning area.

Improvement: Construct a new lift station to serve new development in the Snoqualmie Hills West planning area with the capacity to handle peak hour flows from the development and force main as needed per City standards to connect the Snoqualmie Hills West Pump Station to the City's existing sewer collection system along SE Gravenstein Court. Due to equipment limitations and requirements, a 125 gpm pump may be required at minimum so that a 3-inch solid can be passed.

CIP DF4: Snoqualmie Hills East Pump Station Construction

Deficiency: A facility will be required to serve new development in the Snoqualmie Hills East and West planning areas.

Improvement: Construct a new lift station to serve new development in the Snoqualmie Hills East and West planning areas with the capacity to handle peak hour flows from the development and force main as needed per City standards to connect the Snoqualmie Hills East Pump Station to the City's existing sewer collection system along Silva Avenue SE. Due to equipment limitations and requirements, a 125 gpm pump may be required at minimum so that a 3-inch solid can be passed. When development in this area occurs, other alternatives will be evaluated as well, such as serving a portion of the Snoqualmie Hills East planning area through Pump Station Z.

CIP DF5: Mill Site Pump Station Construction

Deficiency: At least one facility will be required to serve new development at the Snoqualmie Mill Site.

Improvement: Construct a new lift station to serve new development at the Snoqualmie Mill Site with the capacity to handle peak hour flows from the development and force main as needed per City standards to connect the Mill Site Pump Station to the City's existing sewer collection system along SE Mill Pond Road. Due to equipment limitations and requirements, a 125 gpm pump may be required at minimum so that a 3-inch solid can be passed. When development in this area occurs, other alternatives will be evaluated as well, such as serving the Snoqualmie Mill Site with more than one lift station.

CIP DF6: Aerobic Digester Aeration Improvements

Deficiency: The aeration capacity of the aerobic digesters will need to be increased to support the expansion of the Casino.

Improvement: Replace the existing membrane aeration equipment in the first two digesters with jet aeration equipment. This will include removal of the diffusers and top-entering mixers in these digesters. A jet aeration manifold and submersible recycle pump will be installed in each of these digesters, along with mechanical changes to support these additions. Electrical and control improvements also will be made to support these improvements.

2040 System Improvements (Long-Term Planning Capital Improvements)

The 2040 improvements were identified from the results of the WRF and system analyses discussed in **Chapters 6** and **7** and the WRF improvements alternatives analyses presented in **Chapter 8**. These improvements are necessary to serve currently undeveloped areas of the City and the City's UGA expansion. The improvements include the major facility construction that will be required to properly serve those areas. The improvement costs are typically borne by the developers, rather than the existing customers, unless over-sizing of the improvements provides benefit to the existing customers. Additional developer-funded projects that are not described below would include localized improvements that are not associated with overall collection systems outside of the properties being developed but would be necessary to serve the development area.

No gravity sewer main upgrades for the 2040 flow projections, as developed in **Chapter 4**, were identified based on the assumption that the 2030 and existing improvements are complete. The additional system improvements required for 2040 are illustrated in **Figure 11-2**.

Water Reclamation Facility Improvements (CIP F#)

CIP F7 – Third Secondary Clarifier

City's Existing Project No.: SWR16004CIP

Deficiency: Construction of the activated sludge basins improvements, identified in CIP F8, will result in increased settleability of the mixed liquor, which will correspondingly increase the capacity of the existing two secondary clarifiers and reduce the need for construction of a third secondary clarifier as previously scheduled in the 2015 *Snoqualmie WRF Improvements*

Engineering Report by RH2. It is likely that a third clarifier will not be required until 2030 or beyond to provide a redundant offline clarifier at projected WRF influent flow and loading conditions (refer to **Chapter 8** for details). It is prudent for the City to budget for design and construction of a third clarifier during the planning period, but the timing for implementation needs to be re-evaluated as operational data from the completed activated sludge basins improvements becomes available.

Improvement: Following completion of the activated sludge basins improvements (CIP F8), biological treatment process operational data can be evaluated to determine the timing for design and construction of a third secondary clarifier. A third clarifier will increase clarifier capacity for treatment at projected flow and loading conditions while maintaining redundancy. Construction of a third clarifier generally includes the clarifier structure and equipment, return activated sludge and scum pump stations, site work and site utilities, and adding an electrical room in the existing Shop Building. Refer to **Chapter 9** for more information on the proposed improvements.

Planning Improvements

The following miscellaneous improvements are planning efforts.

Miscellaneous Improvements (CIP M#)

CIP M1 – General Sewer Plan Update

Deficiency: The City's GSP should be updated every 10 years in coordination with its Water System Plan update.

Improvement: The City plans to update its GSP every 10 years. In addition, the City may review the GSP at the 5-year mark and adjust the projections and improvements as necessary. This may be completed between 2029 through 2030, and 2039 through 2040.

CIP M2 – WRF Engineering Report

Deficiency: The City may need to upgrade its WRF to meet future NPDES waste discharge permit limits or improve operation of the WRF.

Improvement: If the WRF needs any upgrades, an Engineering Report for the WRF upgrades will need to be submitted to Ecology for approval. The upgraded WRF will be required to meet regulations and the City's NPDES waste discharge permit. The extent of any WRF upgrades cannot be determined until this CIP is conducted.

CIP M3 – Sewer System Defect Investigation

Deficiency: The existing per capita flow rates for the City are slightly above the criteria for inflow set by the U.S. Environmental Protection Agency (EPA) in the *Infiltration/Inflow, I/I Analysis and Project Certification* report, indicating that there might be an inflow problem as discussed in **Chapter 4**. The City suspects some inflow and infiltration in the sewer system could be occurring due to sewer system defects, especially in the older parts of the sewer collection system that was constructed originally in the 1960s.

Improvement: The City plans to conduct a sewer system defect investigation in the City's sewer collection system drainage basins that are upstream of Pump Station No. 1, which contains the older parts of the sewer collection system and parts of the sewer collection system located in the 100-year floodplain for the Snoqualmie River. This investigation will include video inspections, cleaning, and smoke testing of gravity sewer mains in areas where defects are suspected by the City's sewer operations staff.

CIP M4 – Inflow and Infiltration Study

Deficiency: The existing per capita flow rates for the City are slightly above the criteria for inflow set by the EPA in the *Infiltration/Inflow, I/I Analysis and Project Certification* report, indicating that there might be an inflow problem as discussed in **Chapter 4**. It is suspected the high flows above the EPA inflow criteria were partially due to the Snoqualmie River flooding areas since a significant portion of the City, consisting of the downtown area and the eastern portion of the City limits, is located within the 100-year floodplain.

Improvement: The City should conduct an inflow and infiltration (I/I) study to confirm the results of the I/I evaluation in **Chapter 4** and to locate the affected collection system areas to determine if there are any cost-effective sewer rehabilitation measures to remove any excessive inflow. This program will work towards eliminating sources of I/I, replacing or refurbishing mains, manholes, and service lines, and disconnecting inflow sources.

ESTIMATING COSTS OF IMPROVEMENTS

Project costs for the proposed improvements were estimated based on costs of similar recently constructed sewer projects around the Puget Sound area and are presented in 2019 dollars. The unit costs for each pipe size are based on estimates of all construction-related improvements, such as materials and labor for installation, services, manholes, connections to the existing system, trench restoration, asphalt surface restoration, and other work for a complete installation. Project cost estimates for sewer pipe projects were determined from the unit costs (i.e., cost per foot-length) shown in **Table 11-1** and the proposed diameter and approximate length of each improvement. The costs shown in **Table 11-1** include indirect costs estimated at 50 percent of the construction cost for engineering preliminary design, final design, construction contract administration, project administration, permitting, and legal and administrative services.

Table 11-1
Gravity Sewer Pipe Unit Costs

Sewer Main Diameter (in.)	Project Cost per Linear Foot (2019 $ per LF)
8	$683
10	$695
12	$705
18	$751

The cost estimates shown in **Table 11-2** include the estimated construction cost of the improvement and indirect costs estimated at 50 percent of the construction cost for engineering preliminary design, final design, construction contract administration, project administration, permitting, and legal and administrative services. The construction cost estimates include a sales tax of 8.6 percent. The unit costs do not include costs associated with easement acquisition.

Cost estimates prepared by RH2 for projects in the CIP are considered to be Class 5 estimates, based on standards established by the American Association of Cost Engineers (AACE). Class 5 estimates are described as generally being prepared with very limited information and subsequently have wide accuracy ranges. The typical accuracy range for this cost estimate class is from -20 percent to -50 percent on the low side and from +30 percent to +100 percent on the high side. Class 5 estimates are prepared for any number of strategic business planning purposes including, but not limited to, market studies, assessment of initial viability, evaluation of alternate schemes, project screening, project location studies, evaluation of resource needs and budgeting, long-range capital planning, etc.

The final cost of the projects will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, and other variable factors. As a result, the final project costs will likely vary from those presented. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

PRIORITIZING IMPROVEMENTS

The existing system improvements were prioritized by the City based on the perceived need for the improvement to be completed prior to projects with fewer deficiencies or less risk of damage due to failure of the system. Priority and schedule for developer-funded projects is dependent on the timing and design of specific developments areas.

Future projects that are not identified as part of the City's CIP may become necessary. Such projects may be required to remedy an emergency situation or address unforeseen problems. Due to budgetary constraints, the completion of such projects may require modifications to the recommended CIP. The City retains the flexibility to reschedule, expand, or reduce the projects included in the CIP and to add new projects to the CIP, as best determined by rate payers and the City Council, when new information becomes available for review and analysis.

SCHEDULE OF IMPROVEMENTS

The results of prioritizing the improvements were used to assist in establishing an implementation schedule that can be used by the City for preparing its CIP. The implementation schedule for the proposed improvements is shown in **Table 11-2**. It should be noted that the implementation schedule shown is, to some extent, flexible. The implementation schedule should be modified based on City preferences, budget, or as development fluctuates. The City should review **Table 11-2** at least annually and reprioritize as necessary to match budget, growth, flows, and other City conditions/priorities. The City will identify and schedule the flow monitoring study and the repair/replacement projects during the annual budget process. This provides the City with the flexibility to coordinate these projects with road or other projects within the same area.

The developer-funded improvement projects and their associated cost estimates also are shown in **Table 11-2**. However, the implementation dates for these improvements are unknown, due to the uncertainty of the timing of the future developments that will be responsible for these improvements.

Future Project Cost Adjustments

All cost estimates shown in the tables are presented in 2019 dollars. Therefore, it is recommended that future costs be adjusted to account for the effects of inflation and changing construction market conditions at the actual time of project implementation. Future costs can be estimated using the Engineering News Record Construction Cost Index for the Seattle area or by applying an estimated rate of inflation that reflects the current and anticipated future market conditions.

The CIP presented in **Table 11-2** is based on the information currently available. As the City implements the recommendations, the cost and timing of projects may be revised.

Table 11-2
Proposed CIP Implementation Schedule

CIP No.	Project Description	Size: Length (LF)	Size: Diameter (in.)	Estimated Cost (2019 $)	Schedule of Improvements, Planned Year of Project and Estimated Cost in 2019 $: 2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031 to 2040
	Sewer Main Improvements															
SM1	384th Street SE Sewer Main between SE Newton Street and SE Kimball Creek Drive [SWR20002CIP]	1,970	12''	$1,388,000			$709K	$679K								
SM2	Sewer Line Relocation at Pump Station No. 4 (Meadowbrook) [SWR18002CIP]	300	8''	$1,211,000	$1,211K											
SM3	Pump Station No. 1 to MH No. 14 (SE Newton Street) Sewer Main [SWR20001CIP]	2,070	12'', 18''	$1,534,000	$1,303K					$231K						
SM4	Street Preservation Program - Sewer [PUW20002CIP and PUW16001CIP]	3,560	8'', 10''	$2,144,000	$444K	$1,700K										
SM5	SR 202 Bridge Sewer Main Replacement Project Feasibility Analysis [UTL22001CIP]	---	---	$75,000		$50K	$25K									
SM6	SR 202 Bridge Sewer Main Replacement Project, [UTL22001CIP]	---	---	$1,424,000								$1,424K				
Total - Sewer Main Improvements				**$7,776,000**	**$2,958K**	**$1,750K**	**$734K**	**$679K**	**$0K**	**$231K**	**$0K**	**$1,424K**	**$0K**	**$0K**	**$0K**	**$0K**
	Lift Station Improvements															
WW1	Existing Kimball Creek Pump Station Improvements			$1,227,000		$228K	$999K									
WW2	Pump Station No. 2 (Pickering Court) Reconstruction and Force Main Replacement [SWR19001CIP]			$707,800	$235K	$473K										
WW3	Pump Station No. 1 (Railroad Place) Improvements [SWR19002CIP]			$745,800	$499K	$247K										
WW4	Pump Station No. 3 Improvements			$160,000												$160K
WW5	Pump Station No. 4 Improvements			$145,000												$145K
WW6	Pump Station No. 6 Improvements			$150,000												$150K
WW7	Pump Station BP Improvements			$160,000												$160K
WW8	Pump Station E Improvements			$160,000												$160K
WW9	Pump Station F Improvements			$145,000												$145K
WW10	Pump Station K2 Improvements			$135,000												$135K
WW11	Pump Station K3 Improvements			$160,000												$160K
WW12	Pump Station L Improvements			$165,000												$165K
WW13	Pump Station N6 Improvements			$135,000												$135K
WW14	Pump Station S12A Improvements			$200,000												$200K
WW15	Pump Station Z Improvements			$135,000												$135K
WW16	Hospital Pump Station Improvements			$145,000												$145K
WW17	Future Kimball Creek Pump Station Improvements - Phase I			$638,000							$638K					
WW18	Future Kimball Creek Pump Station Improvements - Phase II			$305,000												$305K
Total - Facility Improvements				**$5,618,600**	**$734K**	**$948K**	**$999K**	**$0K**	**$0K**	**$0K**	**$638K**	**$0K**	**$0K**	**$0K**	**$0K**	**$2,300K**
	Water Reclamation Facility Improvements															
F1	Existing Secondary Clarifier Improvements			$933,000		$159K	$774K									
F2	Centrifuge Components Replacement			$100,000					$100K							
F3	WRF Interior Road Grind and Overlay			$309,000								$309K				
F4	Non-Potable Water Pump Station Replacement			$180,000						$180K						
F5	Grit Removal System Improvements			$548,000		$32K	$31K	$243K	$243K							
F6	Reclaimed Water Filters Replacement			$3,000,000								$600K	$2,400K			
F7	Third Secondary Clarifier [SWR16004CIP]			$3,844,000												$3,844K
F8	Activated Sludge Basins Improvements			$7,860,000		$1,200K	$1,200K	$2,730K	$2,730K							
Total - Facility Improvements				**$16,774,000**	**$0K**	**$1,391K**	**$2,005K**	**$2,973K**	**$3,073K**	**$180K**	**$0K**	**$909K**	**$2,400K**	**$0K**	**$0K**	**$3,844K**
	Miscellaneous and Planning Improvements															
M1	General Sewer Plan Update			$450,000											$225K	$225K
M2	WRF Engineering Report			$300,000												$300K
M3	Sewer System Defect Investigation			$50,000												$50K
M4	Inflow and Infiltration Study			$125,000												$125K
Total - Miscellaneous Improvements				**$925,000**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$0K**	**$225K**	**$700K**
Total Estimated Project Costs of City-funded Improvements				**$31,093,600**	**$3,692K**	**$4,089K**	**$3,738K**	**$3,652K**	**$3,073K**	**$411K**	**$638K**	**$2,333K**	**$2,400K**	**$0K**	**$225K**	**$6,844K**
	Developer-Funded Improvements															
DF1	Pump Station BP Capacity Upgrades			$1,074,000					Timing of Project Based on Timing of Future Developments							
DF2	Pump Station S22 Construction			$1,397,000					Timing of Project Based on Timing of Future Developments							
DF3	Snoqualmie Hills West Pump Station Construction			$2,206,000					Timing of Project Based on Timing of Future Developments							
DF4	Snoqualmie Hills East Pump Station Construction			$1,092,000					Timing of Project Based on Timing of Future Developments							
DF5	Mill Site Pump Station Construction			$2,428,000					Timing of Project Based on Timing of Future Developments							
DF6	Aerobic Digester Aeration Improvements			$893,000					Timing of Project Based on Timing of Future Developments							
Total - Developer-Funded Improvements				**$9,090,000**					**Timing of Projects Based on Timing of Future Developments**							

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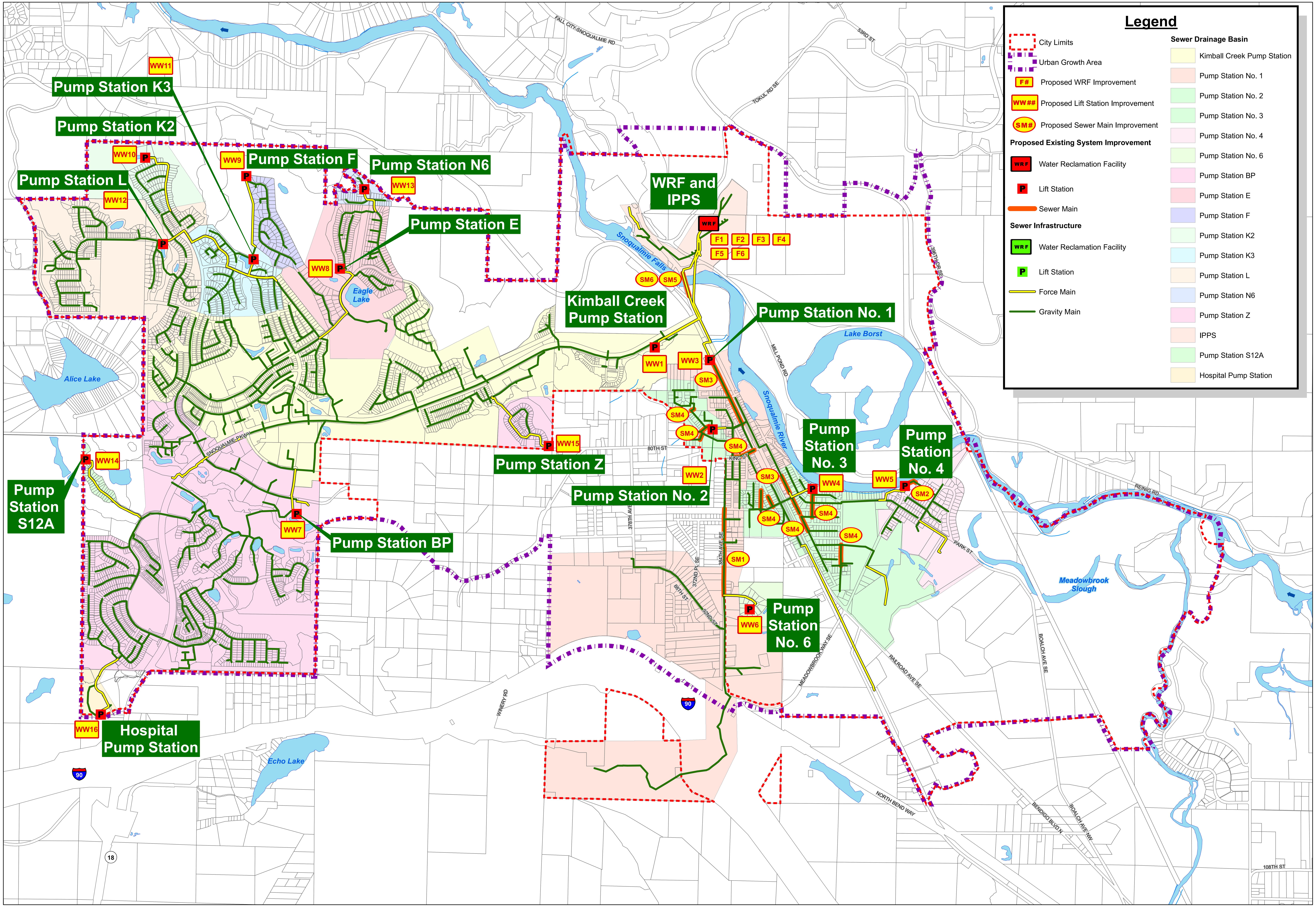

COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET PLOT DATE: JUN 10, 2022 BY: SPERKINS

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Vicinity Map

KING COUNTY

Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Figure 11-1
Existing Sewer System Capital Improvement Projects
City of Snoqualmie General Sewer Plan

CITY OF SNOQUALMIE

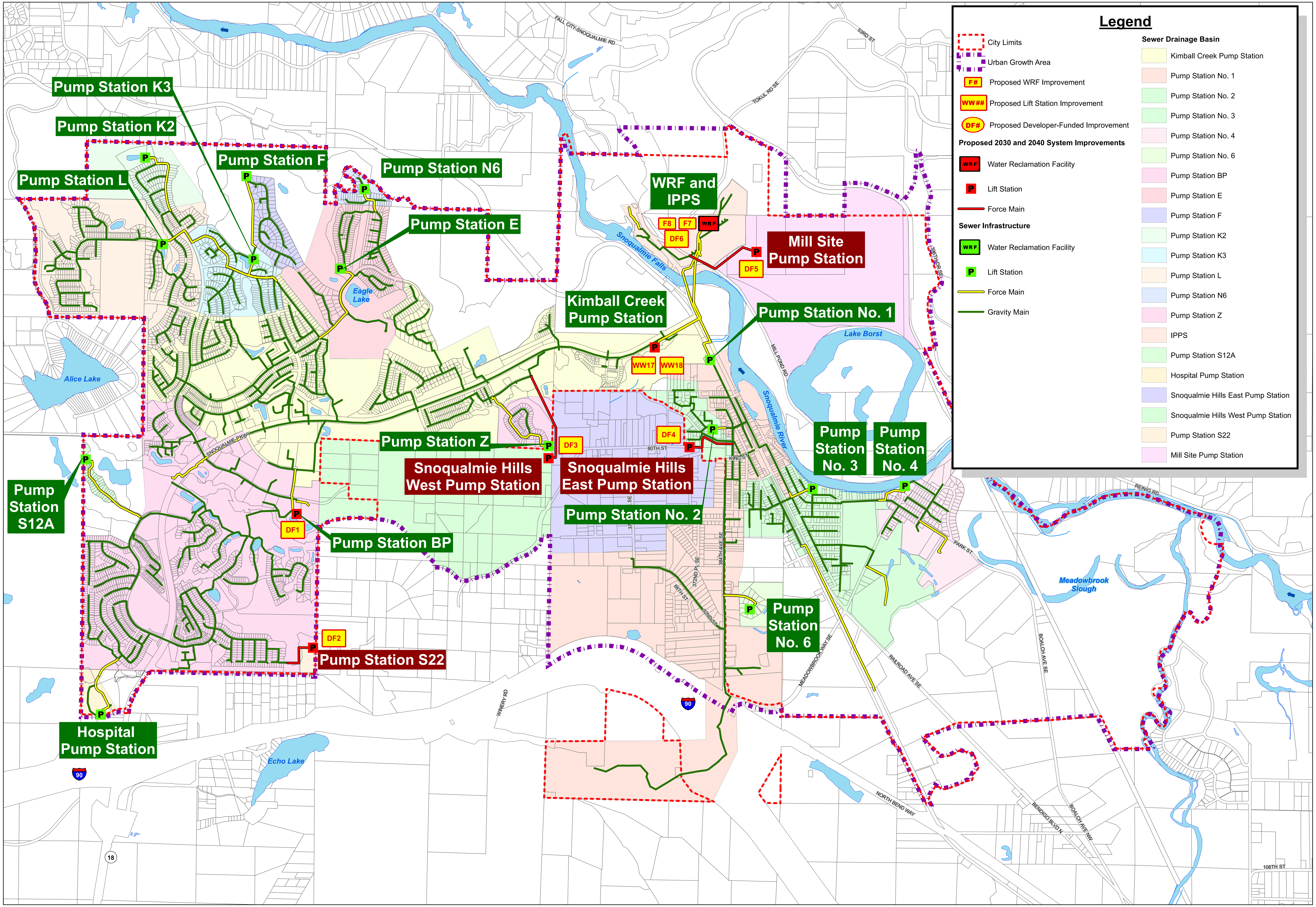
1 inch = 1,000 feet

0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH



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Vicinity Map

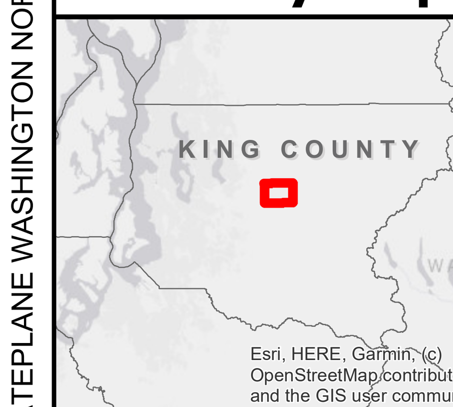

Figure 11-2
Projected Future Sewer System Capital Improvement Projects
City of Snoqualmie General Sewer Plan

CITY OF SNOQUALMIE

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

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NORTH

J:\DATA\SNQ\118-083\GIS\GSP-FIG_11-2_FUTURE SEWER DEFICIENCIES.MXD BY: SPERKINS PLOT DATE: JUN 10, 2022 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

12 | FINANCIAL PLAN

INTRODUCTION

This chapter was prepared by FCS GROUP to provide a financial program that allows the City of Snoqualmie (City) sewer utility to remain financially viable during the planning period. This financial viability analysis considers the historical financial condition, current and identified future financial and policy obligations, operation and maintenance (O&M) needs, and the financial impacts of the capital projects identified in this General Sewer Plan (GSP). Furthermore, this chapter provides a review of the sewer utility's current rate structure with respect to rate adequacy and customer affordability.

This chapter was initiated prior to the Snoqualmie Casino (Casino) expressing interest in expanding their facility; therefore, this chapter does not include the additional capital improvement project that is needed to provide sewer service to the Casino expansion. This project is a developer-funded improvement that will be funded through connection charges for the Casino's expansion, so it does not impact the overall City financing and rate analyses that are presented in this chapter.

PAST FINANCIAL PERFORMANCE

This section includes a historical summary of financial performance as reported by the City, including fund resources and uses arising from cash transactions.

Comparative Financial Statements

The City legally owns and operates water, sewer, and stormwater utilities. The City's utilities operate on a cash basis. Therefore, annual balance sheets and income statements are not prepared. In addition, financial reporting occurs on a combined utility fund basis. Individual utility financial performance history has been isolated by reviewing the City's historical revenue and expense reports. **Table 12-1** shows a summary of sewer fund resources and uses arising from cash transactions for the previous 6 years (2014 through 2019). Noteworthy findings and trends for the historical performance and condition of the City's sewer utility are then discussed.

Table 12-1

Summary of Historical Fund Resources and Uses Arising from Cash Transactions

	2014	2015	2016	2017	2018	2019
Beginning Cash and Investments						
Reserved	$ 1,122,525	$ 1,421,641	$ 1,874,386	$ 3,432,211	$ (2,072,467)	$ 6,981,704
Revenues						
Charges for Goods and Services	$ 2,975,641	$ 3,546,472	$ 3,871,144	$ 3,953,772	$ 4,748,112	$ 5,689,869
Miscellaneous Revenues	95,372	36,540	35,449	2,460	315,030	85,954
Total Operating Revenues:	$ 3,071,013	$ 3,583,012	$ 3,906,593	$ 3,956,232	$ 5,063,142	$ 5,775,822
Expenditures						
Utilities	$ 2,300,045	$ 2,778,847	$ 2,737,442	$ 2,897,820	$ 2,892,290	$ 2,898,091
Total Operating Expenditures:	$ 2,300,045	$ 2,778,847	$ 2,737,442	$ 2,897,820	$ 2,892,290	$ 2,898,091
Excess (Deficiency) Revenues over Expenditures:	**$ 770,967**	**$ 804,165**	**$ 1,169,151**	**$ 1,058,411**	**$ 2,170,852**	**$ 2,877,731**
Other Increases in Fund Resources						
Debt Proceeds	$ -	$ 324,575	$ 59,881	$ 1,947,987	$ 18,751,475	$ -
Custodial Activities	-	-	1,399,814	-	-	-
Other Resources	47,464	259,086	-	-	-	-
Total Other Increases in Fund Resources	$ 47,464	$ 583,662	$ 1,459,694	$ 1,947,987	$ 18,751,475	$ -
Other Decreases in Fund Resources						
Capital Expenditures	$ 102,638	$ 410,348	$ 695,914	$ 4,636,452	$ 9,420,615	$ 3,119,301
Debt Service - Principal and Interest	273,619	266,112	268,966	121,837	439,708	1,166,321
Debt Service - Transfers*	-	-	-	2,271,137	1,901,533	-
Transfers-Out	143,060	181,980	106,140	105,340	106,300	107,550
Custodial Activities	-	-	-	1,376,310	-	-
Other Uses	-	76,642	-	-	-	-
Total Other Decreases in Fund Resources	$ 519,316	$ 935,082	$ 1,071,020	$ 8,511,077	$ 11,868,157	$ 4,393,172
Increase (Decrease) in Cash and Investments:	**$ 299,115**	**$ 452,745**	**$ 1,557,825**	**$ (5,504,678)**	**$ 9,054,171**	**$ (1,515,441)**
Ending Cash and Investments						
Reserved	1,421,641	1,874,386	3,432,211	(2,072,467)	6,981,704	5,466,263
O&M Coverage Ratio	133.52%	128.94%	142.71%	136.52%	175.06%	199.30%
Net Operating Income as a % of Operating Revenue	25.10%	22.44%	29.93%	26.75%	42.88%	49.82%
Debt Service Coverage Ratio**	2.82	3.02	4.35	8.69	4.94	2.47

*Debt Service - Transfers includes repayment of the City's bond anticipation notes

**Does not include Debt Service - Transfers

Findings and Trends

- The City's historical financials show that the sewer utility's cash and investments balance fell below zero by more than $2.0 million (M) to end 2017. However, because the City's utilities are reported as a combined utility fund, the individual balances of one or more funds can go negative as long as the combined utility fund remains positive. This was the case in 2017, when the combined utility fund balance ended at $5.0M.
- The City's sewer charges for services increased from $3.0M in 2014 to $5.7M in 2019. The average annual increase was 13.84 percent per year, with a total increase of 91.21 percent from 2014 to 2019. Operating expenditures remained more constant, increasing by $600,000 over the 6 years for an average annual increase of 4.73 percent. Due to the increasing revenue and relatively flat expenditures, net operating income (revenues less expenditures) grew approximately $2.1M, from $771,000 in 2014 to $2.9M in 2019.

- The O&M coverage ratio (total operating revenues divided by total operating expenses) was 133.52 percent in 2014. Due to the increase in operating income this ratio grew to 199.30 percent in 2019. A ratio of 100 percent or greater shows that operating revenue will successfully cover operating expenses, and the utility has remained above this ratio for the past 6 years.
- Net operating income as a percentage of operating revenue was 25.10 percent in 2014, and increased to a high of 49.82 percent in 2019. Similar to the O&M coverage ratio, these trends help to show how successfully operating revenue actually covered operating expenses, with higher positive numbers being the best and negative numbers showing need for improvement. In addition, these trends demonstrate the ability of the utility to invest in capital, whether through direct cash transfers or the issuance and servicing of debt.
- The debt service coverage ratio measures the amount of cash flow available to meet principal and interest payments. Typically, revenue bond debt service coverage requires a minimum factor of 1.20 during the life of the loans. This ratio is calculated by dividing cash or net operating income (operating revenues less operating expenses) by annual revenue bond debt service. The debt service coverage ratio for all outstanding debt ended 2014 at 2.82, falling to 2.47 by 2019 as the City took on a new debt. The fact that this ratio has sustained levels higher than the minimum target of 1.20 indicates a stable capacity for new debt and will likely result in favorable terms when entering the bond market.

FINANCIAL PLAN

The sewer utility is responsible for generating sufficient revenue to meet all of its costs. The primary source of funding is derived from ongoing monthly service charges, with additional revenue coming from engineering charges and other miscellaneous revenues. The City controls the level of user charges and, with City Council approval, can adjust user charges as needed to meet financial objectives.

The financial plan can only confirm financial feasibility if it considers the total system costs of providing sewer services, both operating and capital. To meet these objectives, the following elements have been completed.

1. **Capital Funding Plan.** Identifies the total capital improvement plan (CIP) obligations of the planning period. The plan defines a strategy for funding the CIP, including an analysis of available resources from rate revenues, existing reserves, general facilities charges, debt financing, and any special resources that may be readily available (e.g., grants, developer contributions, etc.). The capital funding plan impacts the financial plan through the use of debt financing (resulting in annual debt service) and the assumed rate revenue made available for capital funding.
2. **Financial Forecast**. Identifies future annual non-capital costs associated with the operation, maintenance, and administration of the sewer system. Included in the financial plan is a reserve analysis that forecasts cash flow and fund balance activity, along with testing for satisfaction of actual or recommended minimum fund balance policies. The financial plan ultimately evaluates the sufficiency of utility revenues in meeting all obligations, including cash uses such as operating expenses, debt service, capital outlays, and reserve

contributions, as well as any coverage requirements associated with long-term debt. The plan also identifies the future adjustments required to fully fund all utility obligations in the planning period.

Capital Funding Plan

To properly evaluate future capital funding needs, capital costs were escalated by 3.00 percent annually to the year of planned spending. The 2020 budget and CIP developed for this GSP identifies $31.7M in project costs over the 11-year planning horizon from 2020 to 2030. The 21-year period through 2040 includes $57.3M in total project costs.

A summary of the 11-year and 21-year CIPs are shown in **Table 12-2**. As shown, each year has varied capital cost obligations depending on construction schedules and infrastructure planning needs.

Table 12-2

11-Year and 21-Year CIPs

Year	Unescalated $	Escalated $
2020	$ 2,593,287	$ 2,593,287
2021	4,252,228	4,379,795
2022	3,119,870	3,309,870
2023	3,222,340	3,521,138
2024	3,942,616	4,437,449
2025	977,922	1,133,679
2026	1,465,051	1,749,347
2027	3,360,707	4,133,245
2028	3,311,117	4,194,424
2029	855,893	1,116,746
2030	872,512	1,172,584
11-Year Total	**$ 27,973,542**	**$ 31,741,564**
2031 - 2040	16,474,629	25,567,617
21-Year Total	**$ 44,448,171**	**$ 57,309,181**

Table 12-3 provides more detail for the 11-year CIP.

Table 12-3

11-Year CIP (Escalated $)

Project	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2020 Estimated Expenditures	2,593,287										
Sewer Main Replacement Program				175,000	875,000	918,750	964,688	1,012,922	1,063,568	1,116,746	1,172,584
Enterprise Resource Planning (ERP) System Replacement Project		120,000									
Downtown Snoqualmie Infrastructure Improvement Program		1,720,000									
SR 202 Bridge Sewer Main Replacement Project		53,045	27,318					1,803,881			
Lift Station Improvement Program		241,885	1,091,634				784,660				
Railroad Pl. Lift Station Improvement Project		769,153									
Clarifiers Improvement Project		168,683	845,771								
Water Reclamation Facility Improvements Project					115,927	214,929		1,316,443	3,130,856		
Grit Removal System Improvement Project		33,949	33,875	273,499	281,704						
Oxidation Ditches Improvement Project		1,273,080	1,311,272	3,072,639	3,164,818						
Total	**$ 2,593,287**	**$ 4,379,795**	**$ 3,309,870**	**$ 3,521,138**	**$ 4,437,449**	**$ 1,133,679**	**$ 1,749,347**	**$ 4,133,245**	**$ 4,194,424**	**$ 1,116,746**	**$ 1,172,584**

AVAILABLE FUNDING ASSISTANCE AND FINANCING RESOURCES

Feasible long-term capital funding strategies must be defined to ensure that adequate resources are available to fund the CIP identified in this GSP. In addition to the City's resources, such as accumulated cash reserves, capital revenues, and rate revenues designated for capital purposes, capital needs can be met from outside sources, such as grants, low-interest loans, and bond financing. The following is a summary of the City's internal and external resources.

City Resources

Resources appropriate for funding capital needs include accumulated cash in the capital fund, rate revenues designated for capital spending purposes, developer contributions, and capital-related charges such as general facilities charges. The first two resources will be discussed in the **Fiscal Policies** section of the **Financial Forecast**. Capital-related charges are discussed as follows.

General Facilities Charges

A connection charge such as the City's general facilities charge (GFC) refers to a one-time charge imposed on new customers as a condition of connecting to the sewer system. The purpose of the GFC is two-fold: 1) to promote equity between new and existing customers; and 2) to provide a source of revenue to fund capital projects. Revenue can only be used to fund utility capital projects or to pay debt service incurred to finance those projects.

Development of the master-planned Snoqualmie Ridge communities included the construction of sewer facilities, financed by the developers, that required wholesale redesign of the City's sewer system. Because the net benefit of the facilities to the City outweighed the value of GFC payments, it was agreed that GFCs would not be charged to future development in these communities. Development has continued to focus on building out these master-planned communities, which has resulted in no GFC revenues being collected in recent years. However, with the master-planned areas built out, all future development will be subject to the City's GFC.

Local Facilities Charges

While a connection charge is the manner in which new customers pay their share of system investment costs, local facilities charge funding is used to pay the costs of local facilities that connect each property to the system's infrastructure. Local facilities funding is often overlooked in rate forecasting because it is funded upfront by either connecting customers and developers, or through an assessment to properties, but never from rates.

A number of mechanisms can be considered toward funding local facilities. One of the following scenarios typically occurs: (a) the utility charges a connection fee based on the cost of the local facilities (under the same authority as the facilities assessment fee); (b) a developer funds an extension of the system to its development and turns those facilities over to the utility (contributed capital); or (c) a local assessment is set up called a Utility Local Improvement District (ULID/LID) or a Local Utility District (LUD), which collects tax revenue from benefited properties.

A local facilities charge (LFC) is a variation of the connection charge. It is a City-imposed charge to recover the cost related to service extension to local properties. Often called a front-footage charge and imposed on the basis of footage of the main “fronting” a particular property, it is usually implemented as a reimbursement mechanism to a city for the cost of a local facility that directly serves a property. It is a form of connection charge and thus can accumulate up to 10 years of interest. It typically applies in instances when no developer-installed facilities are needed through developer extension due to the prior existence of available mains already serving the developing property.

The developer extension is a requirement that a developer install on-site, and sometimes off-site, improvements as a condition of extending service. These are in addition to the connection charge required and must be built to City standards. Part of the agreement between the City and the developer planning to extend service might include a latecomer agreement, resulting in a latecomer charge to new connections for the developer extension.

Latecomer charges are a variation of developer extensions, whereby new customers connecting to a developer-installed improvement make a payment to the City based on their share of the developer’s cost. The City passes this charge on to the developer who installed the facilities. As part of the developer extension process, this defines the allocation of costs and records latecomer obligations on the title of affected properties. No interest is allowed, and the reimbursement agreement cannot exceed 20 years in duration.

ULID/LID is another mechanism for funding infrastructure that assesses benefited properties based on the special benefit received by the construction of specific facilities. Most often used for local facilities, some ULIDs also recover related general facilities costs. Substantial legal and procedural requirements can make this a relatively expensive process, and there are mechanisms by which a ULID can be rejected.

Outside Resources

This section outlines various grant, loan, and bond opportunities available to the City through federal and state agencies to fund the CIP identified in the GSP.

Grants and Low-Cost Loans

Historically, federal and state grant programs were available to local utilities for capital funding assistance. However, these assistance programs have been mostly eliminated, substantially reduced in scope and amount, or replaced by loan programs. Remaining miscellaneous grant programs are generally lightly funded and heavily subscribed. Nonetheless, the benefit of low-interest loans makes the effort of applying worthwhile. Low-cost loan programs for Washington State utilities include three assistance programs for which the City may be eligible.

Public Works Board (PWB) – Cities, counties, special purpose districts, public utility districts, and quasi-municipal governments are eligible to receive loans from the PWB. Eligible projects include repair, replacement, and construction of infrastructure for domestic water, sanitary wastewater, stormwater, solid waste, road, and bridge projects that improve public health and safety, respond to environmental issues, promote economic development, or upgrade system performance.

The standard PWB loan offer for the most recent funding cycle was 1.58 percent interest repaid over a 20-year term. Reduced interest rates are available for financially distressed communities. All loan terms are subject to negotiation and Board approval.

Currently, there is no funding available for construction loans. Funding cycles typically begin during the summer months, with additional funding subject to legislative appropriation.

Information regarding the application process, as well as rates and terms, is posted on the PWB website. Further detail is available at http://www.pwb.wa.gov.

Water Quality Combined Funding Program – Managed by the Washington State Department of Ecology, this program provides funding for projects that improve and protect water quality throughout the state. Applicants submit one application and, depending on eligibility and priority, are awarded the best available funding from a pool of several different grants and loans, which could include a combination of grants and loans.

Loan interest rates from the most recent funding cycle are based on the repayment term: 5-year loans are repaid at 0.60 percent, 20-year loans at 1.20 percent, and 30-year loans at 1.60 percent.

Applications are accepted from mid-August through mid-October each year. Further detail is available at https://ecology.wa.gov.

Community Economic Revitalization Board (CERB) – CERB provides grants and loans for infrastructure improvements that encourage private business development and expansion. CERB offers loans of $3.0M maximum per project. Applicants must provide evidence that a private development or expansion is ready to occur and that the private development is contingent upon the approval of CERB funds. Grants are available up to 25.00 percent of the total award, determined by the underwriting process and debt service coverage ratio. Applicants must provide a cash match of 20.00 percent of the total project cost. The maximum repayment term is 20 years, and interest rates vary from 1.00 percent to 3.00 percent.

The Board accepts applications on an ongoing basis and meets every 2 months to consider projects and make funding decisions. Further detail is available at https://www.commerce.wa.gov/building-infrastructure/community-economic-revitalization-board.

Bond Financing

General Obligation Bonds – General obligation (G.O.) bonds are bonds secured by the full faith and credit of the issuing agency, committing all available tax and revenue resources to debt repayment. With this high level of commitment, G.O. bonds have relatively low interest rates and few financial restrictions. However, the authority to issue G.O. bonds is restricted in terms of the amount and use of the funds, as defined by the Washington constitution and statute. Specifically, the amount of debt that can be issued is linked to assessed valuation.

Revised Code of Washington (RCW) 39.36.020 states:

> (2)(a)(ii) Counties, cities, and towns are limited to an indebtedness amount not exceeding one and one-half percent of the value of the taxable property in such counties, cities, or towns without the assent of three-fifths of the voters therein voting at an election held for that purpose.

(b) In cases requiring such assent counties, cities, towns, and public hospital districts are limited to a total indebtedness of two and one-half percent of the value of the taxable property therein.

While bonding capacity can limit the availability of G.O. bonds for utility purposes, these can sometimes play a valuable role in project financing. A utility rate savings may be realized through two avenues: the lower interest rate and related bond costs, and the extension of repayment obligation to all tax-paying properties (not just developed properties) through the authorization of an ad valorem property tax levy.

Revenue Bonds – Revenue bonds are commonly used to fund utility capital improvements. The debt is secured by the revenues of the issuing utility. With this limited commitment, revenue bonds typically bear higher interest rates than G.O. bonds and require security conditions related to the maintenance of dedicated reserves (a bond reserve) and financial performance (added bond debt service coverage). The City agrees to satisfy these requirements by resolution as a condition of bond sale.

Revenue bonds can be issued in Washington without a public vote. There is no bonding limit, except perhaps the practical limit of the utility's ability to generate sufficient revenue to repay the debt and provide coverage. In some cases, poor credit might make issuing revenue bonds problematic.

Capital Financing Strategy

An ideal capital financing strategy would include the use of grants and low-cost loans when debt issuance is required. However, these resources are very limited and competitive in nature and do not provide a reliable source of funding for planning purposes. It is recommended that the City pursue these funding avenues but assume revenue bond financing to meet the needs which cannot be met by available cash resources. The capital financing strategy developed to fund the CIP identified in this GSP assumes the following funding resources:

- Accumulated cash reserves, which may include proceeds from previously issued bonds.
- Transfers of excess cash (over minimum balance targets) from the Operating Fund.
- General facilities charge revenues.
- Developer contributions.
- Interest earned on Capital Fund balances and other miscellaneous capital resources.

The cash resources described above are anticipated to fund 63.80 percent of the 11-year CIP and 54.86 percent of the 21-year CIP. The remaining funding is assumed to come from developer contributions and general facilities charges. **Table 12-4** presents the 11-year and 21-year capital financing strategy.

Table 12-4

11-Year and 21-Year Capital Financing Strategy

Year	Capital Expenditures Escalated	Funding Source: General Facilities Charges	Funding Source: Developer Contributions	Funding Source: Cash Funding	Total Financial Resources
2020	$ 2,593,287	$ -	$ -	$ 2,593,287	$ 2,593,287
2021	4,379,795	-	514,537	3,865,258	4,379,795
2022	3,309,870	2,782,629	527,241	-	3,309,870
2023	3,521,138	554,389	1,229,056	1,737,694	3,521,138
2024	4,437,449	-	1,265,927	3,171,522	4,437,449
2025	1,133,679	-	-	1,133,679	1,133,679
2026	1,749,347	625,974	-	1,123,373	1,749,347
2027	4,133,245	1,289,506	180,388	2,663,351	4,133,245
2028	4,194,424	664,096	-	3,530,328	4,194,424
2029	1,116,746	684,019	-	432,728	1,116,746
2030	1,172,584	1,172,584	-	-	1,172,584
Subtotal	**$ 31,741,564**	**$ 7,773,196**	**$ 3,717,148**	**$ 20,251,220**	**$ 31,741,564**
2031 - 2040	25,567,617	14,377,280	-	11,190,337	25,567,617
Total	**$ 57,309,181**	**$ 22,150,475**	**$ 3,717,148**	**$ 31,441,557**	**$ 57,309,181**

FINANCIAL FORECAST

The financial forecast, or revenue requirement analysis, forecasts the amount of annual revenue that needs to be generated by user rates. The analysis incorporates operating revenues, O&M expenses, debt service payments, rate-funded capital needs, and any other identified revenues or expenses related to operations. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates. In addition to annual operating costs, the revenue needs also include debt covenant requirements and specific fiscal policies and financial goals of the City.

For this analysis, two revenue sufficiency tests have been developed to reflect the financial goals and constraints of the City: cash needs must be met; and debt coverage requirements must be realized. In order to operate successfully with respect to these goals, both tests of revenue sufficiency must be met.

Cash Test – The cash flow test identifies all known cash requirements for the City in each year of the planning period. Typically, these include O&M expenses, debt service payments, rate-funded system reinvestment funding or directly funded capital outlays, and any additions to specified reserve balances. The total annual cash needs of the City are then compared to projected cash revenues using the current rate structure. Any projected revenue shortfalls are identified, and the rate increases necessary to make up the shortfalls are established.

Coverage Test – The coverage test is based on a commitment made by the City when issuing revenue bonds and some other forms of long-term debt. For the purposes of this analysis, revenue bond debt is assumed for any needed debt issuance. As a security condition of issuance, the City would be required per covenant to agree that the revenue bond debt would have a higher priority for payment (a senior lien) compared to most other expenditures; the only outlays with a higher lien are O&M expenses. Debt service coverage is expressed as a multiplier of the annual revenue bond debt service payment. For example, a 1.00 coverage factor would imply that no additional cushion is required. A 1.25 coverage factor means revenue must be sufficient to pay O&M expenses, annual revenue bond debt service payments, and an additional 25 percent of annual revenue bond debt service payments. The excess cash flow derived from the added coverage, if any, can be used for any purpose, including funding capital projects. Targeting a higher coverage factor can help the City achieve a better credit rating and provide lower interest rates for future debt issues.

In determining the annual revenue requirement, both the cash and coverage sufficiency tests must be met, and the test with the greatest deficiency drives the level of needed rate increase in any given year.

Current Financial Structure

The City maintains a fund structure and implements financial policies that target management of a financially viable and fiscally responsible sewer system.

Fiscal Policies

A summary of the key financial policies employed by the City, as well as those recommended and incorporated in the financial program, are discussed as follows.

Operating Fund – Operating reserves are designed to provide a liquidity cushion to ensure that adequate cash working capital will be maintained to deal with significant cash balance fluctuations, such as seasonal fluctuations in billings and receipts, unanticipated cash expenses, or lower than expected revenue collections. Like other types of reserves, operating reserves also serve another purpose: they help smooth rate increases over time. Target funding levels for an operating reserve are generally expressed as a certain number of days of O&M expenses, with the minimum requirement varying with the expected revenue volatility. Industry practice for utility operating reserves ranges from 30 days (8 percent) to 120 days (33 percent) of O&M expenses, with the lower end more appropriate for utilities with stable revenue streams and the higher end more appropriate for utilities with significant seasonal or consumption-based fluctuations.

This financial plan targets a minimum balance in the sewer utility Operating Fund equal to 60 days of O&M expenses.

Capital Fund – A utility capital contingency reserve is an amount of cash set aside in case of an emergency should a piece of equipment or a portion of the utility's infrastructure fail unexpectedly. The reserve also could be used for other unanticipated capital needs, including capital project cost overruns. Industry practices range from maintaining a balance equal to 1 to 2 percent of fixed assets, an amount equal to a 5-year rolling average of CIP costs, or an amount determined sufficient to fund equipment failure (other than catastrophic failure). The final target level should balance industry standards with the risk level of the City.

This financial plan targets a minimum balance in the sewer utility Capital Fund equal to 1 percent of fixed assets.

System Reinvestment – System reinvestment funding promotes system integrity through ongoing repair and replacement of system infrastructure. Ideally, a detailed asset management plan would guide the level of rate funded system reinvestment; however, in absence of this level of effort, annual depreciation expense is commonly used as a measure of the decline in asset value associated with routine use of the system. Particularly for utilities that do not already have an explicit system reinvestment policy in place, implementing a funding level based on full depreciation expense could significantly impact rates. An alternative benchmark is annual depreciation expense net of debt principal payments on outstanding debt. This approach recognizes that customers are still paying for certain assets through the debt component of their rate and intends to avoid simultaneously charging customers for an asset and its future replacement. The specific benchmark used to set system reinvestment funding targets is a matter of policy that must balance various objectives, including managing rate impacts, keeping long-term costs down, and promoting "generational equity" (i.e., not excessively burdening current customers with paying for facilities that will serve a larger group of customers in the future).

The City does not currently have a policy in place for system reinvestment funding. No dedicated system reinvestment funding is assumed in this financial plan; however, on average, the City is able to fund approximately $3.0M annually through rates from 2020 through 2040. System reinvestment is recommended for consideration during future policy review and rate planning.

Debt Management – It is prudent to consider policies related to debt management as part of a broader utility financial policy structure. Debt management policies should be evaluated and formalized, including the level of acceptable outstanding debt, debt repayment, bond coverage, and total debt coverage targets. The City has two outstanding sewer revenue bonds, one of which will be fully repaid in 2027. These bonds each carry a coverage requirement of 1.20.

Because the City intends to continue using revenue bonds as a significant source of capital funding, this financial plan targets coverage between 1.50 and 2.0. Targeting a higher than required coverage factor helps the City maintain its credit rating and provides lower interest rates for future debt issues.

Financial Forecast

The financial forecast is primarily based upon the City's budget through 2022 and takes into consideration other key factors and assumptions needed to develop a complete portrait of the City's annual sewer utility financial obligations. The following is a list of the key revenue and expense factors and assumptions used to develop the financial forecast.

- **Growth** – Rate revenue escalation is based on the forecast of annual average flow provided in **Chapter 4** of this GSP. Growth varies from no growth in many years to as high as 8.90 percent in 2032. On average, annual growth for the forecast period is 1.20 percent.
- **Revenue** – The City has two general revenue sources: 1) sewer service charges (rate revenue); and 2) miscellaneous (non-rate) revenue. Sewer rate revenue includes revenue collected for the City's reclaimed water irrigation program. In the event of a forecasted annual shortfall, rate revenue can be increased to meet the annual revenue requirement. For the purpose of this financial forecast, rate revenues are forecasted to increase with customer growth. Non-rate revenues are forecasted to increase with general cost inflation.

- **General Facilities Charge Revenue** – Because recent development has occurred in the developer-funded Snoqualmie Ridge communities, no GFC revenue has been included in the forecast through 2021. The City expects GFC-eligible construction to resume in 2022, with $3.3M in GFC revenue forecasted due to the 4.69 percent growth rate assumed in that year. The growth forecast then indicates a period of no growth from 2023 through 2025, but from 2026 through 2040 this financial plan includes an average of $1.3M in GFC revenue per year. All GFC revenue collected is used to fund capital projects.
- **Expenses** – O&M expense projections are based on the City's budget through 2022 and general cost inflation increases of 3 percent, labor cost inflation increases of 5 percent, and benefit cost inflation increases of 5 percent in subsequent years. Budget figures were used for taxes through 2022. Future taxes are calculated based on forecasted revenues and prevailing tax rates.
- **Existing Debt** – The sewer utility has five outstanding debt issues: two revenue bonds, a G.O. bond, and two PWB loans. One revenue bond has annual payments of $160,000 that end after 2027, with the second bond carrying payments of just over $950,000 in each year of the forecast. The G.O. bond payments average $101,000 and end after 2030. The PWB loans carry annual payments of $32,000 and $16,000, and are fully paid off after 2022 and 2031, respectively. The total annual existing debt service obligations begin 2020 at $1.3M and are reduced to $952,000 by 2040.
- **Transfers to Capital** – Operating fund balance above the minimum requirement is assumed to be available to fund capital projects and projected to be transferred to the Capital Fund each year. On average, the utility transfers $3.0M to the Capital Fund annually from 2020 to 2040.

Although the financial plan is completed through 2040, the rate strategy focuses on the shorter-term planning period of 2020 through 2030. It is recommended that the City revisit the proposed rates every 2 to 3 years to ensure that the rate projections developed remain adequate. Any significant changes should be incorporated into the financial plan and future rates should be adjusted as needed.

Table 12-5 summarizes the annual revenue requirements based on the forecast of revenues, expenditures, fund balances, and fiscal policies.

Table 12-5

11-Year Financial Forecast

Revenue Requirement	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Revenues											
Rate Revenues Under Existing Rates	$ 5,807,532	$ 6,007,787	$ 6,247,675	$ 6,247,675	$ 6,247,675	$ 6,247,675	$ 6,287,657	$ 6,367,620	$ 6,407,601	$ 6,447,583	$ 6,567,527
Non-Rate Revenues	38,150	30,046	31,804	33,948	36,445	38,612	39,813	41,077	42,384	44,401	45,050
Total Revenues	**$ 5,845,682**	**$ 6,037,833**	**$ 6,279,479**	**$ 6,281,624**	**$ 6,284,121**	**$ 6,286,288**	**$ 6,327,470**	**$ 6,408,697**	**$ 6,449,985**	**$ 6,491,983**	**$ 6,612,577**
Expenses											
Cash Operating Expenses	$ 2,864,953	$ 2,868,359	$ 2,934,916	$ 3,166,709	$ 3,131,902	$ 3,246,468	$ 3,377,704	$ 3,515,537	$ 3,983,565	$ 3,770,940	$ 3,939,251
Existing Debt Service	1,261,996	1,259,078	1,262,521	1,227,116	1,226,900	1,227,521	1,228,666	1,228,995	1,067,969	1,067,156	1,068,078
New Debt Service	-	-	-	-	-	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-	-	-	-	-	-	-
Total Expenses	**$ 4,126,949**	**$ 4,127,437**	**$ 4,197,437**	**$ 4,393,825**	**$ 4,358,802**	**$ 4,473,989**	**$ 4,606,371**	**$ 4,744,533**	**$ 5,051,534**	**$ 4,838,096**	**$ 5,007,328**
Total Surplus (Deficiency)	**$ 1,718,733**	**$ 1,910,396**	**$ 2,082,042**	**$ 1,887,799**	**$ 1,925,319**	**$ 1,812,299**	**$ 1,721,099**	**$ 1,664,164**	**$ 1,398,451**	**$ 1,653,888**	**$ 1,605,249**
Annual Rate Adjustment	**0.00%**	**0.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**
Cumulative Annual Rate Adjustment	**0.00%**	**0.00%**	**2.00%**	**4.04%**	**6.12%**	**8.24%**	**10.41%**	**12.62%**	**14.87%**	**17.17%**	**19.51%**
Rate Revenues After Rate Increase	$ 5,807,532	$ 6,007,787	$ 6,372,629	$ 6,500,081	$ 6,630,083	$ 6,762,685	$ 6,942,081	$ 7,170,974	$ 7,360,320	$ 7,554,371	$ 7,848,803
Additional Taxes from Rate Increase	-	-	4,813	9,723	14,730	19,838	25,208	30,945	36,699	42,633	49,355
Net Cash Flow After Rate Increase	**$ 1,718,733**	**$ 1,910,396**	**$ 2,202,182**	**$ 2,130,482**	**$ 2,292,996**	**$ 2,307,470**	**$ 2,350,315**	**$ 2,436,573**	**$ 2,314,471**	**$ 2,718,042**	**$ 2,837,170**
Coverage After Rate Increases	2.7	2.9	6.1	3.1	3.2	3.2	3.9	4.5	4.4	4.8	6.4

The financial forecast indicates that revenues sufficiently cover the expenses of the sewer utility throughout the forecast. However, best practice in utility rate-setting is to adopt inflation-level annual rate increases to avoid future rate spikes. In light of the COVID-19 global pandemic, and the associated financial hardship on the City's rate payers, the City Council deferred any rate action for 2021. Annual inflationary increases of 2.0 percent are assumed starting in 2022.

City Funds and Reserves

Table 12-6 shows a summary of the projected Operating Fund and Capital Fund ending balances through 2030 based on the rate forecasts presented previously. The Operating Fund is maintained at a minimum of 60 days of O&M expenses, and the Capital Fund balance continues to exceed the target 1.00 percent of fixed assets.

Table 12-6

Ending Cash Balance Summary

Ending Fund Balances	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating Fund	$ 470,951	$ 471,511	$ 482,452	$ 520,555	$ 514,833	$ 533,666	$ 555,239	$ 577,897	$ 654,833	$ 619,881	$ 647,548
Capital Fund	5,205,883	3,263,476	6,025,423	5,870,911	5,056,816	6,274,984	7,558,790	7,403,839	6,203,594	8,601,405	12,459,459
Total	**$ 5,676,834**	**$ 3,734,987**	**$ 6,507,875**	**$ 6,391,466**	**$ 5,571,649**	**$ 6,808,650**	**$ 8,114,029**	**$ 7,981,736**	**$ 6,858,427**	**$ 9,221,286**	**$13,107,007**

CURRENT AND PROJECTED RATES

Current Rates

The City's current rate structure consists of a fixed monthly charge based on customer class, with high-strength sewer commercial customers paying more than low-strength customers. Commercial customers pay a variable charge per 100 cubic feet (cf) for all usage above the first 600 cf of water per month. **Table 12-7** shows the existing rate schedule.

Table 12-7

Existing Schedule of Rates

Sewer Rates	2020
Monthly Fixed	
Residential	$ 78.99
Multifamily (per unit)	62.87
Commercial	
Low Strength	97.92
High Strength	121.72
Volume (per 100 cf > 600 cf per month)	
Commercial	
Low Strength	$ 7.09
High Strength	9.64

The City offers reduced sewer rates to low-income residential customers. A customer whose residence has a separate water meter is eligible for a 30 percent discount if their total household annual income meets the U.S. Department of Housing and Urban Development income limits for very low income in King County. Customers are not eligible for the discount if their annual water consumption is in excess of 100 ccf (hundred cubic feet). Applicants may appeal the criteria to the director of administrative services and must provide a convincing justification for the excess usage.

Projected Rates

The financial forecast includes inflation-level annual rate increases of 2.00 percent throughout the study period. **Table 12-8** shows the projected rates with increases applied uniformly to all rate components in all classes.

Table 12-8

Proposed Schedule of Rates

Monthly Rates	Existing	Proposed									
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Monthly Fixed	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**
Residential	$ 78.99	$ 78.99	$ 80.57	$ 82.18	$ 83.82	$ 85.50	$ 87.21	$ 88.96	$ 90.73	$ 92.55	$ 94.40
Multifamily (per unit)	62.87	62.87	64.13	65.41	66.72	68.05	69.41	70.80	72.22	73.66	75.14
Commercial											
Low Strength	97.92	97.92	99.88	101.88	103.91	105.99	108.11	110.27	112.48	114.73	117.02
High Strength	121.72	121.72	124.15	126.64	129.17	131.75	134.39	137.08	139.82	142.61	145.47
Volume Charge	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**
Commercial (> 600 cf per month)											
Low Strength	$ 7.09	$ 7.09	$ 7.23	$ 7.38	$ 7.52	$ 7.67	$ 7.83	$ 7.98	$ 8.14	$ 8.31	$ 8.47
High Strength	9.64	9.64	9.83	10.03	10.23	10.43	10.64	10.86	11.07	11.29	11.52

AFFORDABILITY

A common affordability metric used by the U.S. Environmental Protection Agency (EPA) to measure the relative financial impact sewer rates have on a community as a whole considers whether rates exceed 2.50 percent of a community's median household income. The average median household income for the City was $145,580 between 2015 and 2019 according to the U.S. Census Bureau. The 2019 value is escalated based on the 2020 increase in the Employment Cost Index Wages and Salaries index of 2.00 percent to project the median household income in future years. **Table 12-9** presents the City's monthly sewer bill projected to 2030, tested against the 2.50 percent monthly affordability threshold.

Table 12-9

Community Affordability Test

Year	Inflation	Median HH Income	2.5% Monthly Threshold	Projected Monthly Bill	% of Median HH Income
2019		$ 145,580			
2020	2.00%	148,492	$ 309.36	$ 78.99	0.64%
2021	2.00%	151,461	315.54	78.99	0.63%
2022	2.00%	154,491	321.86	80.57	0.63%
2023	2.00%	157,580	328.29	82.18	0.63%
2024	2.00%	160,732	334.86	83.82	0.63%
2025	2.00%	163,947	341.56	85.50	0.63%
2026	2.00%	163,947	341.56	87.21	0.64%
2027	2.00%	167,226	348.39	88.96	0.64%
2028	2.00%	170,570	355.35	90.73	0.64%
2029	2.00%	173,982	362.46	92.55	0.64%
2030	2.00%	177,461	369.71	94.40	0.64%

Applying the 2.50 percent test, the City's rates are forecasted to remain within the indicated affordability range through 2030.

CONCLUSION

The results of this analysis indicate that the sewer utility's existing rates are sufficient to cover all existing and forecasted financial obligations. However, best practice in utility rate-setting is to adopt inflation-level annual rate increases to avoid future rate spikes. Beginning in 2022, annual rate increases of 2.00 percent through 2030 should provide for continued financial viability while maintaining affordable rates.

It is important to remember that the analysis performed in this chapter assumes growth rates from **Chapter 4** of this GSP. If the future growth rates change, the existing rate strategy may need to be updated and revised.

It is recommended that the City regularly review and update the key underlying assumptions that compose the multi-year financial plan to ensure that adequate revenues are collected to meet the City's total financial obligations.

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Appendix A

NPDES Permit

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Issuance Date: May 19, 2021
Effective Date: July 1, 2021
Expiration Date: June 30, 2026

National Pollutant Discharge Elimination System
Waste Discharge Permit No. WA0022403

State of Washington
DEPARTMENT OF ECOLOGY
Northwest Regional Office
PO Box 330316
Shoreline, WA 98133-9716

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
The State of Washington Reclaimed Water Act,
Chapter 90.46 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1342 et seq.

City of Snoqualmie Water Reclamation Facility
PO Box 987
Snoqualmie, WA 98065

is authorized to discharge treated wastewater and to produce and distribute reclaimed water in accordance with the Special, Reclaimed Water, and General Conditions that follow.

Plant Location: 38190 SE Stearns Road Snoqualmie, WA 98065	**Receiving Water:** Snoqualmie River
Treatment Type: Oxidation ditch followed by sand filtration	**Reclaimed Water Production:** Class A water for irrigation uses

Rachel McCrea

Rachel McCrea
Water Quality Section Manager
Northwest Regional Office
Washington State Department of Ecology

Table of Contents

Summary of Permit Report Submittals

Refer to the Special and General Conditions of this permit for additional submittal requirements.

Table 1 – Summary of Permit Report Submittals

Permit Section	Submittal	Frequency	First Submittal Date
S3.A	Discharge Monitoring Report (DMR)	Monthly	August 15, 2021
S3.A	Discharge Monitoring Report (DMR)	Quarterly	April 15, 2024
S3.F	Reporting Permit Violations	As necessary	
S4.E	Infiltration and Inflow Evaluation	1/permit cycle	March 31, 2023
S5.F	Bypass Notification	As necessary	
S5.G	Operations and Maintenance Manual Update	1/permit cycle	December 15, 2023
S6.E	Industrial User Survey Submittal	1/permit cycle	December 31, 2022
S8	Spill Control Plan Submittal	1/permit cycle	May 31, 2023
S9.A	Effluent Mixing Plan of Study	1/permit cycle	July 31, 2023
S9.B	Effluent Mixing Report	1/permit cycle	July 31, 2024
S10	Acute Toxicity Effluent Test Results	2/permit cycle	March 30, 2024 September 30, 2024
S11	Chronic Toxicity Effluent Test Results	2/permit cycle	March 30, 2024 September 30, 2024
S12	Application for Permit Renewal	1/permit cycle	December 31, 2025
R2.A	Reclaimed Water Monitoring Report	Monthly	August 15, 2021
R3.B	Annual Summary Report	Annual	March 15, 2022
R3.G	Reporting Violations of Reclaimed Water Production and Distribution Conditions	As necessary	
R4.B	Service and Use Area Agreement Revisions	As necessary	June 30, 2022
R4.C	Cross-connection Control Program Plan	1/permit cycle	June 30, 2025
R6.C	Operations and Maintenance Manual Update	1/permit cycle	December 15, 2023
R8.A.1	Draft engineering report – Distribution system improvements	1/permit cycle	July 1, 2023
R8.A.2	Final engineering report – Distribution system improvements	1/permit cycle	December 31, 2023
R8.A.3	Final plans and specifications – Distribution system improvements	1/permit cycle	December 31, 2024
R8.A.4	Declaration of construction – Distribution system improvements	1/permit cycle	June 30, 2026
R9	Application for Reclaimed Water Permit Renewal	1/permit cycle	December 31, 2025
G1	Notice of Change in Authorization	As necessary	
G4	Reporting Planned Changes	As necessary	
G5	Engineering Report for Construction or Modification Activities	As necessary	
G7	Notice of Permit Transfer	As necessary	
G10	Duty to Provide Information	As necessary	
G20	Compliance Schedules	As necessary	
G21	Contract Submittal	As necessary	

Special Conditions

S1. Discharge limits

S1.A. Effluent limits

All discharges and activities authorized by this permit must comply with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a level in excess of, that identified and authorized by this permit violates the terms and conditions of this permit.

Beginning on the effective date of this permit, the Permittee may discharge treated domestic wastewater to the Snoqualmie River at the permitted location subject to compliance with the following limits:

Table 2 – Effluent Limits: Outfall 001

Latitude: 47.53916 Longitude: -121.83222

Parameter	Average Monthly [a]	Average Weekly [b]
5-day Carbonaceous Biochemical Oxygen Demand (CBOD5)	25 milligrams/liter (mg/L) 85% removal of influent $CBOD_5$	40 mg/L
$CBOD_5$ Mass *Effective November – July Only*	448 pounds/day (lbs/day)	717 lbs/day
Total Suspended Solids (TSS)	30 mg/L 538 lbs/day 85% removal of influent TSS	45 mg/L 807 lbs/day
Parameter	**Minimum**	**Maximum**
pH [c]	6.3 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria [d]	200/100 milliliter (mL)	400/100 mL
Parameter	**Average Monthly**	**Maximum Daily [e]**
$CBOD_5$ Mass *Effective August – October Only*	51.6 lbs/day	206 lbs/day
Total Ammonia mass (as NH3-N) *Effective August – October Only*	21.6 lbs/day	68.7 lbs/day
Temperature, Maximum 7-Day Running Average (7DADMax) *Effective June – September Only*	N/A	24.7° C

a	Average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured. See footnote c for fecal coliform calculations.
b	Average weekly discharge limit means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges' measured during that week. See footnote c for fecal coliform calculations.
c	The pH of the discharge must be within the range bound by the listed minimum and maximum limits. The Permittee must report the instantaneous maximum and minimum pH recorded daily. Do not average pH values.
d	Ecology provides directions to calculate the monthly and the weekly geometric mean in publication No. 04-10-020, Information Manual for Treatment Plant Operators available at: https://apps.ecology.wa.gov/publications/SummaryPages/0410020.html
e	Maximum daily effluent limit is the highest allowable daily discharge. The daily discharge is the average discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. This does not apply to pH or temperature.

S1.B. Mixing zone authorization

Mixing zone for Outfall 001

The following paragraphs define the maximum boundaries of the mixing zones:

Chronic mixing zone

The width of the chronic mixing zone is limited to a distance of 42.5 feet. The length of the chronic mixing zone extends 310.5 feet downstream and 100 feet upstream of the outfall. The mixing zone extends from the discharge port to the top of the water surface. The concentration of pollutants at the edge of the chronic zone must meet chronic aquatic life criteria and human health criteria.

Acute mixing zone

The width of the acute mixing zone is limited to a distance of 42.5 feet in any horizontal direction from the outfall. The length of the acute mixing zone extends 31.0 feet downstream and 10 feet upstream of the outfall. The mixing zone extends from the discharge port to the top of the water surface. The concentration of pollutants at the edge of the acute zone must meet acute aquatic life criteria.

Table 3 – Available Dilution (dilution factor)

Criteria	Factor
Acute Aquatic Life Criteria	2.4
Chronic Aquatic Life Criteria	35.5
Human Health Criteria - Carcinogen	183.3
Human Health Criteria - Non-carcinogen	49.3

S2. Monitoring requirements

S2.A. Monitoring schedule

The Permittee must monitor in accordance with the following schedule and the requirements specified in Appendix A.

Table 4 – Wastewater Influent

Wastewater Influent means the raw sewage flow from the collection system into the treatment facility. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant.

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Flow	MGD	Continuous [1]	Recording
Biochemical Oxygen Demand (BOD_5)	mg/L	2/month	24-hr Composite [2]
BOD_5	lbs/day	2/month	Calculated [3]
$CBOD_5$	mg/L	3/week	24-hr Composite
TSS	mg/L	3/week	24-hr Composite
TSS	lbs/day	3/week	Calculated

Table 5 – Final Wastewater Effluent

Final Wastewater Effluent means wastewater exiting the last treatment process or operation. Typically, this is after or at the exit from the UV disinfection system. The Permittee may take effluent samples for the BOD_5 analysis before or after the disinfection process. If taken after, the Permittee must dechlorinate and reseed the sample.

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Flow	MGD	Continuous	Metered/recorded
$CBOD_5$	mg/L	3/week	24-hr Composite
$CBOD_5$	lbs/day	3/week	Calculated
$CBOD_5$	% removal	1/month	Calculated [4]
TSS	mg/L	3/week	24-hr Composite
TSS	lbs/day	3/week	Calculated
TSS	% removal	1/month	Calculated
Fecal Coliform [5]	# /100 ml	3/week	Grab [6]
E. Coli [7]	CFU/100 mL	3/week (2024, only)	Grab
pH [8]	Standard Units	Continuous	Metered/recorded
Temperature [9]	Degrees centigrade (°C)	Continuous	Measurement
7-DAD Max Temperature [10]	°C	1/day	Calculated
Alkalinity	mg/L as $CaCO_3$	1/month	24-hr Composite
Total Phosphorus	mg/L as P	Monthly	24-hr Composite
Soluble Reactive Phosphorus	mg/L as P	1/week	24-hr Composite
Soluble Reactive Phosphorus	lbs/day as P	1/week	Calculated
Total Ammonia	mg/L as N	1/week	24-hr Composite
Total Ammonia	lbs/day as N	1/week	Calculated
Nitrate + Nitrite Nitrogen	mg/L as N	Monthly	24-hr Composite
Total Kjeldahl Nitrogen (TKN)	mg/L as N	Monthly	24-hr Composite

Table 6 – Whole Effluent Toxicity Testing – Final Wastewater Effluent

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Acute Toxicity Testing	See Condition S11 for testing requirements	2/permit cycle, dates specified in Condition S11	24-hr Composite
Chronic Toxicity Testing	See Condition S12 for testing requirements	2/permit cycle, dates specified in Condition S12	24-hr Composite

Table 7 – Permit Renewal Application Requirements – Final Wastewater Effluent

The Permittee must record and report the wastewater treatment plant flow discharged on the day it collects the sample for priority pollutant testing with the discharge monitoring report.

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Dissolved Oxygen	mg/L	Quarterly[11], 2024	Grab
Oil and Grease	mg/L	Quarterly, 2024 only	Grab
Total Dissolved Solids	mg/L	Quarterly, 2024 only	24-hr Composite
Total Hardness	mg/L	Quarterly, 2024 only	Grab
Cyanide	micrograms/liter (µg/L)	Quarterly, 2024 only	Grab
Total Phenolic Compounds	µg/L	Quarterly, 2024 only	Grab
Priority Pollutants (PP) – Total Metals	µg/L; nanograms (ng/L) for mercury	Quarterly, 2024 only	24-hr Composite Grab for mercury
PP – Volatile Organic Compounds	µg/L	Quarterly, 2024 only	Grab
PP – Acid-extractable Compounds	µg/L	Quarterly, 2024 only	24-hr Composite
PP – Base-neutral Compounds	µg/L	Quarterly, 2024 only	24-hr Composite
PP – Pesticides/PCBs	ug/L or ng/L	Quarterly, 2024 only	24-hr Composite

Footnote	Information
1	Continuous means uninterrupted except for brief lengths of time for calibration, power failure, or unanticipated equipment repair or maintenance.
2	24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.
3	Calculated means figured concurrently with the respective sample, using the following formula: Concentration (in mg/L) X Flow (in MGD) X Conversion Factor (8.34) = lbs/day
4	$\% \text{ removal} = \frac{\text{Influent concentration (mg/L)} - \text{Effluent concentration (mg/L)}}{\text{Influent concentration (mg/L)}} \times 100$ Calculate the percent (%) removal of BOD_5 and TSS using the above equation.
5	Report a numerical value for fecal coliforms following the procedures in Ecology's *Information Manual for Wastewater Treatment Plant Operators*, Publication Number 04-10-020 available at: https://apps.ecology.wa.gov/publications/SummaryPages/0410020.html. Do not report a result as too numerous to count (TNTC).
6	Grab means an individual sample collected over a fifteen (15) minute, or less, period.
7	Permittee must test for E. Coli bacteria using the same grab sample used to test for fecal coliform bacteria.
8	The Permittee must report the instantaneous maximum and minimum pH daily. Do not average pH values.

9	Determine and report a daily maximum from continuous measurements integrated over a maximum half-hour interval. Continuous monitoring instruments must achieve an accuracy of 0.2 degrees C and the Permittee must verify accuracy annually.
10	Calculate a 7-DAD Max for each day by averaging each day's maximum temperature value with the daily maximum temperatures of the three (3) days prior and the three (3) days after that specific date.
11	Quarterly sampling periods are January through March, April through June, July through September, and October through December

S2.B. Sampling and analytical procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters. The Permittee must conduct representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions that may affect effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 (or as applicable in 40 CFR subchapters N [Parts 400–471] or O [Parts 501-503]) unless otherwise specified in this permit. Ecology may only specify alternative methods for parameters without permit limits and for those parameters without an EPA approved test method in 40 CFR Part 136.

S2.C. Flow measurement and continuous monitoring devices

The Permittee must:

1. Select and use appropriate flow measurement and continuous monitoring devices and methods consistent with accepted scientific practices.
2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard, the manufacturer's recommendation, and approved O&M manual procedures for the device and the wastestream.
3. Calibrate continuous monitoring instruments weekly unless it can demonstrate a longer period is sufficient based on monitoring records. The Permittee:
   a. May calibrate apparatus for continuous monitoring of dissolved oxygen by air calibration.
   b. Must calibrate continuous pH measurement instruments using a grab sample analyzed in the lab with a pH meter calibrated with standard buffers and analyzed within 15 minutes of sampling.
   c. Calibrate temperature probes using methods listed in manufacturer operation and maintenance manuals. Although calibration is not required if the Permittee uses recording devices certified by the manufacturer, the Permittee must verify accuracy of the temperature readings monthly by comparing the probe's temperature reading to an alcohol-based thermometer.
4. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
5. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.
6. Maintain calibration records for at least three years.

S2.D. Laboratory accreditation

The Permittee must ensure that all monitoring data required by Ecology for permit specified parameters is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement. The Permittee must obtain accreditation for conductivity and pH if it must receive accreditation or registration for other parameters.

S2.E. Request for reduction in monitoring

The Permittee may request a reduction of the sampling frequency after twelve (12) months of monitoring. Ecology will review each request and at its discretion grant the request when it reissues the permit or by a permit modification.

The Permittee must:

1. Provide a written request.
2. Clearly state the parameters for which it is requesting reduced monitoring.
3. Clearly state the justification for the reduction.

S3. Reporting and recording requirements

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

S3.A. Discharge monitoring reports

The first monitoring period begins on the effective date of the permit (unless otherwise specified). The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic discharge monitoring report (DMR) form provided by Ecology within the Water Quality Permitting Portal. Include data for each of the parameters tabulated in Special Condition S2 and as required by the form. Report a value for each day sampling occurred (unless specifically exempted in the permit) and for the summary values (when applicable) included on the electronic form.
2. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.
3. The Permittee must also submit an electronic copy of the laboratory report as an attachment using WQWebDMR. The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.
4. Submit DMRs for parameters with the monitoring frequencies specified in S2 (monthly, quarterly, annual, etc.) at the reporting schedule identified below.
   The Permittee must:
   a. Submit **monthly** DMRs by the 15th day of the following month, with the first DMR due by August 15, 2021.
   b. Submit **quarterly** DMRs, unless otherwise specified in the permit, by the 15th day of the month following the monitoring period. Quarterly sampling periods are January through

March, April through June, July through September, and October through December. The Permittee must submit the first quarterly DMR on April 15, 2024, for the quarter beginning on January 1, 2024.

5. Enter the "No Discharge" reporting code for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate, if the Permittee did not discharge wastewater or a specific pollutant during a given monitoring period.
6. Report single analytical values below detection as "less than the detection level (DL)" by entering < followed by the numeric value of the detection level (e.g. < 2.0) on the DMR. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.
7. Report single analytical values between the detection level (DL) and the quantitation level (QL) by entering the estimated value, the code for estimated value/below quantitation limit (j) and any additional information in the comments. Submit a copy of the laboratory report as an attachment using WQWebDMR.

   The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.
8. Not report zero for bacteria monitoring. Report as required by the laboratory method.
9. Calculate and report an arithmetic average value for each day for bacteria if multiple samples were taken in one day.
10. Calculate the geometric mean values for bacteria (unless otherwise specified in the permit) using:
    a. The reported numeric value for all bacteria samples measured above the detection value except when it took multiple samples in one day. If the Permittee takes multiple samples in one day it must use the arithmetic average for the day in the geometric mean calculation.
    b. The detection value for those samples measured below detection.
11. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in Appendix A.
12. Calculate average values and calculated total values (unless otherwise specified in the permit) using:
    a. The reported numeric value for all parameters measured between the detection value and the quantitation value for the sample analysis.
    b. One-half the detection value (for values reported below detection) if the lab detected the parameter in another sample from the same monitoring point for the reporting period.
    c. Zero (for values reported below detection) if the lab did not detect the parameter in another sample for the reporting period.
13. Report single-sample grouped parameters (for example: priority pollutants, PAHs, pulp and paper chlorophenolics, TTOs) on the WQWebDMR form and include: sample date, concentration detected, detection limit (DL) (as necessary), and laboratory quantitation level (QL) (as necessary).

S3.B. Permit submittals and schedules

The Permittee must use the Water Quality Permitting Portal – Permit Submittals application (unless otherwise specified in the permit) to submit all other written permit-required reports by the date specified in the permit.

When another permit condition requires submittal of a paper (hard-copy) report, the Permittee must ensure that it is postmarked or received by Ecology no later than the dates specified by this permit. Send these paper reports to Ecology at:

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
PO Box 330316
Shoreline, WA 98133-9716

S3.C. Records retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

S3.D. Recording of results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

S3.E. Additional monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Special Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR unless otherwise specified by Special Condition S2.

S3.F. Reporting permit violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.
2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

a. Immediate reporting

The Permittee must **immediately** report to Ecology and the Public Health of Seattle-King County (at the numbers listed below), all:

- Failures of the disinfection system when discharging to the Snoqualmie River via outfall #001.
- All collection system overflows that discharge to surface waters, stormwater conveyance systems or into areas open to public access.
- Plant bypasses resulting in a discharge to surface waters or into areas of public access.
- Any other failures of the sewage system that may impact surface water or public health.

Northwest Regional Office	206-594-0000
Public Health of Seattle-King County	206-477-8050

Additionally, for any sanitary sewer overflow (SSO) that discharges to a municipal separate storm sewer system (MS4), the Permittee must notify the appropriate MS4 owner or operator.

b. Twenty-four-hour reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone numbers listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.
2. Any unanticipated bypass that causes an exceedance of an effluent limit in the permit (See Part S5.F, "Bypass Procedures").
3. Any upset that causes an exceedance of an effluent limit in the permit (See G.15, "Upset").
4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.

c. Report within five days

The Permittee must also submit a written report within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The report must contain:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times.
3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
5. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

d. Waiver of written reports

Ecology may waive the written report required in subpart c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

e. All other permit violation reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in subpart c, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

S3.G. Other reporting

a. Spills of oil or hazardous materials

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and chapter 173-303-145. You can obtain further instructions at the following website: https://ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue/Report-a-spill .

b. Failure to submit relevant or correct facts

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to Ecology, it must submit such facts or information promptly.

S3.H. Maintaining a copy of this permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S4. Facility loading

S4.A. Design criteria

The flows or waste loads for the permitted facility must not exceed the following design criteria:

Table 8 – Design Criteria

Parameter	Unit
Maximum Month Design Flow (MMDF)	2.15 MGD
BOD_5 Influent Loading for Maximum Month	5,220 lb/day
TSS Influent Loading for Maximum Month	5,220 lb/day

S4.B. Plans for maintaining adequate capacity

a. Conditions triggering plan submittal

The Permittee must submit a plan and a schedule for continuing to maintain capacity to Ecology when:

1. The actual flow or waste load reaches 85 percent of any one of the design criteria in S4.A for three consecutive months.
2. The projected plant flow or loading would reach design capacity within five years.

b. Plan and schedule content

The plan and schedule must identify the actions necessary to maintain adequate capacity for the expected population growth and to meet the limits and requirements of the permit. The Permittee must consider the following topics and actions in its plan.

1. Analysis of the present design and proposed process modifications
2. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system
3. Limits on future sewer extensions or connections or additional waste loads
4. Modification or expansion of facilities
5. Reduction of industrial or commercial flows or waste loads

Engineering documents associated with the plan must meet the requirements of WAC 173-240-060, "Engineering Report," and be approved by Ecology prior to any construction.

S4.C. Duty to mitigate

The Permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

S4.D. Notification of new or altered sources

1. The Permittee must submit written notice to Ecology whenever any new discharge or a substantial change in volume or character of an existing discharge into the wastewater treatment plant is proposed which:
   a. Would interfere with the operation of, or exceed the design capacity of, any portion of the wastewater treatment plant.
   b. Is not part of an approved general sewer plan or approved plans and specifications.
   c. Is subject to pretreatment standards under 40 CFR Part 403 and Section 307(b) of the Clean Water Act.
2. This notice must include an evaluation of the wastewater treatment plant's ability to adequately transport and treat the added flow and/or waste load, the quality and volume of effluent to be discharged to the treatment plant, and the anticipated impact on the Permittee's effluent [40 CFR 122.42(b)].

S4.E. Infiltration and inflow evaluation

1. The Permittee must conduct an infiltration and inflow evaluation. Refer to the U.S. EPA publication, I/I Analysis and Project Certification, available as Publication No. 97-03 at: https://apps.ecology.wa.gov/publications/SummaryPages/9703.html
2. The Permittee may use monitoring records to assess measurable infiltration and inflow.
3. The Permittee must prepare a report summarizing any measurable infiltration and inflow. If infiltration and inflow have increased by more than 15 percent from that found in the previous report based on equivalent rainfall, the report must contain a plan and a schedule to locate the sources of infiltration and inflow and to correct the problem.

4. The Permittee must submit a report summarizing the results of the evaluation and any recommendations for corrective actions by March 31, 2023.

S5. Operation and maintenance

The Permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance (O&M) includes, but is not limited to, performing periodic preventive maintenance and cleaning on all equipment and systems at intervals recommended by equipment manufacturers or as documented in an Ecology-approved (O&M); conducting routine inspections of the collection system to identify pipe defects or blockages that can cause sanitary sewer overflows; completing timely repairs or replacement of damaged equipment (including conveyance system components); keeping a daily operation logbook (paper or electronic); and using adequate laboratory controls and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of this permit.

S5.A. Certified operator

This permitted facility must be operated by an operator certified by the state of Washington for at least a Class III plant. This operator must be in responsible charge of the day-to-day operation and maintenance of the wastewater treatment plant. An operator certified for at least a Class II plant must be in charge during all regularly scheduled shifts. The Permittee must notify Ecology when the operator in charge at the facility changes. It must provide the new operator’s name and certification level and provide the name of the operator leaving the facility.

S5.B. Operation and maintenance program

The Permittee must:

1. Institute an adequate operation and maintenance program for the entire sewage system.
2. Keep maintenance records on all major electrical, SCADA and mechanical components of the treatment plant, as well as the sewage system and pumping stations. Such records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed.
3. Ensure all operations and maintenance tasks done on WWTP process equipment or systems, including process management and SCADA computer systems (including WRF control system servers and internal network control system infrastructure), are performed or supervised by an operator certified by the State of Washington. The Permittee may allow qualified mechanics, programmers, network engineers, electricians or other trained tradespersons appropriate for specific tasks to perform work on equipment as long as a certified operator is on site to supervise, authorize and verify that the work performed does not adversely impact facility operations, effluent quality, or process monitoring and alarm reliability.
4. Make maintenance records available for inspection at all times.

S5.C. Short-term reduction

The Permittee must schedule any facility maintenance, which might require interruption of wastewater treatment and degrade effluent quality, during non-critical water quality periods and carry this maintenance out according to the approved O&M manual or as otherwise approved by Ecology.

If a Permittee contemplates a reduction in the level of treatment that would cause a violation of permit discharge limits on a short-term basis for any reason, and such reduction cannot be avoided, the Permittee must:

1. Give written notification to Ecology, if possible, thirty (30) days prior to such activities.
2. Detail the reasons for, length of time of, and the potential effects of the reduced level of treatment.

This notification does not relieve the Permittee of its obligations under this permit.

S5.D. Electrical power failure

The Permittee must ensure that adequate safeguards prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electrical power failure at the treatment plant and/or sewage lift stations. Adequate safeguards include, but are not limited to, alternate power sources, standby generator(s), or retention of inadequately treated wastes.

The Permittee must maintain Reliability Class II (EPA 430-99-74-001) at the wastewater treatment plant. Reliability Class II requires a backup power source sufficient to operate all vital components and critical lighting and ventilation during peak wastewater flow conditions. Vital components used to support the secondary processes (i.e., mechanical aerators or aeration basin air compressors) need not be operable to full levels of treatment, but must be sufficient to maintain the biota.

S5.E. Prevent connection of inflow

The Permittee must strictly enforce its sewer ordinances and not allow the connection of inflow (roof drains, foundation drains, etc.) to the sanitary sewer system.

S5.F. Bypass procedures

A bypass is the intentional diversion of waste streams from any portion of a treatment facility. This permit prohibits all bypasses except when the bypass is for essential maintenance, as authorized in Special Condition S5.F.1, or is approved by Ecology as an anticipated bypass following the procedures in S5.F.2.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit allows bypasses for essential maintenance of the treatment system when necessary to ensure efficient operation of the system. The Permittee may bypass the treatment system for essential maintenance only if doing so does not cause violations of effluent limits. The Permittee is not required to notify Ecology when bypassing for essential maintenance. However, the Permittee must comply with the monitoring requirements specified in Special Condition S2.B.

2. Anticipated bypasses for non-essential maintenance

   Ecology may approve an anticipated bypass under the conditions listed below. This permit prohibits any anticipated bypass that is not approved through the following process.

a. If a bypass is for non-essential maintenance, the Permittee must notify Ecology, if possible, at least ten (10) days before the planned date of bypass. The notice must contain:
   - A description of the bypass and the reason the bypass is necessary.
   - An analysis of all known alternatives which would eliminate, reduce, or mitigate the potential impacts from the proposed bypass.
   - A cost-effectiveness analysis of alternatives.
   - The minimum and maximum duration of bypass under each alternative.
   - A recommendation as to the preferred alternative for conducting the bypass.
   - The projected date of bypass initiation.
   - A statement of compliance with SEPA.
   - A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
   - Details of the steps taken or planned to reduce, eliminate, and prevent recurrence of the bypass.

b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during the project planning and design process. The project-specific engineering report as well as the plans and specifications must include details of probable construction bypasses to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

c. Ecology will determine if the Permittee has met the conditions of Special Condition S5.F.2 a and b and consider the following prior to issuing a determination letter, an administrative order, or a permit modification as appropriate for an anticipated bypass:
   - If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.
   - If the bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.
   - If feasible alternatives to the bypass exist, such as:
     - The use of auxiliary treatment facilities.
     - Retention of untreated wastes.
     - Stopping production.
     - Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance.

- Transport of untreated wastes to another treatment facility.

S5.G. Operations and maintenance (O&M) manual

a. O&M manual submittal and requirements

The Permittee must:

1. Update the operations and maintenance (O&M) manual that meets the requirements of 173-240-080 WAC and submit it to Ecology for approval by December 15, 2023. The update must incorporate changes to the treatment processes and systems installed during the WRF Improvements Phase 1 and Phase 2 projects.
2. Submit to Ecology for review and approval substantial changes or updates to the O&M manual whenever it incorporates them into the manual.
3. Keep the approved O&M manual at the permitted facility.
4. Follow the instructions and procedures of this manual.

b. O&M manual components

In addition to the requirements of WAC 173-240-080(1) through (5), the O&M manual must be consistent with the guidance in Table G1-3 in the *Criteria for Sewage Works Design* (Orange Book), 2008. The O&M manual must include:

1. Emergency procedures for cleanup in the event of wastewater system upset or failure.
2. A review of system components which if failed could pollute surface water or could impact human health. Provide a procedure for a routine schedule of checking the function of these components.
3. Wastewater system maintenance procedures that contribute to the generation of process wastewater.
4. Reporting protocols for submitting reports to Ecology to comply with the reporting requirements in the discharge permit.
5. Any directions to maintenance staff when cleaning or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine).
6. The treatment plant process control monitoring schedule.
7. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.
8. Specify other items on case-by-case basis such as O&M for collection systems pump stations, SCADA System, etc.

S6. Pretreatment

S6.A. General requirements

The Permittee must work with Ecology to ensure that all commercial and industrial users of the publicly owned treatment works (POTW) comply with the pretreatment regulations in 40 CFR Part 403 and any additional regulations that the Environmental Protection Agency (U.S. EPA) may promulgate under Section 307(b) (pretreatment) and 308 (reporting) of the Federal Clean Water Act.

S6.B. Duty to enforce discharge prohibitions

1. Under federal regulations (40 CFR 403.5(a) and (b)), the Permittee must not authorize or knowingly allow the discharge of any pollutants into its POTW which may be reasonably expected to cause pass through or interference, or which otherwise violate general or specific discharge prohibitions contained in 40 CFR Part 403.5 or WAC 173-216-060.
2. The Permittee must not authorize or knowingly allow the introduction of any of the following into their treatment works:
   a. Pollutants which create a fire or explosion hazard in the POTW (including, but not limited to waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21).
   b. Pollutants which will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0, or greater than 11.0 standard units, unless the works are specifically designed to accommodate such discharges.
   c. Solid or viscous pollutants in amounts that could cause obstruction to the flow in sewers or otherwise interfere with the operation of the POTW.
   d. Any pollutant, including oxygen-demanding pollutants, (BOD_5, etc.) released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the POTW.
   e. Petroleum oil, non-biodegradable cutting oil, or products of mineral origin in amounts that will cause interference or pass through.
   f. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity which may cause acute worker health and safety problems.
   g. Heat in amounts that will inhibit biological activity in the POTW resulting in interference but in no case heat in such quantities such that the temperature at the POTW headworks exceeds 40 degrees Centigrade (104 degrees Fahrenheit) unless Ecology, upon request of the Permittee, approves, in writing, alternate temperature limits.
   h. Any trucked or hauled pollutants, except at discharge points designated by the Permittee.
   i. Wastewaters prohibited to be discharged to the POTW by the Dangerous Waste Regulations (chapter 173-303 WAC), unless authorized under the Domestic Sewage Exclusion (WAC 173-303-071).
3. The Permittee must also not allow the following discharges to the POTW unless approved in writing by Ecology:
   a. Noncontact cooling water in significant volumes.
   b. Stormwater and other direct inflow sources.
   c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment, or would not be afforded a significant degree of treatment by the system.
4. The Permittee must notify Ecology if any industrial user violates the prohibitions listed in this section (S6.B), and initiate enforcement action to promptly curtail any such discharge.

S6.C. Wastewater discharge permit required

The Permittee must:

1. Establish a process for authorizing non-domestic wastewater discharges that ensures all SIUs in all tributary areas meet the applicable state waste discharge permit (SWDP) requirements in accordance with chapter 90.48 RCW and chapter 173-216 WAC.
2. Immediately notify Ecology of any proposed discharge of wastewater from a source, which may be a significant industrial user (SIU) [see fact sheet definitions or refer to 40 CFR 403.3(v)(i)(ii)].
3. Require all SIUs to obtain a SWDP from Ecology prior to accepting their non-domestic wastewater, or require proof that Ecology has determined they do not require a permit.
4. Require the documentation as described in S6.C.3 at the earliest practicable date as a condition of continuing to accept non-domestic wastewater discharges from a previously undiscovered, currently discharging and unpermitted SIU.
5. Require sources of non-domestic wastewater, which do not qualify as SIUs but merit a degree of oversight, to apply for a SWDP and provide it a copy of the application and any Ecology responses.
6. Keep all records documenting that its users have met the requirements of S6.C.

S6.D. Identification and reporting of existing, new, and proposed industrial users

1. The Permittee must take continuous, routine measures to identify all existing, new, and proposed SIUs and potential significant industrial users (PSIUs) discharging or proposing to discharge to the Permittee's sewer system (see *Appendix C* of the fact sheet for definitions).
2. Within 30 days of becoming aware of an unpermitted existing, new, or proposed industrial user who may be a significant industrial user (SIU), the Permittee must notify such user by registered mail that, if classified as an SIU, they must apply to Ecology and obtain a State Waste Discharge Permit. The Permittee must send a copy of this notification letter to Ecology within this same 30-day period.
3. The Permittee must also notify all Potential SIUs (PSIUs), as they are identified, that if their classification should change to an SIU, they must apply to Ecology for a State Waste Discharge Permit within 30 days of such change.

S6.E. Industrial user survey

The Permittee must complete an industrial user survey listing all SIUs and potential significant industrial users (PSIUs) discharging to the POTW. The Permittee must submit the survey to Ecology by December 31, 2022. At a minimum, the Permittee must develop the list of SIUs and PSIUs by means of a telephone book search, a water utility billing records search, and a physical reconnaissance of the service area. Information on PSIUs must include, at a minimum, the business name, telephone number, address, description of the industrial process(s), and the known wastewater volumes and characteristics.

S7. Solid wastes

S7.A. Solid waste handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

S7.B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

S8. Spill control plan update

S8.A Spill control plan submittals and requirements

The Permittee must:

1. Submit to Ecology an update to the existing spill control plan by May 31, 2023.
2. Review the plan at least annually and update the spill plan as needed.
3. Send changes to the plan to Ecology.
4. Follow the plan and any supplements throughout the term of the permit.

S8.B. Spill control plan components

The spill control plan must include the following:

1. A list of all oil and petroleum products and other materials used and/or stored on-site, which when spilled, or otherwise released into the environment, designate as dangerous waste (DW) or extremely hazardous waste (EHW) by the procedures set forth in WAC 173-303-070. Include other materials used and/or stored on-site which may become pollutants or cause pollution upon reaching state's waters.
2. A description of preventive measures and facilities (including an overall facility plot showing drainage patterns) which prevent, contain, or treat spills of these materials.
3. A description of the reporting system the Permittee will use to alert responsible managers and legal authorities in the event of a spill.
4. A description of operator training to implement the plan.

The Permittee may submit plans and manuals required by 40 CFR Part 112, contingency plans required by Chapter 173-303 WAC, or other plans required by other agencies, which meet the intent of this section.

S9. Mixing study

S9.A. General requirements

The Permittee must:

1. Complete an Effluent Mixing Zone Study. Submit a Plan of Study to Ecology for review by July 31, 2023, prior to initiation of the effluent mixing study.
2. Use the Guidance for Conducting Mixing Zone Analyses (Appendix C of Ecology's *Permit Writer's Manual*, 2015) and the protocols identified in S10.C.
3. Include the results of the effluent mixing study in the Effluent Mixing Report and submit it to Ecology for approval by July 31, 2024.
4. If the results of the mixing study, toxicity tests, and chemical analysis indicate that the concentration of any pollutant(s) exceeds or has a reasonable potential to exceed the state water quality standards, chapter 173-201A WAC, Ecology may issue an administrative order to require a reduction of pollutants or modify this permit to impose effluent limits to meet the water quality standards.

S9.B. Reporting requirements

The mixing zone study must include:

1. A statement confirming that AKART has been applied to the discharge.
2. A description of the size of the mixing zone allowed under chapter 173-201A WAC.
3. An analysis showing how mixing zones have been minimized using the lowest dilution from hydraulic limitations, width limitations, distance limitations and those predicted by the model.
4. A clear description of the critical conditions used for dilution factors:
   a. For ambient freshwater (unidirectional flow) use 7Q10 flows for acute, chronic and non-carcinogenic pollutants, and harmonic flow for carcinogens.
   b. Generally, use depth of outfall at 7Q10 flows (rivers). For assessing human health in freshwater, depths of outfall should be established at the applicable flow (e.g. harmonic mean flow or 30Q5 flows).
   c. For unidirectional flow use centerline dilution factor for acute and chronic conditions, while flux average for human health dilution factors.
5. Diffuser information:
   a. Location, orientation, description and dimension of diffusers and ports.
   b. Port elevation above bottom and the depth of the diffuser/port below water surface based on either 7Q10 flow for rivers.
   c. Plan view maps showing the mixing zone size and dimensions in relation to the diffuser.
   d. Schematic of waterbody cross-section, showing channel width, depth, and diffuser location in relation to shoreline and bottom.
   e. Report on the integrity of the diffuser and the ports being modeled.
6. Discharge characteristics:

a. Existing and projected maximum daily, maximum monthly average, and annual average flows.

b. Discharge density (temperature and salinity).

7. Ambient water characteristics:

a. Critical stream flow statistics (7Q10, 30Q5, harmonic flow).

b. Velocity profile in the vicinity of the diffuser.

c. Manning's roughness coefficient, if used.

d. Available information regarding background concentrations of chemical substances in the receiving water for which there are criteria in chapter 173-201A WAC.

8. Model selection and results:

a. Model selection and application discussion. Consider model applicability to single or multiport diffuser, opposing port configuration, submerged, surface or above-surface discharge, buoyant or non-buoyant discharge, and potential plume attachment to boundaries.

b. Description of mixing and plume dynamics (nearfield, farfield, tidal buildup/reflux).

c. Sensitivity analysis.

d. Calibration to empirical data (tracer studies), if applicable.

e. Provide model output and summary table of results.

S9.C. Protocols

The Permittee must determine the dilution ratio using protocols outlined in the following references, approved modifications thereof, or by another method approved by Ecology:

1. Doneker, R.L. and G.H. Jirka, *CORMIX User Manual: A Hydrodynamic Mixing Zone Model and Decision Support System for Pollutant Discharges into Surface Waters*, EPA-823-K-07-001, Dec. 2007. http://www.mixzon.com/downloads/.

   A complete list of general reference for CORMIX is at: http://www.cormix.info/references.php

2. Frick, W.E., Roberts, P.J.W., Davis, L.R., Keyes, D.J., Baumgartner, George, K.P. 2003. *Dilution Models for Effluent Discharges, 4th Edition (Visual Plumes)*. Ecosystems Research Div., USEPA, Athens, GA, USA.

3. Ecology, Water Quality Program, *Permit Writer's Manual*. 2015. Washington State Department of Ecology. Publication No. 92-109, Revised January 2015. https://apps.ecology.wa.gov/publications/documents/92109.pdf.

4. Ecology, Guidance for conducting mixing zone analysis (Appendix C, Water Quality Program *Permit Writer's Manual*. 2015). https://apps.ecology.wa.gov/publications/parts/92109part1.pdf

5. Kilpatrick, F.A., and E.D. Cobb, *Measurement of Discharge Using Tracers, Chapter A16, Techniques of Water-Resources Investigations of the USGS*, Book 3, Application of Hydraulics, USGS, U.S. Department of the Interior, Reston, VA, 1985.

6. Wilson, J.F., E.D. Cobb, and F.A. Kilpatrick, *Fluorometric Procedures for Dye Tracing, Chapter A12. Techniques of Water-Resources Investigations of the USGS*, Book 3, Application of Hydraulics, USGS, U.S. Department of the Interior, Reston, VA, 1986.

S10. Acute toxicity

S10.A. Testing when there is no permit limit for acute toxicity

The Permittee must:

1. Conduct acute toxicity testing on final effluent twice: once in the last winter (January 2024) and once in the last summer (July 2024).
2. Submit the results to Ecology within 60 days of each sampling event, no later than March 30, 2024, and September 30, 2024. In addition, summarize and report results in the next permit renewal application.
3. Conduct acute toxicity testing on a series of at least five concentrations of effluent, including 100% effluent and a control.
4. Use each of the following species and protocols for each acute toxicity test:

Table 9 – Acute Toxicity Tests

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	*Pimephales promelas*	EPA-821-R-02-012
Daphnid 48-hour static test	*Ceriodaphnia dubia, Daphnia pulex,* or *Daphnia magna*	EPA-821-R-02-012

S10.B. Sampling and reporting requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. Reports must contain toxicity data, bench sheets, and reference toxicant results for test methods. In addition, the Permittee must submit toxicity test data in electronic format (CETIS export file preferred) for entry into Ecology's database.
2. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.
3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.
4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Subsection C and the Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.

5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Section A or pristine natural water of sufficient quality for good control performance.
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.
7. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the acute critical effluent concentration (ACEC). The ACEC equals 41.7% effluent.
8. All whole effluent toxicity tests, effluent screening tests, and rapid screening tests that involve hypothesis testing must comply with the acute statistical power standard of 29% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

S11. Chronic toxicity

S11.A. Testing when there is no permit limit for chronic toxicity

The Permittee must:

1. Conduct acute toxicity testing on final effluent twice: once in the last winter (January 2024) and once in the last summer (July 2024).
2. Submit the results to Ecology within 60 days of each sampling event, no later than March 30, 2024, and September 30, 2024. In addition, summarize and report results in the next permit renewal application.
3. Conduct chronic toxicity testing on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). The ACEC equals 41.7% effluent. The series of dilutions should also contain the CCEC of 2.81% effluent.
4. Compare the ACEC to the control using hypothesis testing at the 0.05 level of significance as described in Appendix H, EPA/600/4-89/001.
5. Perform chronic toxicity tests with all of the following species and the most recent version of the following protocols:

Table 10 – Freshwater Chronic Test

Freshwater Chronic Test	Species	Method
Fathead minnow survival and growth	*Pimephales promelas*	EPA-821-R-02-013
Water flea survival and reproduction	*Ceriodaphnia dubia*	EPA-821-R-02-013

S11.B. Sampling and reporting requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. Reports must contain toxicity data, bench sheets, and reference toxicant results for test methods. In addition, the Permittee must submit toxicity test data in electronic format (CETIS export file preferred) for entry into Ecology’s database.

2. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.
3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.
4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Section C and the Ecology Publication no. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Subsection C or pristine natural water of sufficient quality for good control performance.
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.
7. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the CCEC and the ACEC. The CCEC and the ACEC may either substitute for the effluent concentrations that are closest to them in the dilution series or be extra effluent concentrations. The CCEC equals 2.81% effluent. The ACEC equals 41.7% effluent.
8. All whole effluent toxicity tests that involve hypothesis testing must comply with the chronic statistical power standard of 39% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

S12. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this NPDES permit by December 31, 2025.

The Permittee must also submit a new application or addendum at least one hundred eighty (180) days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

Reclaimed Water Conditions

R1. Water quality limits

R1.A. Reclaimed water limits

All activities authorized by this permit for the production and distribution of reclaimed water must comply with the terms and conditions of this permit. The distribution of reclaimed water containing any of the following constituents more frequently than, or at a concentration in excess of, that identified and authorized by this permit violates the terms and conditions of this permit.

Beginning on the effective date of this permit, the Permittee may produce and distribute Class A reclaimed water for the beneficial uses, and to the locations, listed in Reclaimed Water Condition R4 subject to the following water quality limits. In addition to the product water limits below, the source water for the reclaimed water treatment system must at all times comply with the limits on $CBOD_5$, TSS and pH in Special Condition S1 of this permit.

Reclaimed Water Limits (Outfall #002)

Latitude 47.542219 Longitude -121.830353

Table 11 – Biological Oxidation Performance Standard [a]

Parameter	Minimum	Maximum
Dissolved Oxygen (DO)	≥ 0.2 mg/L [b]	

Product Water

Table 12 – Coagulated/ Filtered Water – Prior to Disinfection

Parameter	Average Monthly [c]	Instantaneous Maximum
Turbidity	2 Nephelometic Turbidity Units (NTU)	5 NTU [d]

Disinfected Reclaimed Water

Table 13 – Disinfected Reclaimed Water Prior to Distribution [e]

Parameter	7-Day Median [f]	Sample Maximum [g]
Total Coliform	2.2 MPN /100 mL	23 MPN /100 mL

a	Source water for the reclaimed water facility must meet or exceed minimum technology-based secondary treatment requirements in WAC 173-221-040 to satisfy the biological oxidation treatment standard. The Permittee may measure compliance with this standard either at the end of the reclaimed water treatment system or in the secondary effluent at the point of diversion to the reclaimed water treatment system.
b	The standard for dissolved oxygen is “must be measurably present”. The limit for dissolved oxygen is set at the minimum quantitation level listed in Appendix A.
c	Average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured.
d	The maximum turbidity limit is defined as the value not to be exceeded by a continuous measurement. The Permittee must report the maximum instantaneous turbidity that is recorded for longer than 5 consecutive minutes. Durations of less than or equal to 5 minutes over the sample maximum are not permit violations.
e	End of UV disinfection channel prior to diversion to the reclaimed water pump station clear well.
f	Determine the 7-day median value using all of the bacteriological results of the last 7 days of analyses (the reporting day and the previous 6 days).
g	The number of total coliform organisms must not exceed the sample maximum limit value in any single sample. If the Permittee collects multiple samples in a single day, it must report the highest sample value of all samples taken as the sample maximum.

R2. Monitoring requirements

R2.A. Class A reclaimed water monitoring

The Permittee must monitor in accordance with the following schedule and the requirements specified in Appendix A. These monitoring requirements supplement monitoring required by special condition S2 of this permit.

The Permittee must monitor priority pollutants in final reclaimed water to collect data necessary for the next application for permit renewal. Monitoring must be conducted in accordance with the "Permit Renewal Application Requirements" in Special Condition S2 (Table 7) of this permit and during at least one period when the facility is producing reclaimed water.

Table 14 – Filtration Process Monitoring

The permittee must monitor the amount of coagulants added to the reclaimed water treatment prior to filtration.

Parameter	Units	Minimum Sampling Frequency	Sample Type
Coagulant [1]	Pounds	Daily	Metered Usage

Table 15 – Reclaimed Water Prior to Disinfection

The Permittee must monitor the filtered reclaimed water prior to disinfection. The reclaimed water must comply with the dissolved oxygen and turbidity limits at this monitoring point.

Parameter	Units	Minimum Sampling Frequency	Sample Type
Dissolved Oxygen	mg/L	Continuous	Metered/recorded
Turbidity [2]	NTU	Continuous	Metered/recorded

Table 16 – Final Reclaimed Water

The Permittee must monitor the final reclaimed water quality after disinfection and at a location prior to distribution to Eagle Lake.

Parameter	Units	Minimum Sampling Frequency	Sample Type
Flow	mgd (gpd)	Continuous [3]	Metered
Total coliform	MPN /100mL	Daily	Grab
Total coliform – 7-day Median	MPN /100mL	Daily	Calculated [4]

Table 17 – Footnotes for Monitoring Tables

Footnote	Information
1	Coagulant refers to any polymer, coagulant or any other chemical added to the reclaimed water to enhance filterability. Permittee must record and report the total amount of all chemicals added each day reclaimed water is produced.
2	Effluent turbidity analysis must be performed by a continuous recording turbidimeter. The Permittee must report the maximum value that exceeds 5 minutes.
3	Continuous means uninterrupted except for brief lengths of time for calibration, for power failure, or for unanticipated equipment repair or maintenance
4	Calculate and report the median value of Total Coliform results on a daily basis using the results of daily samples taken on the reporting day and the six previous days when reclaimed water was produced.

The Permittee must meet the minimum sampling frequency in the above table whenever it produces and distributes reclaimed water. If the Permittee produces and distributes reclaimed water intermittently over the course of a month, it must ensure it complies with the minimum monitoring frequency during the periods it produces and distributes reclaimed water. Permittee may use $CBOD_5$ and TSS monitoring conducted on days when it does not distribute reclaimed water to outfall #002 to achieve the minimum frequency in this schedule only if the water was coagulated and filtered prior to discharge through outfall #001.

All reclaimed water monitoring practices and procedures must conform to the requirements of Special Conditions S2.

R2.B. Sampling and analytical procedures

The Permittee must use sampling and analytical procedures consistent with Special Condition S2.B of this permit, with the following change. The Permittee may use sampling and analytical methods listed in either 40 CFR Part 136 (Guidelines Establishing Test Procedures for the Analysis of Pollutants) or 40 CFR Part 141 (National Primary Drinking Water Regulations) for reclaimed water monitoring.

R2.C. Flow measurement and continuous monitoring devices

The Permittee must use flow measurement and continuous monitoring devices consistent with Special Condition S2.C of this permit.

R2.D. Laboratory accreditation

The Permittee must comply with the laboratory accreditation requirement in Special Condition S2.D of this permit.

R2.E. Request for reduction in monitoring

The Permittee may request a reduction of the sampling frequency after twelve (12) months of monitoring. Ecology will review each request and at its discretion grant the request when it reissues the permit or by a permit modification.

The Permittee must:

1. Provide a written request.
2. Clearly state the parameters for which it is requesting reduced monitoring.
3. Clearly state the justification for the reduction.

R3. Reporting and recording requirements

The Permittee must monitor and report in accordance with Special Condition S3 of this permit and the following conditions.

R3.A. Discharge monitoring reports

The first monitoring period begins on the effective date of the permit (unless otherwise specified). The Permittee must submit discharge monitoring reports to report the tabulated data in Reclaimed Condition R2 according to the instructions in Special Condition S3.A of this permit and the instructions below. If the Permittee monitors any pollutant more frequently than required by Reclaimed Water Condition R2, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the DMR, unless otherwise specified by Reclaimed Water Condition R2.

The Permittee must:

1. Report the highest value of any total coliform sample for each day if multiple samples were taken in one day.
2. Calculate the 7-day median values for total coliform using:
    a. The reported numeric value for all daily total coliform samples measured above the detection value except when it took multiple samples in one day. If the Permittee takes multiple samples in one day it must use the highest value for the day in the 7-day median calculation.

R3.B. Annual summary report

The Permittee must submit an annual report by March 15th of each year using the Annual Report Questionnaire Form provided by Ecology in the Water Quality Permitting Portal – Permit Submittals application. The Permittee will generally provide summaries of reclaimed water production topics for the previous calendar year in the questionnaire. Appendix B includes a sample of the Annual Report Questionnaire. Summary topics include, but may not be limited to:

- Number of days of reclaimed water production and distribution.
- Total volume of reclaimed water produced and distributed.
- Total volume of reclaimed water distributed to each use category authorized in Reclaimed Condition R4.A.
- Total volume of off-spec reclaimed water diverted for disposal or retreatment, if any.
- Total volume of reclaimed water diverted from authorized use locations due to distribution system maintenance or repair.
- Number of reclaimed water quality limit violations reported on monthly DMRs, if any.
- Number of backflow incidents discovered and reported to water purveyors, if any.

In addition to providing the data listed above, the questionnaire will require the Permittee to upload supplemental summary documents that provide the following information:

- The annual volume of reclaimed water distributed to each use location.
- A list of any new users or distributors that signed agreements during the year.
- Description of the circumstances that led to the disposal of off-spec reclaimed water along with a description of corrective actions taken.
- A summary of any actions taken to enforce requirements in use or distribution agreements, including nature of the violation and the remedial action taken.
- A Cross-connection Control Program Summary.

R3.C. Records retention

The Permittee must retain all records pertaining to the annual cross-connection control report that is submitted to the Department of Health, Office of Drinking Water, by the water purveyor(s) that provides potable water to any reclaimed water use area for a minimum of three (3) years. This report must identify all cross-connection control assemblies tested and any cross-connection incident that occurred relating to the reclaimed water system. This report only applies to those control assemblies under the control of the Permittee.

The Permittee must retain all records pertaining to the Reclaimed Water Use Plan for a minimum of three (3) years and must retain the plan on-site.

R3.G. Reporting permit violations

In the event of an action that violates the reclaimed water terms and conditions of this permit, the Permittee must immediately take action to stop, contain, and remedy the unauthorized generation, distribution, or use of reclaimed water. The Permittee must report the noncompliance as directed below.

a. Immediate reporting

1. The Permittee must immediately report to Ecology (at the number listed below) all noncompliance that results in the production and distribution of reclaimed water that threatens public health or the environment, including:
   - Any failure of the reclaimed water treatment system resulting in the distribution of improperly treated water.
   - Plant bypasses resulting in distribution of improperly treated water.
   - Overflows or leaks of transmission or irrigation pipelines that discharge to a waterbody used as a source of drinking or irrigation water.

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   Additionally, if an overflow or leak results in a discharge of reclaimed water into a municipal separate storm sewer system (MS4), the Permittee must notify the appropriate MS4 owner or operator.
2. The Permittee must report to Ecology and the appropriate potable water purveyor immediately, but no later than the end of the next business day, when it discovers a backflow incident that may have contaminated the reclaimed water facility, the distribution system, or the potable water system.

b. Written violation reports

The Permittee must also submit a written report within thirty days of the time that the Permittee becomes aware of any reportable event under subpart a above. The report must contain:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times.
3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
4. A description of the corrective actions taken.
5. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
6. Maps, drawings, aerial photographs, or pictures as necessary to show the location and cause(s) of the non-compliance.

c. All other permit violation reporting

The Permittee must report all permit violations that do not require reporting under subparts a or b according to the requirements in Special Condition S3.F of this permit.

R4. Reclaimed water distribution and use

R4.A. Authorized uses and locations

1. The Permittee may produce and distribute Class A reclaimed water for turf and landscape irrigation.
2. The Permittee may add beneficial uses listed in the “Land Application or Irrigation” section of Table 3 in WAC 173-219-390 without modifying this permit as long as the new use does not include additional use-based requirements that are more stringent than the requirements listed in Reclaimed Condition R4.B.c.
3. All distribution and use of reclaimed water must comply with the terms and conditions of this permit and with signed distribution and use agreements. The distribution or release of inadequately treated water or the distribution and use of water to locations not identified in this permit or use agreements is prohibited.
4. The Permittee may distribute reclaimed water for beneficial uses to the following locations. The Permittee may add new reclaimed water users without modification of this permit by submitting a signed use agreement with the new user for Ecology review and approval prior to providing reclaimed water to the new user.

Table 18 –Reclaimed Water Use Locations

Water User	Location (address)
Snoqualmie Ridge Golf Course	36005 SE Ridge Street
Snoqualmie Ridge Business Park	Vicinity of SE Douglas St. and Snoqualmie Pkwy.
Venture Commerce Center	35300-35400 SE Center St.
Snoqualmie Public Works – Snoqualmie Pkwy median and swales	Snoqualmie Parkway
Snoqualmie Ridge ROA	35131 SE Douglas St

R4.B. Use and distribution constraints

a. Agreements required

The Permittee must maintain and enforce use agreements for each user that receives reclaimed water generated by the permitted facility. Agreements may take one of the following forms:

- Individual agreements with each user that receives reclaimed water.
- Standardized general agreements or templates that the Permittee will use for all users.
- Local ordinances that regulate the use of reclaimed water generated at the permitted facility.

The Permittee must submit each individual agreement, general agreement template, or ordinance to Ecology for review and approval prior to providing reclaimed water.

Any use agreement in effect prior to February 23, 2018, that does not comply with the requirements of WAC 173-219-290(2) and with Reclaimed Condition R4.B.c of this permit may remain in effect for up to one year after the effective date of this permit. The Permittee must modify, as necessary, and resubmit any non-conforming agreement to Ecology for review and approval by June 30, 2022.

b. Distribution requirements

The Permittee must comply with the following requirements for the distribution of reclaimed water produced at the permitted facility.

The Permittee must:

1. Notify all owners of potable water supplies with sources within 1,000 feet of reclaimed water storage facilities. Notification requirement applies to all new reclaimed water storage facilities and existing storage facilities for which the Permittee has not previously provided notification.
2. Label or color code all new reclaimed water piping, valves, outlets, storage facilities, and other appurtenances to identify the components as part of the reclaimed water distribution system. Color coding must be Pantone 512, 522 or other shade of purple color approved in the reclaimed water engineering report.
3. Maintain adequate separation between pipes conveying reclaimed water and any nearby sanitary sewer lines, storm sewer lines, potable water lines, and potable water wells.
4. Maintain a minimum 200-foot horizontal separation between reclaimed water distribution and storage infrastructure and all potable water intakes, including well heads, springs, surface water, or designated groundwater under the influence of surface water.
5. Manage cross-connection controls between reclaimed water and potable water as well as between reclaimed water and systems conveying lower quality waters, such as wastewaters and stormwater. Cross-connection controls must comply with the requirements in Reclaimed Water Condition R4.C of this permit and with WAC 173-219-310.
6. Take appropriate steps to contain and divert to the sanitary sewer system or to an approved use area any reclaimed water released from the distribution system during distribution system maintenance. Maintenance releases may result line flushing or pipeline repair. Any release of reclaimed water to surface water or to any area not identified in this permit or a signed use agreement is prohibited.

c. Use agreement requirements

1. Before entering into any use agreement, the Permittee must first evaluate the proposed use site to assure the proposed site is appropriate for the prospective reclaimed water use. The Permittee must also verify that the proposed use is not prohibited by local codes or ordinances and that the use is protective of public health and the environment. A completed site evaluation must accompany each use agreement submitted to Ecology for review and approval.

   A site evaluation is not required for use agreements in place prior to February 23, 2018. A new or updated evaluation will be required for existing use areas if the agreements are modified to increase the amount of reclaimed water supplied to the site or to change the types of beneficial uses at the sites. The Permittee must also reevaluate use sites when they become aware of changes in local codes or ordinances that may affect the use of reclaimed water at the site or if they become aware of any other circumstances that may impact the ability to appropriately use reclaimed water at a site.

2. The Permittee must notify any water purveyor supplying potable water to the proposed use site of their intent to supply reclaimed water to the site. The notice must:
   - Describe the treatment requirements for the reclaimed water,
   - Identify the proposed use(s) at the site, and
   - Identify any proposed measures to protect the potable water supply.

   A copy of the notification must accompany each agreement submitted to Ecology for review and approval.

3. Each use agreements must include the following:
   a. Identification of the person or organization entering into the agreement to use the reclaimed water. For agreements with an organization, include the name of the individual responsible for overseeing the use of the reclaimed water.
   b. Identification of the area where reclaimed water will be used. This identification must list whether the use area is included in a wellhead protection area or critical aquifer recharge area.
   c. Description of the authorized use(s) of reclaimed water at the site covered by the agreement.
   d. Requirements for cross-connection control consistent with Reclaimed Condition R4.C below.
   e. Specification of monitoring points, monitored parameters, and sample times as necessary to implement the terms and conditions in this permit.
   f. Requirements for advisory notification at the use site. Advisory notices may include signs or distributed notices that include the following: "Reclaimed Water – Do Not Drink". The requirement may also use alternate language that is consistent with the Washington State Uniform Plumbing Code (WAC 51-56) or approved by the Department of Health.
   g. Require the design for all pipes carrying reclaimed water at the use site to comply with labeling and separation requirements in Reclaimed Water Condition R4.B.b above and WAC 173-219-360. Ecology may waive this requirement on a case-by-case basis.
   h. Restrict operation of reclaimed water valves and outlets at the use site to authorized personnel and restrict access to hose bibs on reclaimed water lines.
   i. Establish Best Management Practices (BMPs) designed to prevent incidental site runoff.

d. Enforcement of agreements

Each use agreement must include enforcement provisions specifying grounds for suspending delivery of reclaimed water or termination of the agreements. The Permittee must, at a minimum, immediately suspend delivery of reclaimed water to a user under the following conditions:

- Discovery of failed or inadequate cross-connection control devices at the use area covered by an agreement.
- Discovery of use of reclaimed waters to areas not identified in use agreements or for uses not authorized by an agreement or this permit.
- Discovery of the use of reclaimed water at rates greater than the rates authorized by an agreement or in a manner inconsistent with the terms and conditions of this permit and the agreement.
- Failure of a user to provide adequate labeling or use area notification.
- Failure of a user to implement appropriate measures to protect human health and the environment.

R4.C. Cross-connection control

The Permittee must comply with the cross-connection control requirements in this permit and in WAC 173-219-310. It must take the actions specified below to eliminate or prevent cross-connections between water supplies at the reclaimed water production facility and throughout the reclaimed water distribution system.

a. Cross-connection control program

The permittee must develop and implement a cross-connection control program to ensure protection of reclaimed water from lower quality water. The program must ensure protection of reclaimed water at all stages, starting at the production facility and ending at the property line of each use location. The program must also document how the Permittee will coordinate with potable water purveyors to evaluate and prevent potential cross connection between reclaimed water and potable water supplies. The Permittee must ensure that all determinations of the appropriate method of backflow prevention needed to eliminate or control cross-connections is made by a cross-connection control specialist certified under RCW 70.119.

The Permittee must complete program development and begin implementation by June 30, 2025. The Permittee must also provide a status update on the development of the program as an element of the Annual Summary Report required in Reclaimed Water Condition R3.B.

b. Water purveyor coordination

The permittee must coordinate with all potable water purveyors in the service area of the reclaimed water system to eliminate potential cross-connections between the reclaimed water treatment and distribution systems and the potable water systems. The written cross-connection control program must document and describe the procedures used to coordinate with water purveyors and delineate responsibilities.

The Permittee must notify any water purveyor supplying potable water to the proposed use site of their intent to supply reclaimed water to the site. The notice must:

- describe the treatment requirements for the reclaimed water,

- identify the proposed use(s) at the site, and
- identify any proposed measures to protect the potable water supply.

The Permittee may not provide water to a use location before the potable water purveyor has certified that an appropriate backflow prevention assembly has been correctly installed on the potable supply line to the use location property.

c. Program requirements

The Permittee must use good engineering practices in the development and implementation of the of the cross-connection control program. The program must include the following minimum elements:

1. Adoption of a local ordinance, resolution, code, bylaw, or other written legal instrument that establishes the Permittee's authority to implement the program; describes the program's operating policies and technical provisions; and establishes corrective actions needed to enforce the program.
2. Development and implementation procedures and schedules to eliminate or control cross-connections through the proper installation and periodic inspection of approved backflow prevention assemblies at new and existing use locations.
3. Adequate staffing to develop and implement the program, including at least one cross-connection control specialist certified under RCW 70.119.
4. Procedures for responding to backflow incidents.
5. Development and maintenance of a records system that documents locations where potential cross-connections exist; identifies properties where the Permittee provides reclaimed water; identifies the potable water purveyor supplying water to properties receiving reclaimed water, if potable supply is present; a detailed inventory of cross-connection control devices used at each location; and a system for providing annual reports of the cross-connection control program and backflow incident reports.

d. Backflow prevention assemblies

Whenever the use of backflow prevention assemblies is necessary to prevent cross-connection between lower-quality water and higher-quality water, the Permittee must ensure that each assembly used is recognized as an approved device on the current *University of Southern California Foundation for Cross-Connection Control and Hydraulic Research* approved backflow assemblies list. The Permittee must review plans for each installation to verify that the device will not be submerged during flooding; that the installation will comply with applicable safety regulations; and that any bypass piping around a backflow prevention assembly includes at least the same level of protection as the assembly being bypassed.

The Permittee must inspect or test backflow protection assemblies, including air gaps, at the following intervals:

- At the time of installation to verify proper construction.
- At least annually after installation. More frequent inspection may be required for assemblies installed at premises or in systems that may pose a high risk of cross-connection hazard or that have a repeated history of failure.

- After a backflow incident.
- After a repair, reinstallation, or relocation of a system.

R4.D. Water rights protection

Per RCW 90.46.130, the use of reclaimed water produced at the permitted facility must not impair any existing water right downstream of the freshwater discharge point(s) of the facility unless the Permittee and affected right holder agree upon compensation or mitigation. Existing water rights may include any permits, claims, certificates, or instream flows established pursuant to RCW 90.22 and RCW 90.54, along with federally reserved water rights. To prevent new stream impacts or impairments of downstream water rights, production and distribution of reclaimed water from the permitted facility must not exceed a maximum monthly design flow rate of 1.56 MGD.

The Reclaimed Water Rule, WAC 173-219-090(1), requires that any "person applying to ecology or health for a reclaimed water permit, permit renewal, or permit modification under this chapter must demonstrate compliance with RCW 90.46.130." To meet this requirement, the Permittee must document in the next application for permit renewal how the use of reclaimed water from the permitted facility continues to comply with the water rights protection provisions in WAC 173-219-090 and RCW 90.46.130.

R5. Facility loading

The Permittee must comply with the Facility Loading requirements in Special Condition S4 of this permit for the influent wastewater to the treatment facility. The following additional conditions apply to the water reclamation process at the permitted facility.

R5.A. Design criteria

The reclaimed water production flow rate for the permitted facility must not exceed the following design criteria:

Maximum Month Design Flow (MMDF)	1.56 MGD

R5.B. Plans for maintaining adequate capacity

a. Conditions triggering plan submittal

The Permittee must submit a plan and a schedule for continuing to maintain capacity to Ecology when:

1. The actual flow or waste load reaches 85 percent of the design criteria in R5.A for three consecutive months.
2. The projected plant flow or loading would reach design capacity within five years.

b. Plan and schedule content

The plan and schedule must identify the actions necessary to maintain adequate capacity for the expected population growth and to meet the limits and requirements of the permit. The Permittee must consider the following topics and actions in its plan.

1. Analysis of the present design and proposed process modifications.

2. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system.
3. Limits on future sewer extensions or connections or additional waste loads.
4. Modification or expansion of facilities.
5. Reduction of industrial or commercial flows or waste loads.

Engineering documents associated with the plan must meet the requirements of WAC 173-219-210 (engineering reports for reclaimed water facilities) and WAC 173-240-060, (engineering reports for wastewater treatment facilities) and be approved by Ecology prior to any construction.

R6. Operation and maintenance

The Permittee must at all times properly operate and maintain all facilities or systems of treatment and control (and related appurtenances) installed to produce and distribute reclaimed water in compliance with the terms and conditions of this permit. Proper operation and maintenance includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures.

The Permittee must keep maintenance records on all major electrical and mechanical components of the treatment plant and reclaimed water distribution system. Such records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed. It must make maintenance records available for inspection at all times.

This condition supplements operations and maintenance requirements in Special Condition S5 of this permit.

R6.A. Certified operator

An operator certified for at least a Class III plant by the State of Washington must be in responsible charge of the day-to-day operation of the reclaimed water production. An operator certified for at least a Class II plant must be in charge during all regularly scheduled shifts. The Permittee must notify Ecology when the operator in charge at the facility changes. It must provide the new operator’s name and certification level and provide the name of the operator leaving the facility.

R6.B. Treatment reliability

The Permittee must ensure compliance with the reliability requirements of WAC 173-219-350. It must use adequate safeguards to prevent the distribution of water that is not treated in accordance with the requirements of this permit. Adequate safeguards include, but are not limited to alarms to alert operators of problems, use of redundant power sources, retention of inadequately treated wastes, and automatic diversions of water to storage or other authorized disposal when problems occur.

a. Reclaimed water bypass prohibited

The Permittee must not bypass inadequately treated wastewater from the permitted facility to the distribution system or any point of use. It must divert any water not treated in accordance with the reclaimed water requirements of this permit to storage for retreatment or to disposal as authorized by Special Condition S1 of this permit.

b. Alarms and automatic diversion

The Permittee must use alarm systems at the permitted facility to alert operators to failures in critical treatment unit processes. All alarms must sound at an attended location or through an automated notification system that will alert a designated, on-call operator of the need to take corrective action. The alarm system must include automated response programming that, upon failure of a critical system, starts back-up components, diverts water to storage, or diverts water to authorized disposal. Critical systems include, but are not limited to, primary plant power supply, biological treatment, coagulation, filtration, and disinfection treatment processes. Any programming to automatically divert water to storage or disposal must include a requirement for an operator to manually reset after verifying correction of the initial failure.

c. Power supply

The Permittee must at all times maintain power sufficient to operate all vital treatment components, alarms, and critical lighting and ventilation during peak flow conditions. Vital treatment components include biological treatment units, coagulation, filtration and disinfection. Upon loss of primary power, the Permittee must ensure one of the following actions occur.

1. An alarm alerts the plant operator to the power loss and power supply switches to a back-up power source.
2. An alarm alerts the plant operator to the loss of power and automated flow control equipment divert wastewater to storage for retreatment after power returns.
3. An alarm alerts the plant operator to the loss of power and automated flow control equipment divert wastewater to an authorized disposal location.

The power supply to all alarms and automated flow diversion equipment must be independent of the primary power supply for the reclaimed water facility or use an independent, uninterruptible back-up power source.

d. Restoring service

The Permittee may not restore reclaimed water distribution until appropriate back-up systems have been brought online or until the plant failure has been corrected. It must develop and implement checklists and standard operating procedures for operators to use in determining that the plant has been restored to normal operation. The checklists and standard operating procedures must be included in the operations and maintenance manual approved by Ecology in accordance with Reclaimed Water Condition R6.C.

e. Short-term reduction

The Permittee must schedule any facility maintenance, which might require interruption of reclaimed water treatment system and degrade reclaimed water quality, during non-critical production periods and carry this maintenance out according to the approved O&M manual or as otherwise approved by Ecology.

If a Permittee contemplates a reduction in the level of treatment that would cause a violation of permit discharge limits on a short-term basis for any reason, and such reduction cannot be avoided, the Permittee must:

1. Give written notification to Ecology, if possible, thirty (30) days prior to such activities.

2. Detail the reasons for, length of time of, and the potential effects of the reduced level of treatment.
3. Store inadequately treated flow and retreat after full treatment capability has been restored, or divert all inadequately treated flow to permitted disposal.
4. If available storage capacity is insufficient to store all flow during the short-term reduction period and permitted disposal is not available, the Permittee must work with Ecology to develop options for managing the excess off-spec water.
5. Follow the requirements for "Restoring service" listed above before resuming reclaimed water production.

This notification does not relieve the Permittee of its obligations under this permit.

R6.C. Operations and maintenance manual

The Permittee must at all times operate and maintain all facilities or systems of control installed to achieve compliance with the reclaimed water conditions in this permit according to the instructions in an operations and maintenance (O&M) manual approved by Ecology.

a. O&M manual submittal and requirements

The Permittee must:

1. Update the operations and maintenance (O&M) manual that meets the requirements of WAC 173-219-240 and submit it to Ecology for approval by December 15, 2023. The updated manual must include all elements of the WRF Improvements Phase 1 project. The Permittee must submit a paper copy or an electronic copy through secure file transfer.
2. Submit to Ecology for review and approval substantial changes or updates to the O&M manual whenever it incorporates them into the manual.
3. Keep the approved O&M manual at the permitted facility.
4. Follow the instructions and procedures of this manual.

b. O&M manual components

The O&M manual for the reclaimed water facility must include all contents listed in WAC 173-219-240(2) and be consistent with the guidance in section 5.2.6 of the *Reclaimed Water Facilities Manual* (Purple Book). Required content for the O&M manual include, but are not limited to:

1. Emergency procedures for plant shutdown and cleanup in event of wastewater or reclaimed water system upset or failure.
2. System maintenance procedures that contribute to the generation of wastewater or may result in the discharge of reclaimed water at an unauthorized location.
3. Reporting protocols for submitting reports to Ecology to comply with the reporting requirements in this permit.
4. Any directions to maintenance staff when cleaning, or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater or reclaimed water system (for example, defining maximum allowable discharge rate for

draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine.)

5. Treatment plant process control monitoring schedule.
6. Sampling protocols and procedures for compliance with the sampling and reporting requirements in the reclaimed water permit.
7. Procedures to ensure that "off spec" reclaimed water is re-treated so that it meets all reclaimed water permit limits or is discharged through an approved NPDES outfall according to the terms and conditions of the NPDES permit. "Off spec" refers to water produced by the reclaimed water facility that does not meet required water quality requirements or is otherwise not treated according to the requirements of this reclaimed water permit.
8. Procedures to decontaminate reclaimed water piping and other appurtenances prior to returning the facilities to reclaimed water service following incidents when off spec reclaimed water is produced.
9. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.

R7. Pretreatment and source control

The Permittee must implement source water controls that prevent the presence of substances that may affect the reclaimed water quality or impact the ability to produce reclaimed water in accordance with this permit. The treatment of domestic sewage used as a source water for the permitted facility must comply with Special Condition S6, Pretreatment, of this permit.

R8. Compliance schedule – Distribution Improvements

To achieve compliance with this permit, the Permittee must complete the tasks outlined in the following table by the dates specified.

Table 19 – Compliance Schedule

	Tasks	Date Due
1.	Submit a draft engineering report for distribution system modifications, as described below.	July 1, 2023
2.	Submit a final, approvable engineering report for distribution system modifications.	December 31, 2023
3.	Submit plans and specifications for identified distribution system improvements.	December 31, 2024
4.	Complete construction of distribution system improvements.	June 30, 2026

A. The Permittee must evaluate modifications to the reclaimed water distribution system that are necessary to ensure reliable distribution of Class A reclaimed water to all authorized use locations. The modified distribution system must not allow contamination of reclaimed water by lower quality water, such as urban stormwater runoff. All proposed methods of reclaimed water storage and distribution must:

- Comply with the requirements of WAC 173-219-360 (Storage and distribution requirements) and WAC 173-219-310 (Cross-connection control).
- Comply with the requirements of reclaimed water condition R4 of this permit.
- Conform to guidance in chapter 7 of the 2019 Reclaimed Water Facilities Manual (Purple Book) with respect to appropriate design of reclaimed water storage and distribution facilities.

The permittee must submit a draft engineering report to Ecology for agency review by the due date listed for task 1 above. After receiving comments from Ecology and DOH on the draft document, the Permittee must make necessary changes and resubmit the document to Ecology for approval no later than the due date shown for task 2 above.

Following approval of the distribution system engineering report, the Permittee must submit plans and specifications for the design of improvement projects identified in the approved report. The Permittee must submit the plans and specifications to Ecology for approval by the due date listed for task 3 above. Following Ecology approval of proposed improvement project design documents, the Permittee must fully implement all required improvements identified in the approved engineering report and design documents. By the due date listed above for task 4, the Permittee must submit the following to Ecology:

1. A letter describing the implemented projects and the completion date(s).
2. A Declaration of Construction form for any necessary construction projects.

B. The Permittee must prepare and submit engineering documents require above according to the following requirements.

1. The Permittee must prepare and submit two copies of an approvable engineering report in accordance with WAC 173-219-210. The Permittee must submit an electronic copy of the engineering report (preferably as a PDF) contained on a portable storage device (CD, DVD, or flash drive) or through a secure file transfer portal.
2. The engineering report must contain any appropriate requirements as described in the following guidance:
   a. *Reclaimed Water Facilities Manual* (Washington State Department of Ecology Publication No. 15-10-024, 2019)
   b. *Water System Design Manual* (Washington State Department of Health Publication No. DOH 331-123, 2009)
   c. Other reference documents listed in WAC 173-240-040, as appropriate
3. The Permittee must prepare and submit two copies of approvable plans and specifications to Ecology for review and approval in accordance with WAC 173-219- 220. The Permittee must submit an electronic copy of the engineering report (preferably as a PDF) contained on a portable storage device (CD, DVD, or flash drive) or through a secure file transfer portal.
4. The plans and specifications submittal must include the following:
   a. Identification of all potential cross-connections at the facility and the device or assembly to be used to prevent the cross-connection. Cross-connections include

connections between potable water sources and reclaimed water as well as between reclaimed water and other lower-quality water.

b. A field commissioning plan for new facilities that documents the procedures and requirements for testing all new processes, equipment, and reactors used to produce reclaimed water.

5. Within thirty (30) days construction completion, submit the Declaration of Construction form (WAC 173-240-095) to Ecology at the address listed in Reclaimed Condition R3.C. Submit a paper copy of the form stamped and signed by the professional engineer responsible for the construction oversight.

C. Failure to complete the tasks required above by their due dates is a violation of this permit. Violation of this compliance schedule may result in Ecology modifying this permit to remove authorization for the Permittee to distribute reclaimed water to those users that are not connected to a distribution system that complies with the terms of this permit and with the requirements of WAC 173-219.

If the Permittee becomes aware of circumstances that may prevent it from completing the tasks on schedule, it must immediately notify Ecology, in writing, of the potential non-compliance, the reasons for delay and the steps it is taking to complete the task in a timely manner. The Permittee must submit such notice within fourteen (14) calendar days of the date it becomes aware of the potential non-compliance. The Permittee may also request that Ecology consider a schedule change through a permit modification.

R9. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this Reclaimed Water Permit by December 31, 2025. The reclaimed water permit application is in addition to the NPDES permit application required by Special Condition S12 of this permit.

The Permittee must also submit a new or supplemental application at least one hundred eighty (180) days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include increasing the class of water produced at the permitted facility from Class B to Class A; facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

General Conditions

G1. Signatory requirements

1. All applications submitted to Ecology must be signed and certified.
   a. In the case of corporations, by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
      - A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or
      - The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

   b. In the case of a partnership, by a general partner.
   c. In the case of sole proprietorship, by the proprietor.
   d. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

   Applications for permits for domestic wastewater facilities that are either owned or operated by, or under contract to, a public entity shall be submitted by the public entity.

2. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
   a. The authorization is made in writing by a person described above and submitted to Ecology.
   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph G1.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph G1.2, above, must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section must make the following certification:

"I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. Right of inspection and entry

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

1. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit.
2. To have access to and copy, at reasonable times and at reasonable cost, any records required to be kept under the terms and conditions of this permit.
3. To inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.
4. To sample or monitor, at reasonable times, any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G3. Permit actions

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the Permittee) or upon Ecology's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 40 CFR 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

1. The following are causes for terminating this permit during its term, or for denying a permit renewal application:
   a. Violation of any permit term or condition.
   b. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.
   c. A material change in quantity or type of waste disposal.
   d. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination.
   e. A change in any condition that requires either a temporary or permanent reduction, or elimination of any discharge or sludge use or disposal practice controlled by the permit.
   f. Nonpayment of fees assessed pursuant to RCW 90.48.465.
   g. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.
2. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:
   a. A material change in the condition of the waters of the state.

b. New information not available at the time of permit issuance that would have justified the application of different permit conditions.

c. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.

d. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.

e. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.

f. Ecology has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.

g. Incorporation of an approved local pretreatment program into a municipality's permit.

3. The following are causes for modification or alternatively revocation and reissuance:

   a. When cause exists for termination for reasons listed in 1.a through 1.g of this section, and Ecology determines that modification or revocation and reissuance is appropriate.

   b. When Ecology has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer (General Condition G7) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. Reporting planned changes

The Permittee must, as soon as possible, but no later than one hundred eighty (180) days prior to the proposed changes, give notice to Ecology of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in:

1. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b).
2. A significant change in the nature or an increase in quantity of pollutants discharged.
3. A significant change in the Permittee's sludge use or disposal practices. Following such notice, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G5. Plan review required

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with chapter 173-240 WAC. Engineering reports, plans, and specifications must be submitted at least one hundred eighty (180) days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in this permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

In the event of any change in control or ownership of facilities from which the authorized discharge emanates, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to Ecology.

1. Transfers by Modification

   Except as provided in paragraph (2) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

2. Automatic Transfers

   This permit may be automatically transferred to a new Permittee if:

   a. The Permittee notifies Ecology at least thirty (30) days in advance of the proposed transfer date.
   b. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.
   c. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. Reduced production for compliance

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. Other requirements of 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. Additional monitoring

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit may incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. Upset

Definition – “Upset” means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset.
2. The permitted facility was being properly operated at the time of the upset.
3. The Permittee submitted notice of the upset as required in Special Condition S3.F.
4. The Permittee complied with any remedial measures required under S3.F of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. Property rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. Toxic pollutants

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. Penalties for tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two (2) years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment shall be a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G20. Compliance schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than fourteen (14) days following each schedule date.

G21. Service agreement review

The Permittee must submit to Ecology any proposed service agreements and proposed revisions or updates to existing agreements for the operation of any wastewater treatment facility covered by this permit. The review is to ensure consistency with chapters 90.46 and 90.48 RCW as required by RCW 70.150.040(9). In the event that Ecology does not comment within a thirty-day (30) period, the Permittee may assume consistency and proceed with the service agreement or the revised/updated service agreement.

Appendix A

LIST OF POLLUTANTS WITH ANALYTICAL METHODS, DETECTION LIMITS AND QUANTITATION LEVELS

The Permittee must use the specified analytical methods, detection limits (DLs) and quantitation levels (QLs) in the following table for permit and application required monitoring unless:

- Another permit condition specifies other methods, detection levels, or quantitation levels.
- The method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136.

If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

When the permit requires the Permittee to measure the base neutral compounds in the list of priority pollutants, it must measure all of the base neutral pollutants listed in the table below. The list includes EPA required base neutral priority pollutants and several additional polynuclear aromatic hydrocarbons (PAHs). The Water Quality Program added several PAHs to the list of base neutrals below from Ecology's Persistent Bioaccumulative Toxics (PBT) List. It only added those PBT parameters of interest to Appendix A that did not increase the overall cost of analysis unreasonably.

Ecology added this appendix to the permit in order to reduce the number of analytical "non-detects" in permit-required monitoring and to measure effluent concentrations near or below criteria values where possible at a reasonable cost.

The lists below include conventional pollutants (as defined in CWA section 502(6) and 40 CFR Part 122.), toxic or priority pollutants as defined in CWA section 307(a)(1) and listed in 40 CFR Part 122 Appendix D, 40 CFR Part 401.15 and 40 CFR Part 423 Appendix A), and nonconventionals. 40 CFR Part 122 Appendix D (Table V) also identifies toxic pollutants and hazardous substances which are required to be reported by dischargers if expected to be present. This permit Appendix A list does not include those parameters.

Table 1: CONVENTIONAL POLLUTANTS

Pollutant	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)[1] *µg/L unless specified*	Quantitation Level (QL)[2] *µg/L unless specified*
Biochemical Oxygen Demand		SM5210-B		2 mg/L
Biochemical Oxygen Demand, Soluble		SM5210-B [3]		2 mg/L
Fecal Coliform		SM 9221E,9222	N/A	Specified in method - sample aliquot dependent
E. Coli		SM 9221B, 9221F, 9223B	N/A	Specified in method - sample aliquot dependent
Oil and Grease (HEM) (Hexane Extractable Material)		1664 A or B	1,400	5,000
pH		SM4500-H^+ B	N/A	N/A
Total Suspended Solids		SM2540-D		5 mg/L

Table 2: NONCONVENTIONAL POLLUTANTS

Pollutant & CAS No. (if available)	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)[1] µg/L unless specified	Quantitation Level (QL)[2] µg/L unless specified
Alkalinity, Total		SM2320-B		5 mg/L as CaCO3
Aluminum, Total	7429-90-5	200.8	2.0	10
Ammonia, Total (as N)		SM4500-NH3-B and C/D/E/G/H		20
Barium Total	7440-39-3	200.8	0.5	2.0
BTEX (benzene +toluene + ethylbenzene + m,o,p xylenes)		EPA SW 846 8021/8260	1	2
Boron, Total	7440-42-8	200.8	2.0	10.0
Chemical Oxygen Demand		SM5220-D		10 mg/L
Chloride		SM4500-Cl B/C/D/E and SM4110 B		Sample and limit dependent
Chlorine, Total Residual		SM4500 Cl G		50.0
Cobalt, Total	7440-48-4	200.8	0.05	0.25
Color		SM2120 B/C/E		10 color units
Dissolved oxygen		SM4500-OC/OG		0.2 mg/L
Flow		Calibrated device		
Fluoride	16984-48-8	SM4500-F E	25	100
Hardness, Total		SM2340B		200 as CaCO3
Iron, Total	7439-89-6	200.7	12.5	50
Magnesium, Total	7439-95-4	200.7	10	50
Manganese, Total	7439-96-5	200.8	0.1	0.5
Molybdenum, Total	7439-98-7	200.8	0.1	0.5
Nitrate + Nitrite Nitrogen (as N)		SM4500-NO3- E/F/H		100

Nitrogen, Total Kjeldahl (as N)		SM4500-N_{org}B/C and SM4500NH_3-B/C/D/EF/G/H		300
NWTPH Dx [4]		*Ecology NWTPH Dx*	250	250
NWTPH Gx [5]		Ecology NWTPH Gx	250	250
Phosphorus, Total (as P)		SM 4500 PB followed by SM4500-PE/PF	3	10
Salinity		SM2520-B		3 practical salinity units or scale (PSU or PSS)
Settleable Solids		SM2540 -F		Sample and limit dependent
Soluble Reactive Phosphorus (as P)		SM4500-P E/F/G	3	10
Sulfate (as mg/L SO_4)		SM4110-B		0.2 mg/L
Sulfide (as mg/L S)		SM4500-S^2F/D/E/G		0.2 mg/L
Sulfite (as mg/L SO_3)		SM4500-SO3B		2 mg/L
Temperature (max. 7-day avg.)		Analog recorder or use micro-recording devices known as thermistors		0.2º C
Tin, Total	7440-31-5	200.8	0.3	1.5
Titanium, Total	7440-32-6	200.8	0.5	2.5
Total Coliform		SM 9221B, 9222B, 9223B	N/A	Specified in method - sample aliquot dependent
Total Organic Carbon		SM5310-B/C/D		1 mg/L
Total dissolved solids		SM2540 C		20 mg/L

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
METALS, CYANIDE & TOTAL PHENOLS					
Antimony, Total	114	7440-36-0	200.8	0.3	1.0
Arsenic, Total	115	7440-38-2	200.8	0.1	0.5
Beryllium, Total	117	7440-41-7	200.8	0.1	0.5
Cadmium, Total	118	7440-43-9	200.8	0.05	0.25
Chromium (hex) dissolved	119	18540-29-9	SM3500-Cr C	0.3	1.2
Chromium, Total	119	7440-47-3	200.8	0.2	1.0
Copper, Total	120	7440-50-8	200.8	0.4	2.0
Lead, Total	122	7439-92-1	200.8	0.1	0.5
Mercury, Total	123	7439-97-6	1631E	0.0002	0.0005
Nickel, Total	124	7440-02-0	200.8	0.1	0.5
Selenium, Total	125	7782-49-2	200.8	1.0	1.0
Silver, Total	126	7440-22-4	200.8	0.04	0.2

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
METALS, CYANIDE & TOTAL PHENOLS					
Thallium, Total	127	7440-28-0	200.8	0.09	0.36
Zinc, Total	128	7440-66-6	200.8	0.5	2.5
Cyanide, Total	121	57-12-5	335.4	5	10
Cyanide, Weak Acid Dissociable	121		SM4500-CN I	5	10
Cyanide, Free Amenable to Chlorination (Available Cyanide)	121		SM4500-CN G	5	10
Phenols, Total	65		EPA 420.1		50

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
ACID COMPOUNDS					
2-Chlorophenol	24	95-57-8	625.1	3.3	9.9
2,4-Dichlorophenol	31	120-83-2	625.1	2.7	8.1
2,4-Dimethylphenol	34	105-67-9	625.1	2.7	8.1
4,6-dinitro-o-cresol (2-methyl-4,6,-dinitrophenol)	60	534-52-1	625.1/1625B	24	72
2,4 dinitrophenol	59	51-28-5	625.1	42	126
2-Nitrophenol	57	88-75-5	625.1	3.6	10.8
4-Nitrophenol	58	100-02-7	625.1	2.4	7.2
Parachlorometa cresol (4-chloro-3-methylphenol)	22	59-50-7	625.1	3.0	9.0
Pentachlorophenol	64	87-86-5	625.1	3.6	10.8
Phenol	65	108-95-2	625.1	1.5	4.5
2,4,6-Trichlorophenol	21	88-06-2	625.1	2.7	8.1

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
VOLATILE COMPOUNDS					
Acrolein	2	107-02-8	624	5	10
Acrylonitrile	3	107-13-1	624	1.0	2.0
Benzene	4	71-43-2	624.1	4.4	13.2
Bromoform	47	75-25-2	624.1	4.7	14.1

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
VOLATILE COMPOUNDS					
Carbon tetrachloride	6	56-23-5	624.1/601 or SM6230B	2.8	8.4
Chlorobenzene	7	108-90-7	624.1	6.0	18.0
Chloroethane	16	75-00-3	624/601	1.0	2.0
2-Chloroethylvinyl Ether	19	110-75-8	624	1.0	2.0
Chloroform	23	67-66-3	624.1 or SM6210B	1.6	4.8
Dibromochloromethane (chlordibromomethane)	51	124-48-1	624.1	3.1	9.3
1,2-Dichlorobenzene	25	95-50-1	624	1.9	7.6
1,3-Dichlorobenzene	26	541-73-1	624	1.9	7.6
1,4-Dichlorobenzene	27	106-46-7	624	4.4	17.6
Dichlorobromomethane	48	75-27-4	624.1	2.2	6.6
1,1-Dichloroethane	13	75-34-3	624.1	4.7	14.1
1,2-Dichloroethane	10	107-06-2	624.1	2.8	8.4
1,1-Dichloroethylene	29	75-35-4	624.1	2.8	8.4
1,2-Dichloropropane	32	78-87-5	624.1	6.0	18.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) [6]	33	542-75-6	624.1	5.0	15.0
Ethylbenzene	38	100-41-4	624.1	7.2	21.6
Methyl bromide (Bromomethane)	46	74-83-9	624/601	5.0	10.0
Methyl chloride (Chloromethane)	45	74-87-3	624	1.0	2.0
Methylene chloride	44	75-09-2	624.1	2.8	8.4
1,1,2,2-Tetrachloroethane	15	79-34-5	624.1	6.9	20.7
Tetrachloroethylene	85	127-18-4	624.1	4.1	12.3
Toluene	86	108-88-3	624.1	6.0	18.0
1,2-Trans-Dichloroethylene (Ethylene dichloride)	30	156-60-5	624.1	1.6	4.8
1,1,1-Trichloroethane	11	71-55-6	624.1	3.8	11.4
1,1,2-Trichloroethane	14	79-00-5	624.1	5.0	15.0
Trichloroethylene	87	79-01-6	624.1	1.9	5.7
Vinyl chloride	88	75-01-4	624/SM6200B	1.0	2.0

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)					
Acenaphthene	1	83-32-9	625.1	1.9	5.7
Acenaphthylene	77	208-96-8	625.1	3.5	10.5
Anthracene	78	120-12-7	625.1	1.9	5.7
Benzidine	5	92-87-5	625.1	44	132
Benzyl butyl phthalate	67	85-68-7	625.1	2.5	7.5
Benzo(*a*)anthracene	72	56-55-3	625.1	7.8	23.4
Benzo(b)fluoranthene (3,4-benzofluoranthene) [7]	74	205-99-2	610/625.1	4.8	14.4
Benzo(j)fluoranthene [7]		**205-82-3**	625	0.5	1.0
Benzo(k)fluoranthene (11,12-benzofluoranthene) [7]	75	207-08-9	610/625.1	2.5	7.5
Benzo(r,s,t)pentaphene		**189-55-9**	625	1.3	5.0
Benzo(*a*)pyrene	73	50-32-8	610/625.1	2.5	7.5
Benzo(*ghi*)Perylene	79	191-24-2	610/625.1	4.1	12.3
Bis(*2-chloroethoxy)*methane	43	111-91-1	625.1	5.3	15.9
Bis(*2-chloroethyl*)ether	18	111-44-4	611/625.1	5.7	17.1
Bis(*2-chloroisopropyl*)ether	42	39638-32-9	625	0.5	1.0
Bis(*2-ethylhexyl*)phthalate	66	117-81-7	625.1	2.5	7.5
4-Bromophenyl phenyl ether	41	101-55-3	625.1	1.9	5.7
2-Chloronaphthalene	20	91-58-7	625.1	1.9	5.7
4-Chlorophenyl phenyl ether	40	7005-72-3	625.1	4.2	12.6
Chrysene	76	218-01-9	610/625.1	2.5	7.5
Dibenzo (a,h)acridine		**226-36-8**	610M/625M	2.5	10.0
Dibenzo (a,j)acridine		**224-42-0**	610M/625M	2.5	10.0
Dibenzo(a-*h*)anthracene (1,2,5,6-dibenzanthracene)	82	53-70-3	625.1	2.5	7.5
Dibenzo(a,e)pyrene		192-65-4	610M/625M	2.5	10.0
Dibenzo(a,h)pyrene		189-64-0	625M	2.5	10.0
3,3-Dichlorobenzidine	28	91-94-1	605/625.1	16.5	49.5
Diethyl phthalate	70	84-66-2	625.1	1.9	5.7
Dimethyl phthalate	71	131-11-3	625.1	1.6	4.8
Di-n-butyl phthalate	68	84-74-2	625.1	2.5	7.5
2,4-dinitrotoluene	35	121-14-2	609/625.1	5.7	17.1
2,6-dinitrotoluene	36	606-20-2	609/625.1	1.9	5.7
Di-n-octyl phthalate	69	117-84-0	625.1	2.5	7.5

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)					
1,2-Diphenylhydrazine (*as Azobenzene*)	37	122-66-7	1625B	5.0	20
Fluoranthene	39	206-44-0	625.1	2.2	6.6
Fluorene	80	86-73-7	625.1	1.9	5.7
Hexachlorobenzene	9	118-74-1	612/625.1	1.9	5.7
Hexachlorobutadiene	52	87-68-3	625.1	0.9	2.7
Hexachlorocyclopentadiene	53	77-47-4	1625B/625	2.0	4.0
Hexachloroethane	12	67-72-1	625.1	1.6	4.8
Indeno(*1,2,3-cd*)Pyrene	83	193-39-5	610/625.1	3.7	11.1
Isophorone	54	78-59-1	625.1	2.2	6.6
3-Methyl cholanthrene		**56-49-5**	625	2.0	8.0
Naphthalene	55	91-20-3	625.1	1.6	4.8
Nitrobenzene	56	98-95-3	625.1	1.9	5.7
N-Nitrosodimethylamine	61	62-75-9	607/625	2.0	4.0
N-Nitrosodi-n-propylamine	63	621-64-7	607/625	0.5	1.0
N-Nitrosodiphenylamine	62	86-30-6	625	1.0	2.0
Perylene		**198-55-0**	625	1.9	7.6
Phenanthrene	81	85-01-8	625.1	5.4	16.2
Pyrene	84	129-00-0	625.1	1.9	5.7
1,2,4-Trichlorobenzene	8	120-82-1	625.1	1.9	5.7

PRIORITY POLLUTANT	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
DIOXIN					
2,3,7,8-Tetra-Chlorodibenzo-P-Dioxin (2,3,7,8 TCDD)	129	1746-01-6	1613B	1.3 pg/L	5 pg/L

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
PESTICIDES/PCBs					
Aldrin	89	309-00-2	608.3	4.0 ng/L	12 ng/L
alpha-BHC	102	319-84-6	608.3	3.0 ng/L	9.0 ng/L
beta-BHC	103	319-85-7	608.3	6.0 ng/L	18 ng/L

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
PESTICIDES/PCBs					
gamma-BHC (Lindane)	104	58-89-9	608.3	4.0 ng/L	12 ng/L
delta-BHC	105	319-86-8	608.3	9.0 ng/L	27 ng/L
Chlordane [8]	91	57-74-9	608.3	14 ng/L	42 ng/L
4,4'-DDT	92	50-29-3	608.3	12 ng/L	36 ng/L
4,4'-DDE	93	72-55-9	608.3	4.0 ng/L	12 ng/L
4,4' DDD	94	72-54-8	608.3	11ng/L	33 ng/L
Dieldrin	90	60-57-1	608.3	2.0 ng/L	6.0 ng/L
alpha-Endosulfan	95	959-98-8	608.3	14 ng/L	42 ng/L
beta-Endosulfan	96	33213-65-9	608.3	4.0 ng/L	12 ng/L
Endosulfan Sulfate	97	1031-07-8	608.3	66 ng/L	198 ng/L
Endrin	98	72-20-8	608.3	6.0 ng/L	18 ng/L
Endrin Aldehyde	99	7421-93-4	608.3	23 ng/L	70 ng/L
Heptachlor	100	76-44-8	608.3	3.0 ng/L	9.0 ng/L
Heptachlor Epoxide	101	1024-57-3	608.3	83 ng/L	249 ng/L
PCB-1242 [9]	106	53469-21-9	608.3	0.065	0.195
PCB-1254	107	11097-69-1	608.3	0.065	0.195
PCB-1221	108	11104-28-2	608.3	0.065	0.195
PCB-1232	109	11141-16-5	608.3	0.065	0.195
PCB-1248	110	12672-29-6	608.3	0.065	0.195
PCB-1260	111	11096-82-5	608.3	0.065	0.195
PCB-1016 [9]	112	12674-11-2	608.3	0.065	0.195
Toxaphene	113	8001-35-2	608.3	240 ng/L	720 ng/L

1. <u>Detection level (DL)</u> or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.

2. <u>Quantitation Level (QL)</u> also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer (64 FR 30417).
   ALSO GIVEN AS:
   The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency, December 2007).

3. Soluble Biochemical Oxygen Demand method note: First, filter the sample through a Millipore Nylon filter (or equivalent) - pore size of 0.45-0.50 um (prep all filters by filtering 250 ml of laboratory grade deionized water through the filter and discard). Then, analyze sample as per method 5210-B.
4. NWTPH Dx - Northwest Total Petroleum Hydrocarbons Diesel Extended Range – see https://apps.ecology.wa.gov/publications/documents/97602.pdf
5. NWTPH Gx - Northwest Total Petroleum Hydrocarbons Gasoline Extended Range – see https://apps.ecology.wa.gov/publications/documents/97602.pdf
6. 1, 3-dichloroproylene (mixed isomers) You may report this parameter as two separate parameters: cis-1, 3-dichlorpropropene (10061-01-5) and trans-1, 3-dichloropropene (10061-02-6).
7. Total Benzofluoranthenes - Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzofluoranthenes.
8. Chlordane – You may report alpha-chlordane (5103-71-9) and gamma-chlordane (5103-74-2) in place of chlordane (57-74-9). If you report alpha and gamma-chlordane, the DL/PQLs that apply are 14/42 ng/L.
9. PCB 1016 & PCB 1242 – You may report these two PCB compounds as one parameter called PCB 1016/1242.

Appendix B

Sample Annual Report Questionnaire

Condition R3.B requires the Permittee to submit an annual report using a questionnaire form in the Water Quality Permitting Portal – Permit Submittals application. The following table provides an example of the questions that will appear in the form. While Ecology's goal is to maintain consistency between this sample and the questions asked in the Permitting Portal, the permit condition requires the Permittee to answer the questions as they appear on the web form. Ecology may periodically alter the questions in the web form to improve clarity in the way questions are asked.

The questionnaire will require the Permittee to either fill in numbers, upload files for supporting documents, or answer "yes/no" questions. Most "yes/no" questions will trigger a need to supply additional information or files if the Permittee answers "yes".

Where the questionnaire asks the Permittee to upload a file, Ecology prefers a single file upload. The Permittee may, however, upload multiple files for a single question, if needed. The Portal application provides instructions for uploading multiple files.

Question Number	Permit Section	Question	Expected Response
1a	R3.B	How many days did the facility produce reclaimed water during the last year?	enter number
1b	R3.B	How many days did the facility distribute reclaimed water during the last year?	enter number
2a	R3.B	What was the total volume (in millions of gallons) of reclaimed water produced during the last year?	enter number
2b	R3.B	What was the total volume (in millions of gallons) of reclaimed water distributed during the last year?	enter number
3	R3.B	Reclaimed Water Distribution Summary: Using the file upload box below, please attach a file (spreadsheet or written report) that provides a detailed breakdown of reclaimed water distributed to each authorized user. In addition, please use the data fields in questions 3a through 3j below to report the volume of reclaimed water distributed to each use category authorized in your permit (enter volume in millions of gallons).	upload file
3a	*R3.B*	*Indoor Uses*	*enter number*
3b	*R3.B*	*Commercial, Industrial, and Institutional Uses*	*enter number*
3c	*R3.B*	*Irrigation – Class A food crops*	*enter number*
3d	*R3.B*	*Irrigation – Class A other*	*enter number*
3e	*R3.B*	*Irrigation – Class B process food crops, nonfood crops, and orchard frost protection*	*enter number*
3f	*R3.B*	*Irrigation – Class B other*	*enter number*
3g	*R3.B*	*Wetland Enhancement (all classes)*	*enter number*
3h	*R3.B*	*Surface Water Augmentation*	*enter number*
3i	*R3.B*	*Groundwater Recharge (direct and indirect)*	*enter number*
3j	*R3.B*	*Aquifer Storage and Recovery*	*enter number*

Question Number	Permit Section	Question	Expected Response
Questions 3a-3j will include an option to check "N/A" for any use that category that is not applicable to the permit.			
4	R4.B.a	Were any new user or distributors added to the system during the last year?	Yes or No
4a	*R4.B.a*	*Attach a list identifying the new users, the type of uses, and the use locations along with the date of Ecology's approval of the use agreement.*	*upload file*
5	R4.B.d	Were any actions taken during the last year to enforce requirements of a use or distribution agreement?	Yes or No
5a	*R4.B.d*	*Attach a file identifying the user or distributor involved, the nature of the violation, and the remedial actions taken.*	*upload file*
6	R3.B	Were there any reclaimed water limit violations reported on monthly DMRs during the last year (includes all limits associated with reclaimed water production as well as distribution system chlorine residual limits, if applicable)?	Yes or No
6a	*R3.B*	*How many violations were reported?*	*enter number*
7	R6.B.a	Did the facility diverted off-spec reclaimed water for disposal or retreatment during the last year?	Yes or No
7a	*R6.B.a*	*What volume of water was diverted (in millions of gallons)?*	*enter number*
7b	*R6.B.a*	*Please attach a file that describes the circumstances that required diversion and the steps taken to remedy.*	*upload file*
8	R4.B.b.7	Was any reclaimed water diverted from authorized use locations due to distribution system maintenance or repair?	Yes or No
8a	*R4.B.b.7*	*What volume of water was diverted (in millions of gallons)?*	*enter number*
8b	*R4.B.b.7*	*Please attach a file that describes the circumstances that required diversion and the steps taken to remedy.*	*upload file*
9	R3.G.a.3	Were any backflow incidents discovered and reported during the last year?	Yes or No
9a	*R3.G.a.3*	*How many incidents were reported?*	*enter number*
9b	*R3.G.a.3*	*Attach a document that summarizes the reported incidents and remedial actions taken.*	*upload file*
10	*R4.C*	Cross-Connection Control Summary: Does your permit include a requirement to submit an annual Cross-Connection Control Summary Report?	Yes or No
10a	*R4.C*	*Select the type of summary your permit requires:*	*Select report type from menu*
10b	*R4.C*	*If 'other' selected please describe the type of summary:*	*enter text to describe report type, if "other" selected in question 10a*
10c	*R4.C*	*Attach a document or documents that provide the required summary report*	*upload file*
Questions 4a, 5a, 6a, 7a, 7b, 8a, 8b, 9a, 9b, 10a, 10b, and 10c are conditional questions that will only appear if the Permittee answers "Yes" in questions 4, 5, 6, 7, 8, 9 or 10, respectively.			

Appendix B

SEPA Checklist/DNS and SERP/Affirmed Determination

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COMMUNITY DEVELOPMENT DEPARTMENT

38624 SE River Street
PO Box 987
Snoqualmie, WA 98065

Office: 425-888-5337
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www.snoqualmiewa.gov

DETERMINATION OF NONSIGNIFICANCE (DNS)

Project Name: Snoqualmie General Sewer Plan Update

Issuance Date: March 23, 2022

Publication Date: March 28, 2022

Proponent: City of Snoqualmie, Parks and Public Works Department
P.O. Box 987
Snoqualmie, WA 98065

Description of Proposal: The City of Snoqualmie's General Sewer Plan (GSP) proposes various improvements that are necessary to resolve existing system deficiencies and plan for the project growth of the sewer system. The GSP details the service area and existing facilities; and construction, operation, and maintenance requirements for the sewer system in accordance with WAC 173-240-050.

Lead Agency: City of Snoqualmie

Threshold Determination: After a review of the environmental checklist, the City of Snoqualmie (lead agency for this proposal) has determined that the Snoqualmie General Sewer Plan Update will not have any probable significant adverse impacts on the environment. An environmental impact statement is therefore not required under RCW 43.21C.030(2)(c).

Responsible Official: Jason Rogers, Interim Community Development Director, 38624 SE River Street, P.O. Box 987, Snoqualmie, WA 98065, 425-888-5337 or jrogers@snoqualmiewa.gov.

This decision was made after a review of a completed environmental checklist and other information on file with the City. This information is available to the public upon request. This DNS is issued under WAC 197-11-340; the lead agency will not act on this proposal for 14 days from the date of publication, allowing time for public comment.

Comments on the Threshold Determination: If you would like to comment on this Threshold Determination, written comments should be sent to P.O. Box 987, Snoqualmie WA, 98065, Attn: Jason Rogers, or jrogers@snoqualmiewa.gov, by April 11, 2022, at 5:00 PM. The City will not take final action on this proposal until after the end of the comment period. The issuance of this DNS should not be interpreted as acceptance or approval of this proposal as presented. The City of Snoqualmie (City) reserves the right to deny or approve said proposal subject to conditions if it is determined to be in the best interest of the City and/or necessary for the general health, safety, and welfare of the public. This DNS may be appealed, pursuant to WAC 197-11-680.

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SEPA ENVIRONMENTAL CHECKLIST

A. Background

1. Name of proposed project, if applicable: City of Snoqualmie General Sewer Plan (GSP)

2. Name of applicant: City of Snoqualmie (City)

3. Address and phone number of applicant and contact person:

   Jeff Hamlin, Project Engineer
   38624 SE River Street
   Snoqualmie, WA 98065
   (425) 831-4919

4. Date checklist prepared: November 5, 2021

5. Agency requesting checklist: City of Snoqualmie

6. Proposed timing or schedule (including phasing, if applicable):

   Projects associated with the City's Capital Improvement Plan (CIP) presented in the GSP could occur between 2021 and 2040 or in later years. No specific projects are proposed at this time.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

   Future sewer improvements will be based on the capital improvement projects described in the GSP. These are detailed in Chapter 11 of the GSP.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

   Environmental checklists and required related studies will be prepared for individual construction projects listed in the GSP.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

   None at this time.

10. List any government approvals or permits that will be needed for your proposal, if known.

    Washington State Department of Ecology. No project-specific approvals or permits are required as part of the GSP update.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The City's GSP proposes various improvements that are necessary to resolve existing system deficiencies and plan for the projected growth of the sewer system. The GSP details the service area, existing facilities, and construction, operation, and maintenance requirements for the sewer system in accordance with WAC 173-240-050.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The City is located in King County, adjacent to the Snoqualmie River, approximately 20 miles east of the Seattle metro area. The City's urban growth area covers an area of approximately 8.8 square miles, including the current City limits and some areas of unincorporated King County. The City's sewer collection system extends from Snoqualmie Elementary School in the east to the western City limits in the Snoqualmie Ridge area. A small portion of the collection system extends south of Interstate 90 in the Snoqualmie Point area.

B. Environmental Elements

1. Earth

a. General description of the site:

(circle one): Flat, rolling, hilly, steep slopes, mountainous, other ____________

Refer to Chapter 2 of the GSP. Checklists for individual projects will address this on a site-specific basis.

b. What is the steepest slope on the site (approximate percent slope)?

Refer to Chapter 2 of the GSP. Checklists for individual projects will address this on a site-specific basis.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Based on a review of National Resources Conservation Service web soil survey for the City's sewer service are, the primary soil types (i.e. soil types accounting for more than 1 percent of the service area) include Arents, Barneston gravelly ashy coarse sandy loam, Edgewick silt loam, Nooksack silt loam, Pilchuck loamy fine sand, Puget silty clay loam, Ragnar-Lynnwood complex, Salal silt loam, Seattle muck, Si silt loam, Tokul gravelly medial loam, and Tokul-Pastik complex.

Checklists for individual projects will address this on a site-specific basis.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

Checklists for individual projects will address this on a site-specific basis.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

Checklists for individual projects will address this on a site-specific basis.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Checklists for individual projects will address this on a site-specific basis.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Checklists for individual projects will address this on a site-specific basis.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Temporary erosion and sedimentation control (TESC) plans and Best Management Practices (BMPs) will be included on a site-specific basis and implemented per the City's *Addendum to the 2016 King County Surface Water Design Manual.*

2. Air

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

Temporary exhaust and dust emissions from construction equipment and vehicles are anticipated during construction of the proposed projects. Checklists for individual projects will address this on a site-specific basis.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None known. Checklists for individual projects will address this on a site-specific basis.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Construction equipment and vehicles used for the proposed projects shall conform with Washington State standards for air quality, including using properly functioning equipment and vehicles that have passed emissions testing, using clean-burning fuels when possible, limiting diesel exhaust, limiting vehicle idling, etc. Checklists for individual projects will address this on a site-specific basis.

3. Water

a. Surface Water:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

The Snoqualmie River is the largest surface water body in the City limits. The Snoqualmie Falls, Lake Borst, and Meadowbrook Slough also exist inside the City limits, along with numerous smaller ponds and creeks. Refer to Figure 2-2 of the GSP for additional information. Checklists for individual projects will address this on a site-specific basis.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Refer to Figure 2-2 of the GSP. Checklists for individual projects will address this on a site-specific basis.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Checklists for individual projects will address this on a site-specific basis.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

Checklists for individual projects will address this on a site-specific basis.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

A significant portion of the City, including the downtown area and eastern portion of the City limits, is located within the 100-year floodplain. Portions of specific GSP projects may be located within the 100-year floodplain. Checklists for individual projects will address this on a site-specific basis.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

Checklists for individual projects will address this on a site-specific basis.

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

No.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

The City currently has 34 properties with septic systems and drainfields. The City will be able to accommodate connecting these properties to the sewer system during the 20-year planning period if the identified improvements are implemented. No additional waste material discharges into the ground are identified at this time. Checklists for individual projects will address this on a site-specific basis.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

BMPs will be utilized during construction to minimize impacts from stormwater runoff. The completed projects will restore ground surface to pre-construction elevations, and the existing runoff patterns of the project areas are not anticipated to change. Checklists for individual projects will address this on a site-specific basis.

2) Could waste materials enter ground or surface waters? If so, generally describe.

Checklists for individual projects will address this on a site-specific basis.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

Checklists for individual projects will address this on a site-specific basis.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

Checklists for individual projects will address this on a site-specific basis.

4. Plants

a. Check the types of vegetation found on the site:

_X_ deciduous tree: alder, maple, aspen, other
_X_ evergreen tree: fir, cedar, pine, other
_X_ shrubs
_X_ grass
____pasture
____crop or grain
____Orchards, vineyards or other permanent crops.
_X_ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
____water plants: water lily, eelgrass, milfoil, other
_X__other types of vegetation

Checklists for individual projects will address this on a site-specific basis.

b. What kind and amount of vegetation will be removed or altered?

Checklists for individual projects will address this on a site-specific basis.

c. List threatened and endangered species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Checklists for individual projects will address this on a site-specific basis.

e. List all noxious weeds and invasive species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis.

5. Animals

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

Examples include:

birds: hawk, heron, eagle, songbirds, other:

mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other ________

Checklists for individual projects will address this on a site-specific basis.

b. List any threatened and endangered species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis.

c. Is the site part of a migration route? If so, explain.

The project area is within the Pacific Flyway migration route; therefore, it may provide habitat for migratory bird species. Checklists for individual projects will address this on a site-specific basis.

d. Proposed measures to preserve or enhance wildlife, if any:

Checklists for individual projects will address this on a site-specific basis.

e. List any invasive animal species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis.

6. Energy and Natural Resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Gasoline, oil, and electricity may be used to power project equipment and/or facilities. Checklists for individual projects will address this on a site-specific basis.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

Not applicable.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Checklists for individual projects will address this on a site-specific basis.

7. Environmental Health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

Checklists for individual projects will address this on a site-specific basis.

1) Describe any known or possible contamination at the site from present or past uses.

Checklists for individual projects will address this on a site-specific basis.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

Checklists for individual projects will address this on a site-specific basis.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

Checklists for individual projects will address this on a site-specific basis.

4) Describe special emergency services that might be required.

None anticipated. Checklists for individual projects will address this on a site-specific basis.

5) Proposed measures to reduce or control environmental health hazards, if any:

Checklists for individual projects will address this on a site-specific basis.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Traffic is present in the City's sewer service area, but is not expected to have an effect.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Temporary construction noise will occur with the projects, including noise generated by construction vehicles, excavation, and sawcutting associated with open-cutting roads. The contractor will need to follow regulations set forth in King County Code (KCC) 12.86.520, including controlling the level and timing of noise generated during construction. Checklists for individual projects will address this on a site-specific basis.

3) Proposed measures to reduce or control noise impacts, if any:

Construction activities and proposed site improvements shall comply with the noise regulations of KCC. Checklists for individual projects will address this on a site-specific basis.

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

Sewer main lines are located within King County rights-of-way and repairs will not affect current land uses. Checklists for individual projects will address this on a site-specific basis.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

Checklists for individual projects will address this on a site-specific basis.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

Checklists for individual projects will address this on a site-specific basis.

c. Describe any structures on the site.

Checklists for individual projects will address this on a site-specific basis.

d. Will any structures be demolished? If so, what?

Checklists for individual projects will address this on a site-specific basis.

e. What is the current zoning classification of the site?

Refer to Chapter 3 and Figure 3-1 of the GSP. The City's GSP covers the City's sewer service area and involves all zoning within City code, along with King County Agriculture, Open Space, Rural Area 1, and Rural City Urban Growth Area land uses.

f. What is the current comprehensive plan designation of the site?

Varies, including commercial, residential, institutional, utility park, golf course, and others. Checklists for individual projects will address this on a site-specific basis.

g. If applicable, what is the current shoreline master program designation of the site?

The service area include properties within the shoreline jurisdiction. Designations include Hydropower, Natural Environment, Urban Conservancy, Urban Floodplain, Urban Riverfront, and Urban Riverfront Conservancy.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

Some projects identified in the GSP may be in critical areas. Checklists for individual projects will address this on a site-specific basis.

i. Approximately how many people would reside or work in the completed project?

Not applicable.

j. Approximately how many people would the completed project displace?

Not applicable.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Not applicable.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Refer to Chapter 3 of the GSP. Checklists for individual projects will address this on a site-specific basis.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

Checklists for individual projects will address this on a site-specific basis.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

Not applicable.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

Not applicable.

c. Proposed measures to reduce or control housing impacts, if any:

Not applicable.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Checklists for individual projects will address this on a site-specific basis.

b. What views in the immediate vicinity would be altered or obstructed?

Checklists for individual projects will address this on a site-specific basis.

b. Proposed measures to reduce or control aesthetic impacts, if any:

Checklists for individual projects will address this on a site-specific basis.

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Checklists for individual projects will address this on a site-specific basis.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Checklists for individual projects will address this on a site-specific basis.

c. What existing off-site sources of light or glare may affect your proposal?

Checklists for individual projects will address this on a site-specific basis.

d. Proposed measures to reduce or control light and glare impacts, if any:

Checklists for individual projects will address this on a site-specific basis.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

The City offers numerous designated and informal recreational opportunities, including parks. Checklists for individual projects will address this on a site-specific basis.

b. Would the proposed project displace any existing recreational uses? If so, describe.

Checklists for individual projects will address this on a site-specific basis.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Checklists for individual projects will address this on a site-specific basis.

13. Historic and Cultural Preservation

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe.

The City's sewer service area contains 9 historic buildings, structures, or sites as shown on Washington State Department of Archaeology and Historic Preservation WISAARD mapping data. Checklists for individual projects will address this on a site-specific basis.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

Checklists for individual projects will address this on a site-specific basis.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

Review of the Washington Information System for Architectural and Archaeology Records Data (WISAARD) in the vicinity of the proposed improvements. Checklists for individual projects will address this on a site-specific basis.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

The City shall utilize standard Inadvertent Discovery Plan language to guide the contractor if any artifacts or remains are inadvertently uncovered. Checklists for individual projects will address this on a site-specific basis.

14. Transportation

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

Refer to Figure 2-2 of the GSP. The City's transportation system consists of major transportation corridors, arterials, City streets, and local access roads. The City's sewer system is planned and constructed, for the most part, to utilize public street rights-of-way. Checklists for individual projects will address this on a site-specific basis.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

Yes. Transit service is available throughout the service area.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

Not applicable.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

Checklists for individual projects will address this on a site-specific basis.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

Not applicable.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

Not applicable.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

Checklists for individual projects will address this on a site-specific basis.

h. Proposed measures to reduce or control transportation impacts, if any:

Checklists for individual projects will address this on a site-specific basis.

15. Public Services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

Not applicable.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Not applicable.

16. Utilities

a. Circle utilities currently available at the site:

electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other ____________

Checklists for individual projects will address this on a site-specific basis.

c. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Checklists for individual projects will address this on a site-specific basis.

C. Signature

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: [signature]
Name of signee JEFF HAMLIN
Position and Agency/Organization UTILITIES OPERATIONS MGR
Date Submitted: 1/25/22

D. Supplemental sheet for nonproject actions

(**IT IS NOT NECESSARY** to use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Discharge to Water

During the construction of the proposed sewer main and facility CIP projects, discharge of turbid water could occur. After the projects are constructed and in use, development in the City's sewer service area may be expanded into the new areas served by the City's sewer system. Without these utility improvements, development projects would be unable to occur at the housing density the City anticipates will be necessary to accommodate growth. More development and higher population will produce more wastewater to be treated and discharged. Increased impervious surfaces will increase discharge of stormwater to local water bodies, which also may contribute to higher flood risks.

Emissions to Air

Temporary construction emissions expected include exhaust from machinery and vehicles, and dust. Personal vehicles belonging to the new homes built as a result of the improved and expanded sewer system and various heating methods (wood and pellet burning stoves) would contribute exhaust and greenhouse gas emissions to the air.

Production, Storage, and Release of Toxic or Hazardous Substances

The projects will not increase production, storage, or release of toxic or hazardous substances.

Production of Noise

Temporary construction noise would be limited to daytime, work-day hours. Subsequent development of residential and commercial structures will also result in temporary construction noise. The production of noise created in new residential and commercial areas should be equal to current ambient noise levels within the City limits.

Potential concerns will be addressed in SEPA review for specific projects contained in the GSP.

Proposed measures to avoid or reduce such increases are:

Discharges to Water

The discharge of water supply as wastewater effluent flows to the Snoqualmie River are addressed in the City's National Pollutant Discharge Elimination System operating permit. The Washington State Department of Ecology (Ecology) monitors compliance with permit conditions intended to avoid or mitigate impacts from these discharges.

Reducing Discharges to Water

- TESC plans for each construction project will minimize and protect water bodies from turbid water discharge and runoff.
- Construction work will comply with near-water work windows to avoid disturbing sensitive and protected fish and wildlife.

Reducing Emissions to Air

- Construction machinery and vehicle emissions shall be kept to a minimum by turning off equipment instead of idling during periods when equipment is not in use.
- Appropriate dust control measures (sweeping, watering) will be implemented as part of each project's TESC plan to keep construction generated dust to a minimum.
- Green technologies and equipment should be utilized within construction of the proposed projects when plausible.

Reducing the Projection of Noise

- Limit construction work to daytime, work-day hours, Monday through Friday.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Once completed, the sewer main projects will be fully buried within roadway rights-of-way. Staging of excavation and fill materials and equipment on land would affect any plants in the immediate area.

The facility projects could have some localized effects on plants, animals, and fish. These projects could require clearing of existing vegetation, which could in turn affect wildlife that utilizes that vegetation for food or shelter. Clearing and grading for facilities may result in discharge of turbid water to streams, which could disrupt migration or rearing of salmonids.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

- TESC plans for each construction project will create means to protect water bodies from turbid water discharge and runoff.
- Working during the summer month work-window presents less of a risk for turbid discharge since rain events are less frequent and severe.
- Staging materials and equipment should be located on impervious surfaces or in previously cleared or impacted areas if possible.

- There should be no further clearing of vegetation beyond what is needed for the construction of the projects.

3. How would the proposal be likely to deplete energy or natural resources?

Petroleum resources will be used for the construction of the proposed projects (fuel for construction machinery and vehicles) and subsequent construction of residential and commercial structures. Housing and other structures will require heating (natural gas and wood/pellet burning stoves) and electricity.

Proposed measures to protect or conserve energy and natural resources are:

Specific measures will be identified and included in SEPA review for specific projects contained in the GSP.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

The proposal should have no direct effect on parks, wilderness, wild and scenic rivers, floodplains, or prime farmlands. The project could directly affect sensitive areas such as federally-listed threatened species habitat, cultural sites, and wetlands. As discussed previously, construction of these projects could potentially discharge turbid water to water bodies (including riparian wetland areas).

The proposal could have indirect effects (via expanded clearing, grading, and building in the service area) on federally-listed threatened species habitat, cultural sites, wetlands, and floodplains. Discharge of turbid water to adjacent water bodies could affect rearing and migrating bull trout and salmonids, critical habitat, and riparian wetlands associated with these water bodies. Excavation of structure foundations could uncover cultural sites. Impervious surfaces (buildings, parking lots, roads) result in increased stormwater runoff, which could contribute to flooding issues.

Proposed measures to protect such resources or to avoid or reduce impacts are:

- TESC plans for each construction project will create means to protect water bodies from turbid water discharge and runoff.
- Working during the summer month work-window presents less of a risk for turbid discharge since rain events are less frequent and severe.
- Construction work will comply with near-water and migratory bird work windows to avoid disturbing federally-listed salmonids and wildlife.
- Staging materials and equipment should be located on impervious surfaces or in previously cleared or impacted areas if possible.

- There should be no further clearing of vegetation beyond what is needed for the construction of the projects.
- If cultural artifacts or historic resources are uncovered during construction, project work should be suspended immediately. Appropriate authorities at King County and state levels should be notified and appropriate measures taken to protect these resources.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

The proposed projects in the GSP would allow for an expansion of residential and commercial uses within the City's Urban Growth Area. The Urban Growth Area was defined specifically to accommodate population growth in the City.

Proposed measures to avoid or reduce shoreline and land use impacts are:

Minimize clearing and grading of vegetation to that directly needed to accomplish the proposed project. Ensure projects are consistent with City planning objectives and ordinances.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

The direct transportation effects of the proposed projects associated with the GSP could be temporary loss of sidewalks, on-street parking, lane closures, or detours near sewer main installation within road right-of-way. Bus stops may be temporarily affected by work in the right-of-way. Sewer service and other utility services should not be affected during construction.

Indirect effects of the proposed projects on transportation would be increased road usage and the need to build new roads for new developments and potentially expand and make more frequent repairs to existing roads. Higher population may result in increased ridership of community transit and expanded service route frequency and stops. The expansion and improvement of the water system will result in the ability to supply more water to support new residential and commercial developments.

Proposed measures to reduce or respond to such demand(s) are:

- Construction would take place in a timely manner to minimize obstructions and alterations of local traffic flow.
- City-approved traffic control will be provided during construction if needed.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

The proposed projects may conflict with environmental protection laws; however, all projects proposed will be required to obtain applicable local, state, and federal permits, which are intended to encourage avoidance, minimization, and mitigation for adverse environmental impacts. A preliminary list of potential permits needed for proposed sewer main and facility projects are listed as follows.

City of Snoqualmie

- Building, Right-of-Way, and Site Development Permits.
- Floodplain Development Permit.
- Critical Areas Compliance.
- Shoreline Conditional Use or Variance Permit (for structures within 200 feet landward of a water body).

State

- Ecology General Order of Approval for Diesel or Gas Emergency Electrical Generators (for backup generators during power outages).
- Section 401 Water Quality Certification through Ecology (needed if Section 404 is required).

Federal

- Federal permits for work within wetlands or waters of the state (i.e. Section 404 or Section 10 approval through the US Army Corps of Engineers), including associated Endangered Species Act, Coastal Zone Management, and National Historic Preservation Act compliance.

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Appendix C

City Sanitary Sewer Standards

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CHAPTER 5

5.000 SANITARY SEWERS

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CHAPTER 5

5.000 SANITARY SEWERS

5.010 Specifications

These Technical Specifications shall be used for all sanitary sewer construction in the Snoqualmie Ridge II Development.

The current "English unit" edition of the Standard Specifications for Road, Bridge, and Municipal Construction, prepared by the Washington State Department of Transportation and the American Public Works Associations, Washington State Chapter, herein referred to as the Standard Specifications, shall be used to supplement these Standards. The general requirements of the Standard Specifications shall apply unless they are inconsistent with any of the provisions of these Standards. Should inconsistencies occur, these Standards shall have precedence.

References to sections in the Standard Specifications are based on the latest published edition of the Standard Specifications. If section references in future editions of the Standard Specifications are changed, these Standards will be deemed to be revised accordingly without re-issuance.

5.020 General

Design details, workmanship and materials shall be in accordance with Washington State Department of Ecology requirements, the City of Snoqualmie Comprehensive Sewer System Plan, the SR II Wastewater Collection Facilities Project Report and the Standard Specifications.

Standard Plans need not be repeated on the plans unless required for plan clarification for the contractor, if being modified to suit a specific design, or as required by the City. However, standard plans shall be clearly referenced on the drawings.

The installation of all sanitary sewer facilities shall be done per plans which have been approved by the City Engineer. Plans shall be prepared in accordance with Chapter 1.

5.030 Easements

All sewer mains not in the public right-of-way shall be in easements granted to the City of Snoqualmie.

In general, all easements for sanitary sewers shall be a minimum of 15 feet wide or twice the average depth of the pipe, whichever is greater. In special circumstances the easement width may be reduced to 10 feet or increased depending on pipe size and depth with the approval of the City Engineer.

No permanent structures are allowed to be constructed in the easement area. No additional building setback line from the edges of easements is required. Access to easements for maintenance and/or repair of the utility by the City shall not be restricted or prohibited by fences, rockeries, plantings and other improvements.

In general, all easements shall be located within single lots rather than being split by a lot line. In special circumstances, easements may be located on two adjacent lots with the approval of the Engineer.

Vehicular access shall be provided to every manhole. The configuration and construction of the vehicular access shall be as approved by the City Engineer.

5.040 System Design

Sanitary sewer pipe shall be ductile iron class 50 for trenches 25' – 30' deep and class 52 for trenches greater than 30' deep.

NOTES – System Design

1. **Vertical Separation (Perpendicular)**
   Sewer lines crossing potable water lines shall be laid below the water lines to provide a separation of at least 18" between the invert of the water pipe and the crown of the sewer, whenever possible.

   Unusual Conditions (Perpendicular)
   When local conditions prevent a vertical separation as described above, the following construction shall be used:

   a. Gravity sewers passing over or under water lines shall be:

      1. The one segment of the maximum standard length of pipe (but not less than 18 feet long) shall be used with the pipes centered to maximize joint separation.
      2. Standard Gravity sewer material encased in concrete or in a ¼" thick continuous steel casing with all voids pressure-grouted with sand-cement grout.
      3. The length of sewer pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water line. The sewer pipe shall be the longest standard length available from the manufacturer.

   b. Potable water lines passing under gravity sewers in addition, shall be protected by providing:

      1. A vertical separation of at least 18 inches between the invert of the sewer and the crown of the water line;

2. Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking of the water lines; and
3. The length of sewer pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water line. The sewer pipe shall be the longest standard length available from the manufacturer.

c. Pressure sewers shall only be constructed under potable water lines in a steel casing for a distance of at least ten (10) feet on each side of the crossing.

2. Sanitary sewer force mains to be HDPE SDR 17 continuously welded pipe with a minimum pressure rating of 100 PSI. Sanitary sewer force mains to have minimum 3 feet cover to finished grade, except where shown on plans or profiles.

Force mains shall be installed with tracer wire. Tracer wire shall be 12 gauge solid copper core and green colored insulation. Ends of tracer wire shall be extended a minimum of 12" into value boxes and into the end manholes under the frame and left coiled just under the lid. Tracer wire is to be continuous without splices unless the length of installation is longer than the standards tracer wire coil in which case splice shall be made using an underground splicing kit for electrical applications.

3. The minimum sewer main size shall be 8 inches diameter. Larger size mains are required in specific areas as outlined in the *Comprehensive Sewer System Plan* and as modified by the *Sewer System Master Plan.*

In residential areas, the minimum slope of 8-inch mains shall be as follows:

a. 1% slope for the first run between manholes and a dead end line.

b. 0.75% slope when the number of lots upstream of the run totals 60 or less and the line is not covered under condition "a" above.

c. 0.50% slope when the total number of lots upstream of the run is 60 or more.

In the non-residential areas, sanitary sewer grades shall be determined based on DOE standards. In no case shall the design grade be less than 0.50% for an 8-inch pipe.

Maximum spacing of manholes shall be 400 feet.

Manholes will be required at any change in pipe slope, alignment, or size. Manholes are not allowed in a fill section unless base is on a structural fill.

A manhole is required at the ends of all sewer mains. The City Engineer may approve a cleanout in lieu of a manhole where the end pipe run serves 4 or less lots. The maximum allowable distance between a manhole and a cleanout is 200 feet.

All requests for inspections and for witnessing of tests shall be scheduled with the City 24 hours in advance. Failure to give adequate advance notice may result in delay to the contractor.

The following notes shall be included on each plan set:

1. All workmanship and materials shall be in accordance with the latest "English" unit edition of the Standard Specifications for Road, Bridge and Municipal Construction (WSDOT/APWA). The Standard Specifications, except as they may be modified or superseded by these plans, shall govern all phases of work.
2. Before any construction or development activity, a preconstruction meting must be held between the contractor, the City's Inspector and other appropriate parties.

3. The City Engineer must be notified at least 24 hours prior to commencing construction. No part of the sanitary sewer system shall be put into use until the City has completed its normal inspections and has concluded that the work is acceptable. The City may waive this requirement on a case by case basis if continued evidence of sound construction practice by the contractor so warrants. In any event, installations which do not meet the requirements of these standards shall be removed and replaced at the contractor's sole expense.

4. Approximate locations of existing utilities have been obtained from available records and are shown for convenience. The contractor shall be responsible for verification of locations and to avoid damage to any additional utilities not shown. If conflicts with existing utilities arise during construction, the contractor shall notify the public works inspector and any changes required shall be approved by the City Engineer prior to commencement of related construction on the project.

5. All sewer main extensions within the public right-of-way or in easements must be staked by survey for line and grade prior to starting construction. Surveys shall be performed by a surveyor licensed by the State of Washington.
6. All sewer pipe shall be bedded. Bedding material shall conform to "Bedding Material for Rigid Pipe" as specified in Section 9-03.15 of the Standard Specifications or pea gravel. Bedding shall be placed to a minimum depth of 6-inches under the barrel of the pipe and up to the following levels:

- PVC Sewer Pipe and HDPE pipe – one (1) foot above the crown of the pipe

- Ductile Iron Sewer Pipe – springline of the pipe

As an option the contractor may use controlled density fill.

Bedding shall be placed in more than one lift. The first lift, to provide at least 6 inches thickness under the barrel of the pipe, shall be placed before the pipe is installed and shall be spread smoothly so that the pipe is uniformly supported along the barrel. Subsequent lifts of not more than 6 inches thickness shall be installed and individually compacted to 90% density as determined by ASTM: D-1557.

7. Trench backfill shall be excavated native material or Bank Run Gravel for Trench Backfill conforming to Section 9-03.19 of the Standard Specifications, depending on the suitability of the native material to compaction. Suitable native material shall be free from mud, muck, organic matter, broken pavement, rocks greater than 6-inch dimension, and other deleterious material, and must be capable of compaction to the required density at the time of placement. If the native material cannot be readily compacted to the specified density, only Bank Run Gravel shall be utilized and any insufficiently compacted native material shall be removed and replaced with Bank Run Gravel. The native material shall only be used and remain in place if in situ compaction testing provides sufficient evidence that the specified compaction is uniformly attained.

   Backfill directly over the pipe to a depth of two (2) feet above the pipe shall be hand tamped only. Above this level, backfill shall be placed in lifts not to exceed 12 inches in loose depth, and each lift shall be mechanically compacted to the following densities.

   - Above two (2) feet above the crown of the pipe in unimproved areas – 90 percent of maximum density.

   - Above two (2) feet above the crown of the pipe in areas to be paved (roadway and/or sidewalk) – 95 percent of maximum density.

   - Maximum density to be determined by ASTM: D-1557.

8. The maximum tolerance from true line and grade shall be as follows:

a. Maximum deviation from established line and grade shall not be greater than 1/32 inch per inch of pipe diameter and not to exceed 1/2 inch per pipe length.

b. No adverse grade or ponding in any pipe length will be permitted.

c. The difference in deviation from established line and grade between two successive joints shall not exceed 1/3 of the amounts specified above.

9. Open-cut transverse crossings of roadways after final paving are not to be permitted unless it can be shown that alternatives such as jacking, auguring or tunneling are not feasible or unless the utility can be installed just prior to reconstruction or an overlay of the road. Should an open cut be approved, all transverse trenches shall be backfilled with controlled density fill. Transverse crossings in roadway under construction with ATB applied may be backfilled with crushed rock.

10. Call underground locate line 1-800-424-5555 a minimum 48 hours prior to any excavations.

11. A copy of these approved plans must be on the job site whenever construction is in progress.

12. Sanitary sewer stub-outs on each lot shall be located by a white 2x4 stake marked "Sewer" in black letters. The stake shall extend above surface level, be visible, and located at the end of the stub-out. The stub-out shall not be connected to the stake in any manner.

13. 6" sanitary pipe for sewer mains shall be PVC SDR 35.

14. Sanitary sewer force main shall be either HDPE pipe or D.I. as approved on plans by the City Engineer.

15. All sanitary sewer systems shall be video inspected 30 days after installation to allow time for settlement. Video tape and report shall be submitted to the City for review.

5.050 Utility Removal

Where it is feasible and practical, as determined by the City Engineer, all abandoned pipes and appurtenances shall be removed. If it is decided by the City Engineer that the pipes can be abandoned in-place, then ends of abandoned pipes shall be plugged for a distance of 2 pipe diameters with commercial concrete.

5.050 Trench Excavation and Backfill

The maximum permissible trench width between the foundation level and to 12 inches above the pipe shall be 40 inches for pipe 15 inches or smaller inside diameter or 1 1/2 times the inside diameter plus 18 inches for pipe 18 inches or larger. If the maximum trench width is exceeded without written authorization of the City Engineer, the contractor will be required to provide pipe of higher strength classification or to provide a higher class of bedding, as required by the City Engineer.

Trench backfill shall be excavated native material or Bank Run Gravel for Trench Backfill conforming to Section 9-03.19 of the Standard Specifications, depending on the suitability of the native material to compaction. Suitable native material shall be free from mud, muck, organic matter, broken pavement, rocks greater than 6-inch dimension, and other deleterious material, and must be capable of compaction to the required density at the time of placement. If the native material cannot be readily compacted to the specified density, only Bank Run Gravel shall be utilized and any insufficiently compacted native material shall be removed and replaced with Bank Run Gravel. The native material shall only be used and remain in place if in situ compaction testing provides sufficient evidence that the specified compaction is uniformly attained.

Backfill directly over the pipe to a depth of two (2) feet above the pipe shall be hand tamped only. Above this level, backfill shall be placed in lifts not to exceed 12 inches in loose depth, and each lift shall be mechanically compacted to the following densities:

- Above one foot above the crown of the pipe in unimproved areas – 90 percent of maximum density.

- Above two (2) feet above the crown of the pipe in areas to be paved (roadway and/or sidewalk) – 95 percent of maximum density.

Compaction of trench backfill material shall be accomplished with mechanical tampers, vibratory compactors, or other equipment suitable to the characteristics of the soils. Water settling shall not be employed. The use of compaction equipment directly over the pipe shall be controlled and limited in accordance with installation instructions and recommendations provided by the manufacturer of the pipe.

In-place density testing of compacted backfill material shall be in accordance with ASTM: D-1556 (sand cone device) or ASTM: D-2922 (nuclear density gauge). Laboratory maximum density testing of fill material shall be performed in accordance with ASTM: D-1557.

A minimum of two compaction tests are required for each 200 linear feet of trench (one at subgrade and one at 50% of trench depth). Trenches failing the required test shall have the backfill removed, replaced, and re-compacted. Compaction testing shall be done only by an approved testing laboratory at the contractor's/developer's expense. All test results and analysis shall be promptly given to the City Engineer. The City reserves the right to contract with an independent testing laboratory for testing of trench backfill. This testing shall be done at the contractor's/developer's expense.

When, after excavating for pipes to the foundation level, the material remaining in the trench is unsuitable, as determined by the City Engineer, excavation shall be continued to such additional depth as may be required by the City Engineer. Unsuitable foundation material shall be replaced with foundation gravel conforming to Section 9-03.17 of the Standard Specifications.

The developer/contractor shall furnish, install, and operate all necessary equipment to keep excavations above the foundation level free from water during construction, and shall dewater and dispose of the water so as not to cause injury to public or private property or nuisance to the public. Sufficient pumping equipment in good working condition shall be available at all times for all emergencies, including power outage, and shall have available at all times competent workmen for the operation of the pumping equipment.

5.060 Trenching Transverse to Existing Roadway

Sewer trenching that crosses transversely to existing roadway paving will generally not be permitted unless it can be shown that alternatives such as jacking, auguring or tunneling are not feasible or unless the pipe can be installed just prior to reconstruction or an overlay of the road. Should an open cut be approved, the trench shall be backfilled with controlled density fill (CDF). Transverse crossings in roadway under construction with ATB applied may be backfilled with crushed rock.

5.070 Jacking, Auguring, or Tunneling

Tunneling may be ordered by the City Engineer under pavements, buildings, railroad tracks, etc. The developer/contractor shall install the pipe by jacking, auguring or tunneling, or installing the pipe in a casing pipe by a combination of these methods.

When use of a casing pipe is required, the developer/contractor shall be responsible to select the gauge and size required, unless otherwise indicated on the drawings, and consistent with his jacking or auguring operation, and shall be set to line and grade. During jacking or auguring operations, particular care shall be exercised to prevent caving ahead of the pipe which will cause voids outside the pipe. When the carrier pipe is installed within a casing pipe, the carrier pipe shall be skidded into position in an acceptable manner and to the line and grade as designated. The annular space between the casing and the pipe shall be filled with controlled density fill or as otherwise approved.

The faces of the jacking pit shall be constructed by driving steel sheets, or installing timber lagging as the excavation proceeds. The sheets, or lagging, shall extend a minimum of 5 feet below the bottom of the pit except at the entrance of the utility. Prior to jacking or auguring activities, shop drawings describing these activities, including dimensioning of pit length and size of underground borings and complete description of shoring, shall be submitted to the City Engineer for approval.

5.080 Bedding

All sewer pipe shall be bedded. Bedding material shall conform to "Bedding Material for Rigid Pipe" or pea gravel as specified in Section 9-03.15. Bedding shall be placed to a minimum depth of 6 inches under the barrel of the pipe and up to the following levels:

- PVC Sewer Pipe and HDPE pipe – one (1) foot above the crown of the pipe
- Ductile Iron Sewer Pipe – springline of the pipe

As an option the contractor may use controlled density fill.

Bedding shall be placed in more than one lift. The first lift, to provide at least 6 inches thickness under the barrel of the pipe, shall be placed before the pipe is installed and shall be spread smoothly so that the pipe is uniformly supported along the barrel. Subsequent lifts of not more than 6 inches thickness shall be installed and individually compacted to 90% density as determined by ASTM: D-1557.

5.090 Shoring

Construction safety is the developer's/contractor's responsibility and all persons on site are subject to the safety direction of developer/contractor personnel. The City of Snoqualmie and its representatives do not have either control or authority on site safety issues therefore assumes no responsibility for the safety of others.

The requirements of the Occupational Safety and Health Act (OSHA) and the Washington Industrial Safety and Health Act of 1973 (WISHA) shall apply to all excavation, trenching, and ditching operations on this project. All trenches over four (4) feet in depth shall be shored, braced, and shielded in compliance with applicable Federal and/or State regulations. Shoring, bracing, or shielding shall be required in all street area excavations, including those areas where all existing pavement is being removed. Sloping to the angle of repose will be permitted only in non-critical, off-street areas.

Shoring and cribbing of excavations and trenches shall be provided in accordance with the provisions of Section 2-09 of the Standard Specifications.

The shoring system shall be a commercially available shoring systems designed for the depths anticipated on the project. The shoring system shall meet all requirements of the Washington State Safety and Health Act (WISHA) and United States federal Occupational Safety and Health Act (OSHA).

5.100 Controlled Density Fill

Controlled Density Fill (CDF) shall be a mixture of Portland cement, fly ash, aggregates, water, and admixtures proportioned to provide a non-segregating, self-consolidating, free-flowing, and excavatable material which will result in a hardened dense, non-settling fill. Slump shall be 3 inches to 6 inches.

CDF shall be discharged from the mixer by any reasonable means into the area to be filled. The CDF shall be brought up uniformly to the elevation shown on the plans.

CDF shall not be placed on frozen ground.

CDF patching, mixing, and placing may be started if weather conditions are favorable, when the temperature is at 34 degrees F and rising. At the time of placement, CDF must have a temperature of at least 40 degrees F. Mixing and placing shall stop when temperature is 38 degrees F or less and falling. Each filling stage shall be as continuous an operation as is practicable.

Trench section to be filled with CDF shall be contained at either end of trench section by bulkhead or earth fill.

Contractor shall provide steel plates to span utility trenches and prevent traffic contact with CDF for at least 24 hours after placement or until CDF is hard enough to prevent rutting by construction equipment or traffic.

Controlled Density Fill shall be a mixture of Portland cement, fly ash, aggregates, water, and admixtures which have been batched and mixed in accordance with Section 6-02.3 of the WSDOT/APWA Standard Specifications.

Materials	
1. Portland Cement	AASHTO M 85 or WSDOT 9-01
2. Fly Ash	Class F
3. Aggregates	WSDOT 9-03.1(2)B
4. Admixtures	WSDOT 9-23.6

5.110 Sawcutting Existing Pavement & Sidewalk

The contractor shall make a vertical sawcut to the full depth of existing asphalt or concrete pavement for all crossings of the existing pavement.

Where necessary to remove existing curb, gutter, driveways and sidewalk, full panels shall be removed. Care shall be taken during removal to protect adjacent sidewalk panels, concrete curbs and existing utilities from damage. In no case shall any segment of sidewalk or curb and gutter be shorter than 5 feet in length.

5.120 Pavement Patching

This work shall consist of the reconstruction and patching of existing pavement that is scheduled to remain. The following provisions shall apply regardless of the condition or type of roadway base and pavement types encountered. Asphalt pavements shall be patched with asphalt, and concrete pavements shall be patched with concrete.

Pavement patching shall be scheduled to accommodate the demands of traffic and shall be performed as rapidly as possible to provide maximum safety and convenience to public travel.

Before the patch is constructed, all pavement cuts shall be trued so that the marginal lines of the patch will form a rectangle with straight edges and vertical faces. The patch shall be flush with the surrounding surface and shall provide a smooth riding surface for passing traffic.

Asphalt shall be Asphalt Concrete Pavement, Class B. The depth of asphalt shall be a minimum of four inches in all areas, and shall be increased as necessary to match the existing thickness. Asphalt Concrete Pavement shall be laid over four inches of crushed surfacing.

Cement Concrete Pavement shall be a 3-day mix conforming to the requirements of Section 5-05 of the WSDOT/APWA Standard Specifications. The thickness of concrete shall be a minimum of 6 inches, and shall be increased as necessary to match the existing thickness.

Until such time as the permanent patch placed, the contractor shall install a temporary patch over unfinished portions of work. Temporary pavement patch shall be accomplished by using 3 inches of cold mix (MC 250), or 3 inches of ATB.

5.130 Lift (Pump) Stations

All side sewers must gravity into the City's sanitary system. The City does not promote the construction of individual side sewer pumps or public service pump stations. The City will only consider this method if no area gravity system can be constructed. Private pressure lines are not permitted on public right-of-way. If no gravity system can be constructed and a non-gravity system has been approved by the City, the private pressure lines must enter a manhole on private property and gravity into the public system with a standard side sewer connection. The minimum manhole size permitted for this application is 48 inch diameter installed with a locking lid frame and cover.

Lift Stations must be in conformance with the standards outlined in the SR II Wastewater Collection Facilities Project Report and meet the following general criteria:

- State, Federal, and Local Regulatory Compliance.
- Safety.
- Performance.
- Reliability.
- Maintenance and service efficiency.
- Operational efficiency.
- Environmental compatibility.
- Pumps shall be submersible type.
- Provisions for auxiliary power shall be provided as defined by the SR II Wastewater Collection Facilities Project Report

- Provisions for telemetry shall be provided; monitoring, signal transmission and reception, status and alarm display and data archiving equipment and systems shall conform to the equipment and systems currently in use by the City and/or as directed by the City Engineer.
- Force main design materials, construction and testing shall be as approved by the City Engineer.

Plans and design calculations for lift stations and force mains must be approved by the City Engineer.

5.140 Manholes

Description

This work shall consist of constructing manholes in accordance with these Standards, the Standard Plans and Section 7-05 of the Standard Specifications.

Materials

Manholes shall be constructed of pre-cast units, in accordance with the Standard Plans. Any deviations from Standard Plans will be subject to a shop drawing submitted by the contractor and approved by the City Engineer.
Joints between manhole elements shall be rubber gasket.

All pre-cast concrete shall be Class 4000. Manhole channels shall be Class 3000 concrete. Concrete blocks or concrete (masonry) rings may be used for adjustment of the casting to final street grade. Mortar will be used in between joints.

Standard pre-cast cones shall provide reduction from 48 inches to 24 inches with height of not less than 18 inches and 54 to 24 inches with height of not less than 24 inches.

PVC pipe may be used to a maximum depth of 25' cover. Over 25' requires use of ductile iron pipe.

Standard flat slab covers shall be a minimum of 8 inches thick and shall conform to the outer dimension of the standard sections upon which they are to be placed.

Bedding

Unless otherwise directed by the City Engineer, manholes constructed with pre-cast base sections or cast-in-place sections shall be placed to grade upon a 6 inch minimum depth of pea gravel.

Joints

Joints between pre-cast manhole elements shall be rubber gasketed in a manner similar to pipe joints conforming to ASTM: C-443. Shop drawings of the joint design shall be submitted to the City Engineer for approval, prior to manufacture. Mortar shall be placed in between every joint, both vertical and horizontal, of concrete adjustment sections, risers, and bricks when rising and adjusting manhole and catch basin frames. Completed joints shall show no visible leakage and shall conform to the dimensional requirements of ASTM: 478.

Manhole Channels

All manholes shall be channeled unless otherwise approved by the City Engineer. Manhole channels shall be made to conform accurately to the sewer grade and shall be brought together smoothly with well rounded junctions. Channel sides shall be carried up vertically to the crown elevation of the various pipes, and the concrete shelf between channels shall be smoothly finished and warped evenly with slope to drain.

The very first manhole in parcels shall not be channeled until after the majority of all construction activities are finalized. This manhole shall be ordered with a 2' catch and shall be cleaned and filled with commercial concrete for channeling with the permission of the City of Snoqualmie Public Works Department.

Manhole Pipe Connections

All pipes except PVC pipe entering or leaving the manhole shall be provided with flexible joints within 1/2 of a pipe diameter or 12 inches, whichever is greater, from the outside face of the manhole structure and shall be placed on firmly compacted bedding, particularly within the area of the manhole excavation which normally is deeper than that of the sewer trench. Special care shall be taken to see that the openings through which pipes enter the manhole are completely and firmly rammed full of non-shrink grout to ensure watertightness.

PVC pipe connections to manholes shall be with a flexible pipe to manhole connection such as "Kor-n-Seal" approved by the City Engineer. No pipe joint in PVC shall be placed within 10 feet of the outside face of the manhole.

Frame and cover

Manhole frame and cover shall conform to the standard plan. All manhole covers shall be secured to the frame by means of three 5/8" diameter stainless steel socket head cap screws. A light coating of anti-seize thread compound shall be applied to the screws at the time of installation. Frame and cover shall be water tight with a pick notch.

Ladder

All manholes over 3 feet in height shall be provided with a ladder or steps as specified in the Standard Plans. Steps shall be installed at 12 inch spacing.

5.150 Connections to Existing Manholes

The contractor shall verify invert elevations prior to construction. The crown elevation of laterals shall be the same as the crown elevation of the incoming pipe unless specified. The existing base shall be reshaped to provide a channel equivalent to that specified for a new manhole.

The contractor shall core drill an opening to match the size of pipe to be inserted. Jackhammer shall not be used. The contractor shall excavate completely around the manhole to prevent unbalanced loading. The manhole shall be kept in operation at all times and the necessary precautions shall be taken to prevent debris or other material from entering the sewer, including a tight pipeline bypass through the existing channel if required. All openings must provide a minimum of 1 inch and a maximum of 2 inches clearance around the circumference of the pipe.

5.160 **Sewer Main**

Materials

Materials for sanitary sewer pipe shall meet the requirements of the following:

1. PVC Sewer Pipe: Polyvinyl Chloride (PVC) sanitary sewer pipe shall conform to the requirements of ASTM: D-3034 SDR35.

2. Ductile Iron Sewer Pipe: Ductile iron sanitary sewer pipe shall conform to ANSI A 21.51 or AWWA C151 and shall be cement mortar lined, push-on joint or mechanical joint. The ductile iron pipe shall be Class 50 or 52 depending on trench depth.

From time to time, the City may approve other types of pipe for use in sanitary sewer systems. The list of approved alternative sanitary sewer pipes is on file at the office of the City Engineer.

Laying Sewer Pipe

All sewer main installations shall have line and grade set prior to construction by survey, with a minimum of staking for each manhole with cuts to inverts of inlets and outlets. All mains are to be straight between manholes, unless specifically approved otherwise in writing by the City Engineer or shown as such on the approved plans.

The contractor may use any method such as "swede line and batter board" and "laser beam" etc., which would allow him to accurately transfer the control points provided by the surveyor in laying the pipe to the designated alignment and grade.

When using the "swede line and batter board" method, the contractor shall transfer line and grade into the ditch where they shall be carried by means of a taut grade line supported on firmly set batter boards at intervals of not more than 30 feet. No less then three batter boards shall be in use at one time. Grades shall be constantly checked and in the event the batter boards do not line up, the work shall be immediately stopped and the cause remedied before proceeding with the work.

When using a "laser beam" to set pipe alignment and grade, the contractor shall constantly check the position of laser beam from surface hubs provided by the surveyor to ensure the laser beam is still on alignment and grade. In the event the laser beam is found out of position, the contractor shall stop work and make necessary corrections to the laser beam equipment and pipe installed.

A minimum of 10 feet horizontal clearance and 18 inches vertical clearance between sewer and water main pipe shall be maintained whenever possible in accordance with Department of Health requirements.

Plugs and Connections

All fittings shall be capped or plugged with a plug of an approved material gasketed with the same gasket material as the pipe unit; or shall be fitted with an approved mechanical stopper; or shall have an integrally cast knock-out plug. The plug shall be able to withstand all test pressures without leaking, and when later removed, shall permit continuation of piping with jointing similar to joints in the installed line.

Jointing

Where it is necessary to break out or connect to an existing sewer during construction, only new pipe having the same inside diameter will be used in reconnecting the sewer. Where joints must be made between pipes with a mismatched wall thickness, the contractor shall using flexible gasketed coupling, adapter or coupling-adapter to make a watertight joint. Couplings shall be those manufactured by "Romac," "Smith Blair," or approved equal for reinforced pipes and "Fernco" or approved equal for non-reinforced pipes.

5.170 Cleaning and Testing

All sanitary sewer pipe installations shall be tested in accordance with Section 7-17.3(4) of the Standard Specifications. A copy of this testing procedure is available for inspection at the office of the City Engineer. Sewers and appurtenance shall be cleaned and tested after backfilling by either the exfiltration or low pressure air method at the option of the contractor, except where the ground water table is such that the City Engineer may require the infiltration test.

The contractor/developer shall be required to clean and flush, with an approved cleaning ball and clean water, all gravity sanitary sewer lines prior to testing. The cleaning ball shall be an inflatable diagonally ribbed rubber ball of a size that will inflate to fit snugly into the pipe to be tested. A rope or chord will be fastened to the ball to enable total control of the ball at all times. Television inspection of the sewer mains is required 30 days after the installation of the system. Such inspections will be done at the developer's/contractor's cost.

All required tests shall be performed in the presence of the City Engineer or their authorized representative.

5.180 Side Sewers

Description

A side sewer is that portion of a sewer line that will be constructed between a main sewer line and a residence or other buildings in which the disposal of sanitary waste originates. It does not include any of the internal piping or connecting appurtenances, the installation of which is controlled by a municipal code, ordinance or regulation.

The general requirements for construction of sewers in other sections of these Specifications shall apply for construction of side sewers unless they are inconsistent with any of the provisions of this particular section and the Specifications shall apply alike to all side sewers on public rights-of-way and private property.

Materials
Materials shall meet the requirements of these Specifications.

All pipe shall be clearly marked with type, class, and/or thickness, as applicable. Lettering shall be legible and permanent under normal conditions of handling and storage.

Approved jointing shall be flexible gasketing.

Flexible gasketing shall be construed to include rubber, synthetic rubber-like and plastic materials specially manufactured for the joint, pipe size, and use intended and shall be furnished by the manufacturer of the pipe to be used.

General
Side sewer construction shall conform to the Standard Plans. Tracer wire shall be installed from the main to the clean out.

The minimum depth of side sewer shall be 6 feet at the curb or edge of shoulder and 5 feet at the property line.

Side sewer locations shown on the drawings shall be subject to relocation in the field after construction starts. Regardless of the drawing location, the contractor shall place the wye branch in the main sewer line at the location designated by the engineer.

A maximum of two residential units or one non-residential building will be allowed to connect to each side sewer. If the equivalent sewage flow from the building will be equal to more than 20 residential units, then a manhole will be required to be constructed at the connection to the sewer main.

Side sewers are not permitted to cross a public right-of-way or run parallel to the right-of-way centerline. All lots must front on a public sanitary system in order to be sewered unless otherwise approved by the City Engineer.

Excavation, Bedding, Backfill And Compaction
Excavation, bedding, backfill and compaction for side sewers shall conform to the requirements set forth in other sections of these Standards.

Size
The minimum size requirement for that portion of any side sewer within the public right-of-way is 6 inches in diameter.

On private property, that portion of the side sewer may be reduced to 4 inches in diameter for service to single family homes, side sewers to other buildings from duplexes to commercial must be 6 inch minimum diameter.

Slope
The minimum slope for side sewers shall be 2%.

Fittings
All fittings shall be factory-produced and shall be designed for installation on the pipe to be used. Fittings shall be of the same quality and material as the pipe used, except when installing a PVC insert on existing pipe.

Side sewers shall be connected to the tee or riser provided in the public sewer where such is available, utilizing approved fittings or adapters. Where no tee or riser is provided or available, connection shall be made by core drilling and installing an approved tee. Tees shall be "Romac Industries, Style CG" or approved equal.

Cleanouts
All side sewers shall have a 6 inch clean-out at the property line per the Standard Plans. The riser portion of the clean-out shall be PVC unless otherwise approved by the City Engineer. For longer side sewer installations, extra clean-outs will be required at spacings not to exceed 100 feet.

Testing
All side sewers shall be tested after backfill. Side sewers that are reconstructed or repaired to a length of 10 feet or more shall be tested for watertightness. Testing of newly reconstructed sections of side sewers consisting of a single length of pipe will not be required. Testing shall be performed in the presence of the City Engineer in accordance with Section 7-17.3(4) of the Standard Specifications. A copy of this testing procedure is available at the office of the City Engineer.

When a new side sewer is installed, the entire length of new pipe installed shall be tested. In cases where a new tap is made on the main, the first joint of pipe off the main shall be installed with a test tee, so that an inflatable rubber ball can be inserted for sealing off the side sewer installation for testing. In cases where the side sewer stub is existing to the property line, the test ball may be inserted through the clean-out wye to test the new portion of the side sewer installation.

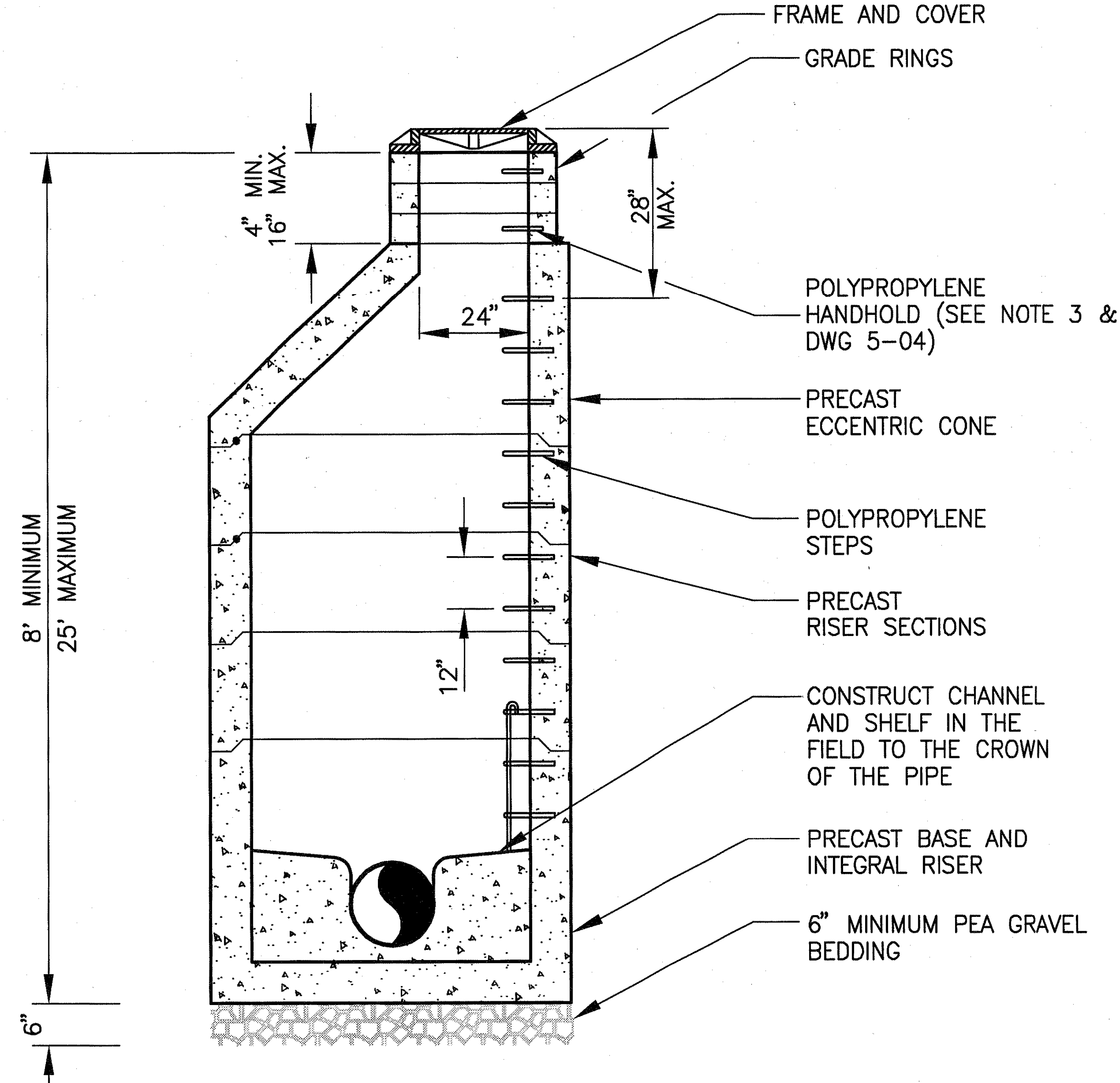
5.190 Approval of Alternate Materials

"Approved Equal" Process

The City Engineer shall be the sole judge of whether suppliers or materials qualify as "or equal" and/or "or equivalent" substitutions as may be indicated herein or on the standard plans. As a minimum, submit catalog cuts clearly showing the equivalency. The developer/contractor shall have the full burden of proof in proving equivalency. Incomplete submittals will be rejected. Allow 20 working days after receipt of all required information for the approval process. See Chapter 1 for submittal requirements.

LIST OF STANDARD DRAWINGS

CHAPTER 5 – SEWER

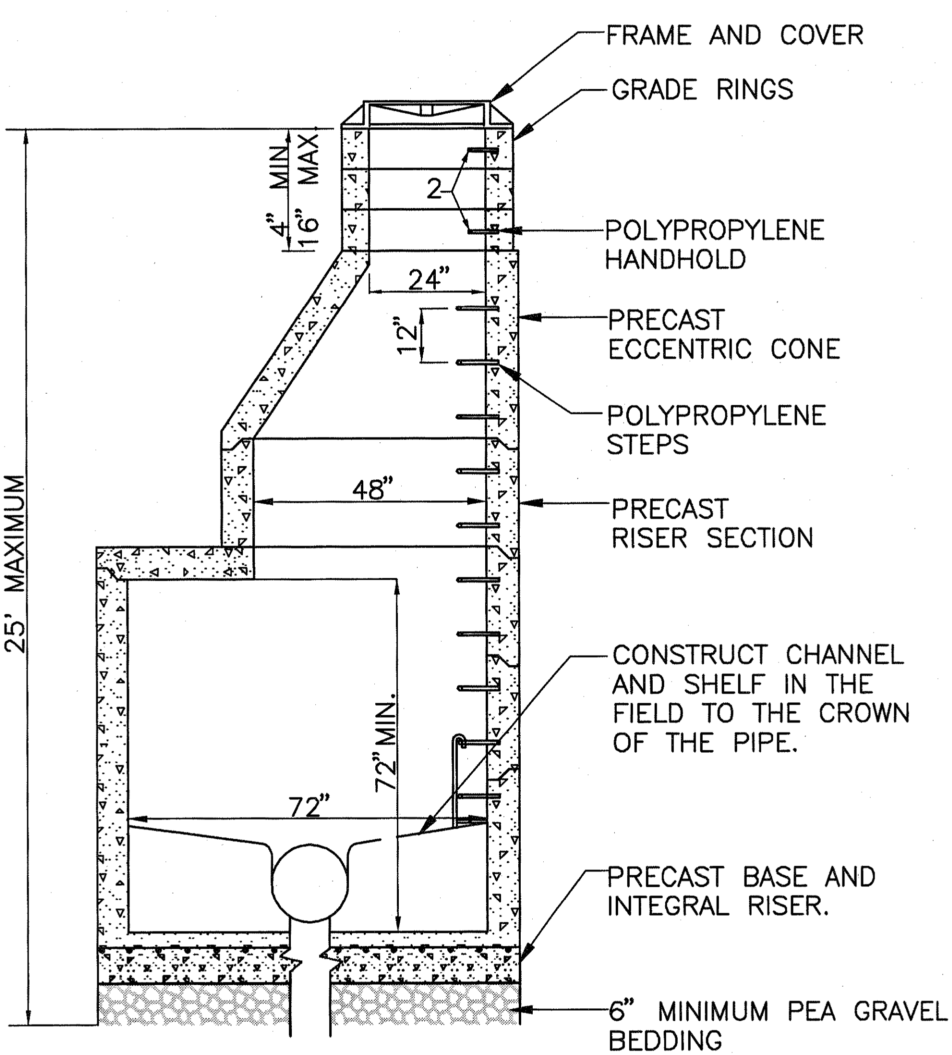


NOTES:

1. CONNECTIONS TO MANHOLE WITH PVC PIPE SHALL BE MADE BY KOR-N-SEAL BOOT, OR APPROVED EQUIVALENT.
2. FLAT TOP MANHOLES UNDER 8 FEET MAY BE USED UPON APPROVAL BY CITY ENGINEER.
3. SEE WSDOT STANDARD PLANS, FIGURE B-23a FOR FURTHER SPECIFICATIONS.
4. FRAME AND COVER TO BE LOCATED AT LANE EDGE, LANE CENTERLINE OR ROADWAY CENTERLINE.

SNOQUALMIE RIDGE II			
MANHOLE TYPE 1 48" AND 54"			
DWN ER	CKD	DATE 09/30/04	DWG 5-01

Approved: AB#04-172 11/8/04
Attest: Jodi Warren/CMC City Clerk

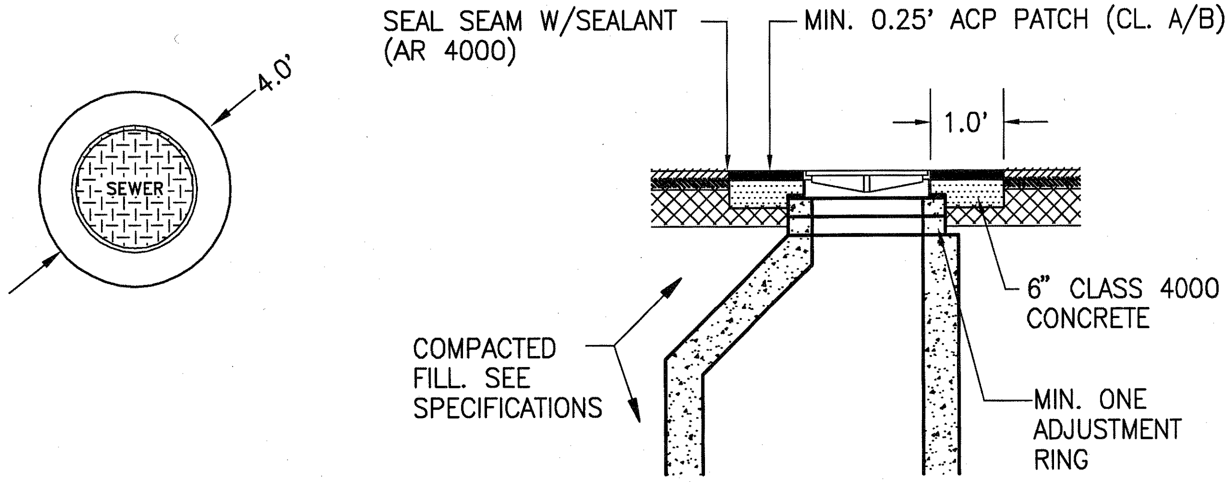


NOTES:

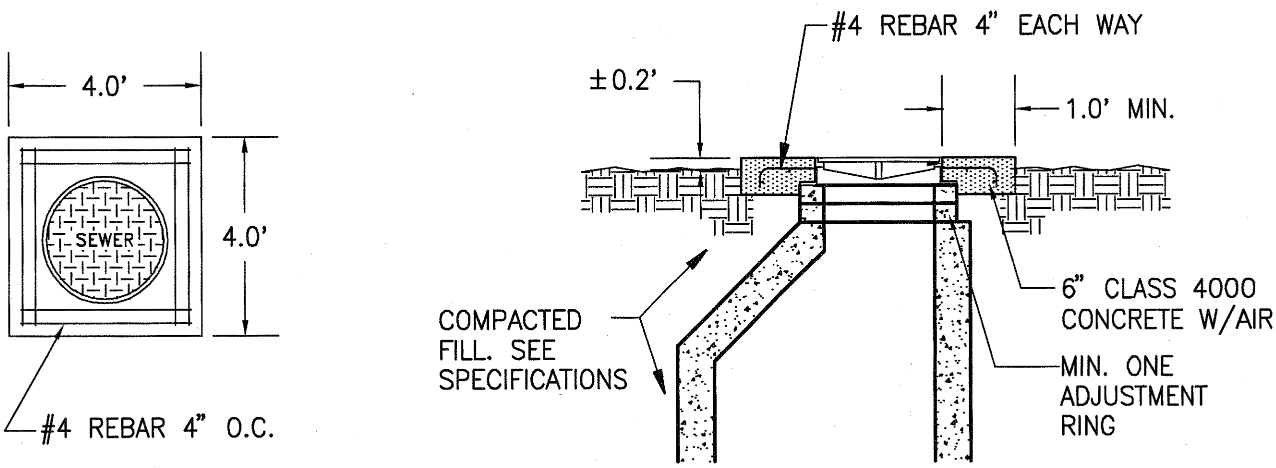
1. CONNECTIONS TO MANHOLE WITH PVC PIPE SHALL BE MADE BY KOR-N-SEAL BOOT, OR APPROVED EQUIVALENT.
2. SEE WSDOT STANDARD PLANS, FIGURE B-23b FOR FURTHER SPECIFICATIONS.
3. FRAME AND COVER TO BE LOCATED AT LANE EDGE, LANE CENTERLINE OR ROADWAY CENTERLINE.

SNOQUALMIE RIDGE II			
MANHOLE TYPE 2 72"			
DWN ER	CKD	DATE 09/30/04	DWG 5-02

Approved: AB#04-172 11/8/04
Attest: [signature] Jodi Warren/CMC City Clerk



MANHOLE IN ASPHALT



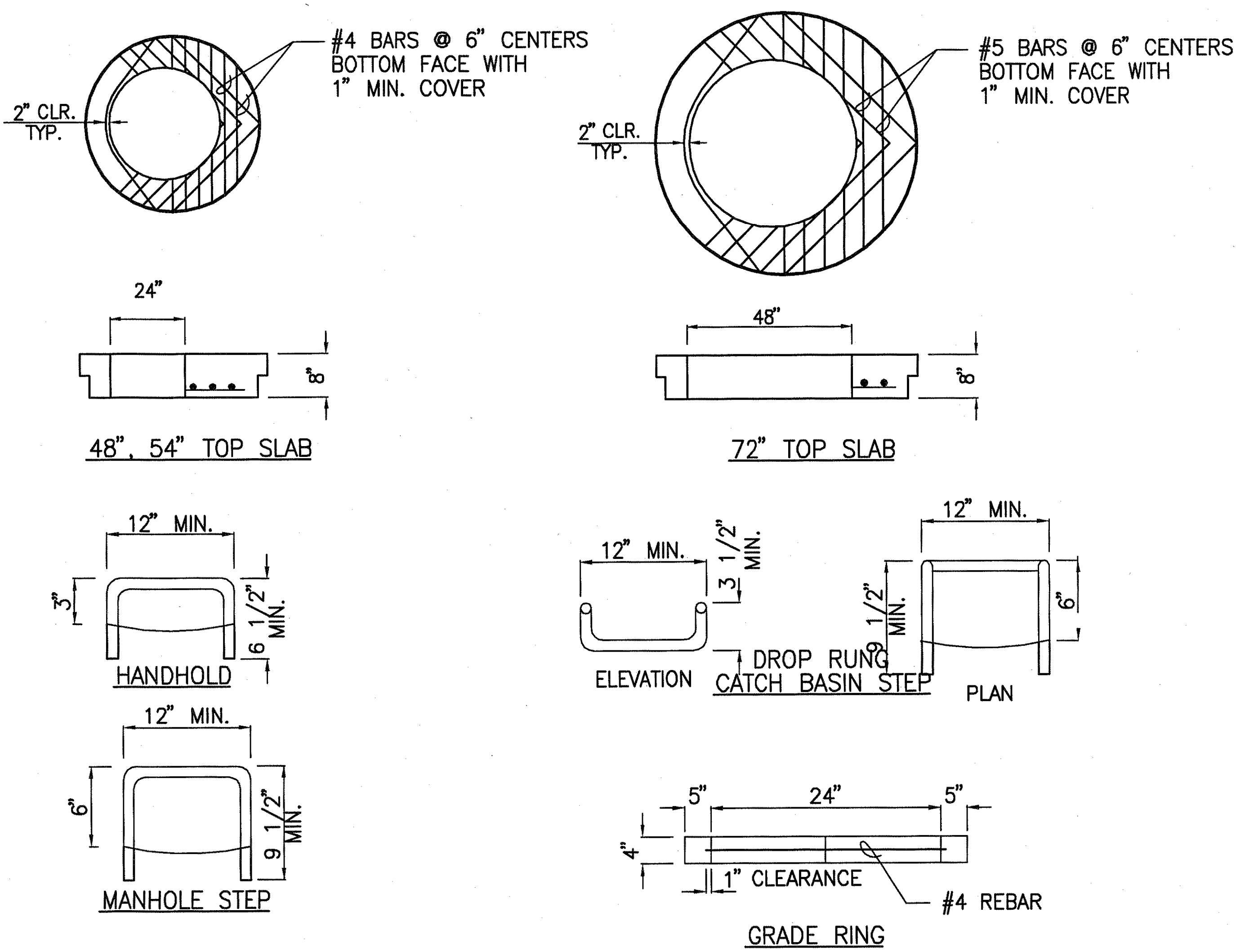
MANHOLE OUTSIDE ASPHALT

NOTE:

1. ON MANHOLE OUTSIDE ASPHALT ADD REINFORCING STEEL AS SHOWN ABOVE. DEFORMED BAR TO MEET ASTM A615 GRADE 60

SNOQUALMIE RIDGE II			
MANHOLE COLLAR			
DWN	CKD	DATE	DWG
ER		10/18/04	5-03

Approved: AB#04-172 11/8/04
Attest: *JLW* Jodi Warren/CMC City Clerk



NOTES:

1. PROPRIETARY MANHOLE STEPS ARE ACCEPTABLE, PROVIDED THAT THEY CONFORM TO R, ASTM C478, (AASHTO M199) AND MEET ALL WISHA REQUIREMENTS.
2. MANHOLE STEP LEGS SHALL BE PARALLEL OR APPROXIMATELY RADIAL AT THE OPTION OF THE MANUFACTURER, EXCEPT THAT ALL STEPS IN ANY MANHOLE SHALL BE SIMILAR. PENETRATION OF OUTER WALL BY A LEG IS PROHIBITED.

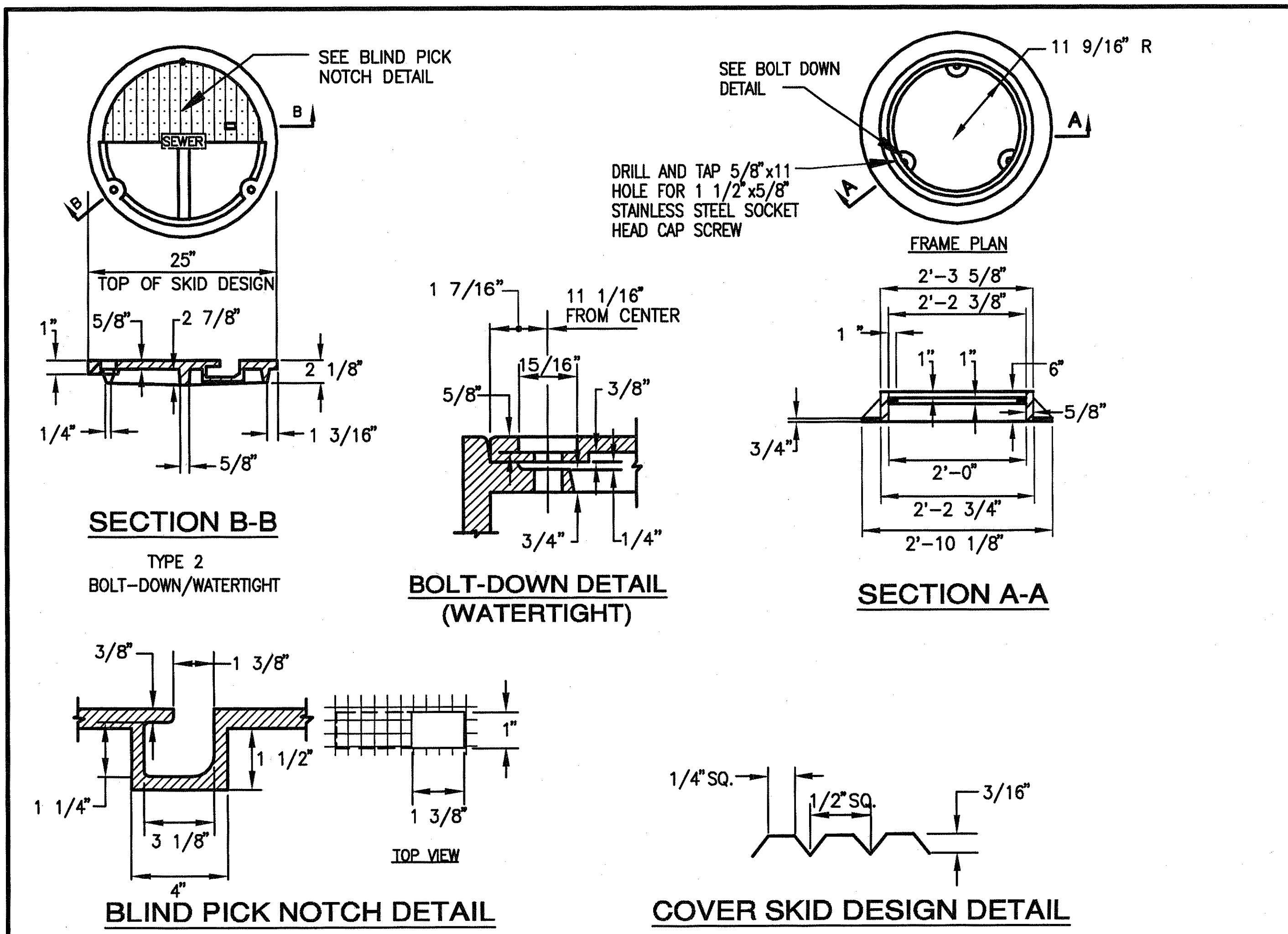
* ALL STEPS & RUNGS 1" DIA. COPOLYMER PROPYLENE WITH MINIMUM 1/2" DIA. GRADE 60 REINFORCING BAR.

SNOQUALMIE RIDGE II

MISCELLANEOUS MANHOLE DETAILS

DWN	CKD	DATE	DWG
ER		09/16/04	5-04

Approved: AB#04-172 11/8/04
Attest: [signature] Jodi Warren/CMC City Clerk



NOTES:

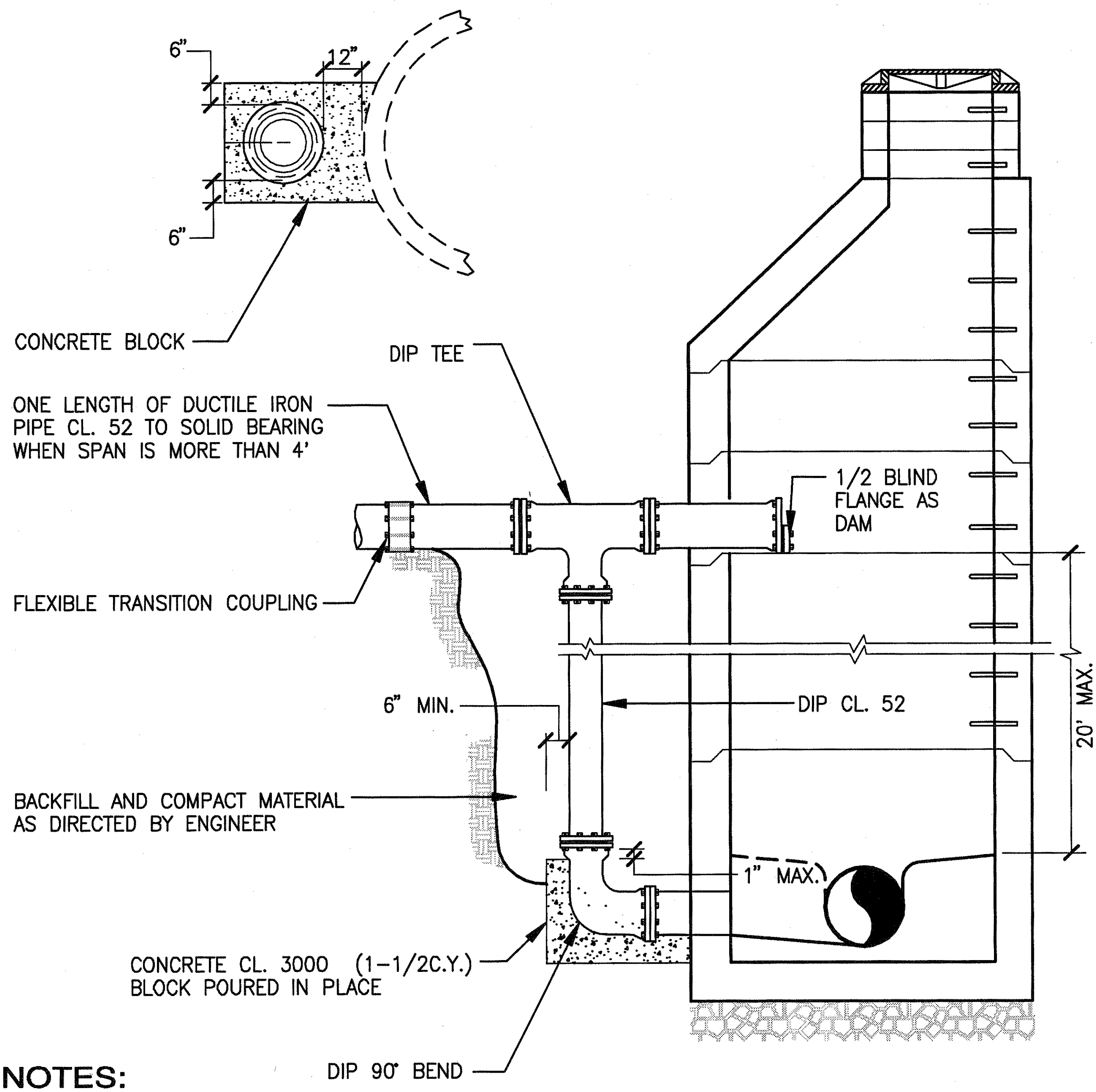
1. GASKET AND GROOVE MAY BE IN THE SEAT OR UNDERSIDE OF COVER.
2. FOR BOLT DOWN MANHOLE RING AND COVERS THAT ARE NOT REQUIRED TO BE WATERTIGHT, THE NEOPRENE GASKET, GROOVE AND WASHER ARE NOT REQUIRED.
3. WASHER SHALL BE NEOPRENE.
4. TYPE 1 STANDARD MANHOLE RINGS AND COVERS SHALL BE USED, UNLESS OTHERWISE SHOWN ON THE PLANS, OR SPECIFIED IN THE SPECIAL PROVISIONS.
5. PROPRIETARY MANHOLE COVERS WITHOUT BOTTOM RIBS ARE ACCEPTABLE, PROVIDED THEY MEET THE STANDARD SPCIFICATIONS REQUIREMENTS FOR "METAL CASTINGS".
6. MANHOLE RINGS SHALL BE DUCTILE IRON CONFORMING TO THE REQUIREMENTS OF ASTM 19-48, CL 30.
7. MANHOLE COVERS TO BE DUCTILE IRON CONFORMING TO ASTM A-536, CL 50-55-06.
8. RING AND COVER SHALL BE TESTED FOR ACCURACY OF FIT AND SHALL BE MARKED IN SETS FOR DELIVERY.
9. ALL CASTINGS TO HAVE A BITUMINOUS COATING.
10. SANITARY SEWER COVERS SHALL BEAR THE WORD "SANITARY OR SEWER" AND STORM DRAIN COVERS SHALL BEAR THE WORD "DRAIN OR STORM".
11. ALL MANHOLE RING AND COVERS TO BE LOCKING TYPE (BOLT-DOWN).

SNOQUALMIE RIDGE II

MANHOLE RING AND COVER

	DWN	CKD	DATE	DWG
K:\ENGR\LIBRARY\DETAILS\SRII\CHAPTER 05\5-05.DWG	ER	JSF	09/16/04	5-05

Approved: AB#04-172 11/8/04
Attest: [signature] Jodi Warren/CMC City Clerk



NOTES:

1. UPPER AND LOWER CONNECTIONS TO MANHOLE SHALL BE MADE BY KOR-N-SEAL BOOT, OR APPROVED EQUIVALENT.
2. SEE WSDOT STANDARD PLANS, FIGURE B-23b FOR FURTHER SPECIFICATIONS.

SNOQUALMIE RIDGE II			
MANHOLE OUTSIDE DROP CONNECTION			
DWN	CKD	10/18/04	DWG
ER	JSF	10/18/04	5-06

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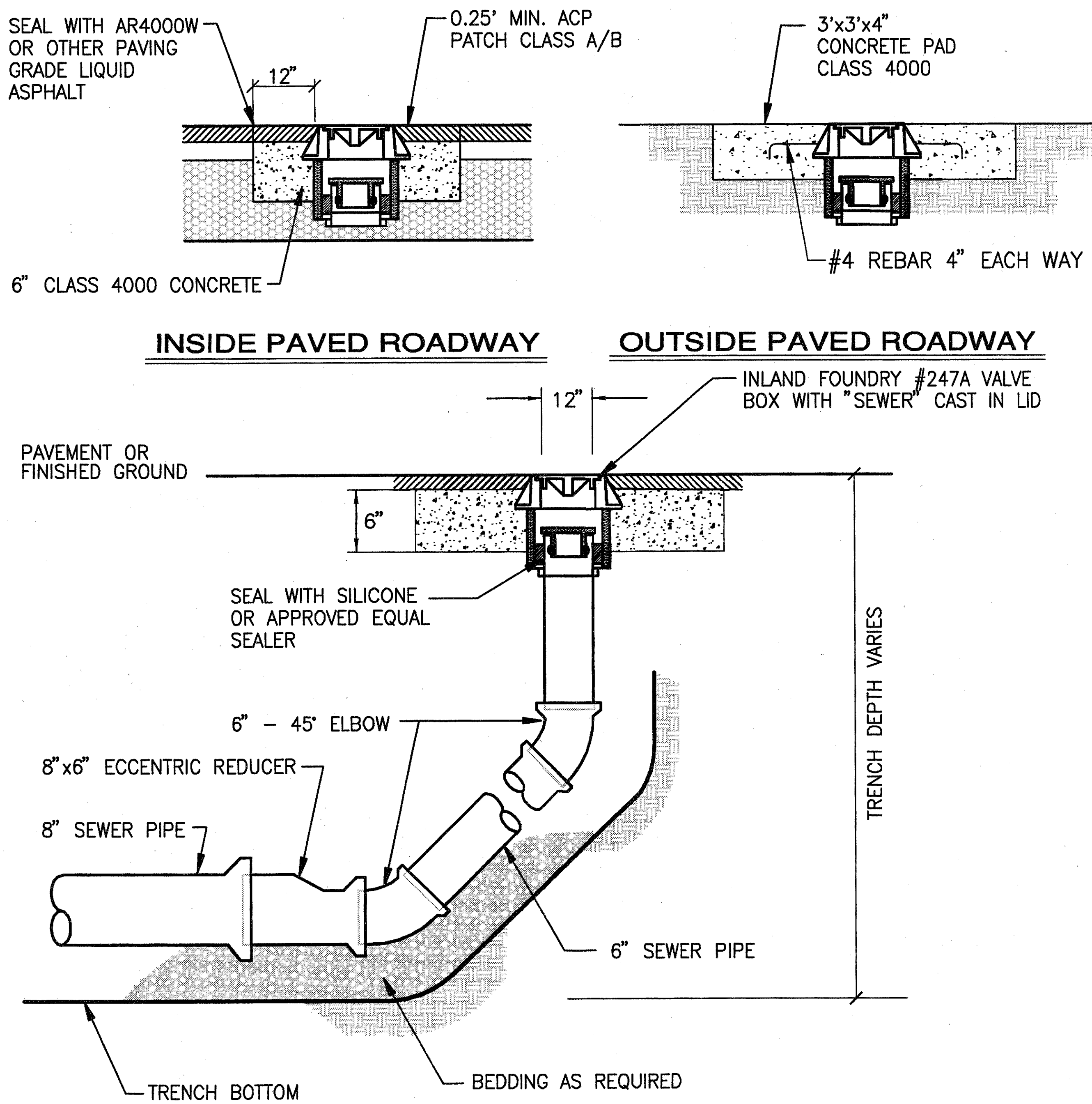
Approved: AB#04-172 11/8/04
Attest: [signature] Jodi Warren/CMC City Clerk



SNOQUALMIE RIDGE II

CLEAN–OUT

K:\ENGR\LIBRARY\DETAILS\SRII\CHAPTER 05\5–07.DWG	DWN	CKD	DATE	DWG
	ER	JSF	10/19/04	5–07

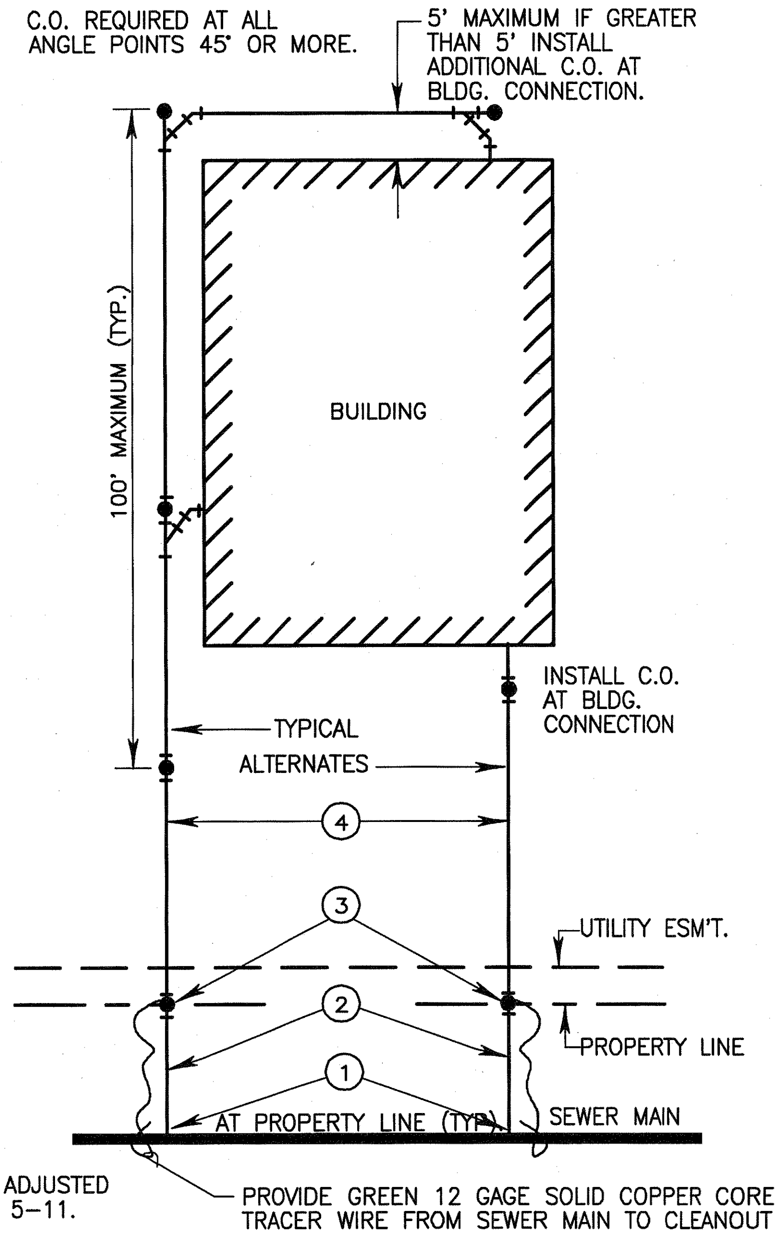
Approved: AB#04-172 11/8/04
Attest: [signature] Jodi Warren/CMC City Clerk

① CONNECTION TO SEWER MAIN PER SPECIFICATIONS AND STD DWG 5-14 AND 5-10

② INSTALL 6" MINIMUM PIPE SIZE IN R.O.W.

③ INSTALL 6" C.O. PER STD DWG 5-11

④ PRIVATE SIDE SEWER
4" MINIMUM FOR SINGLE FAMILY
6" MINIMUM FOR ALL OTHER USES.

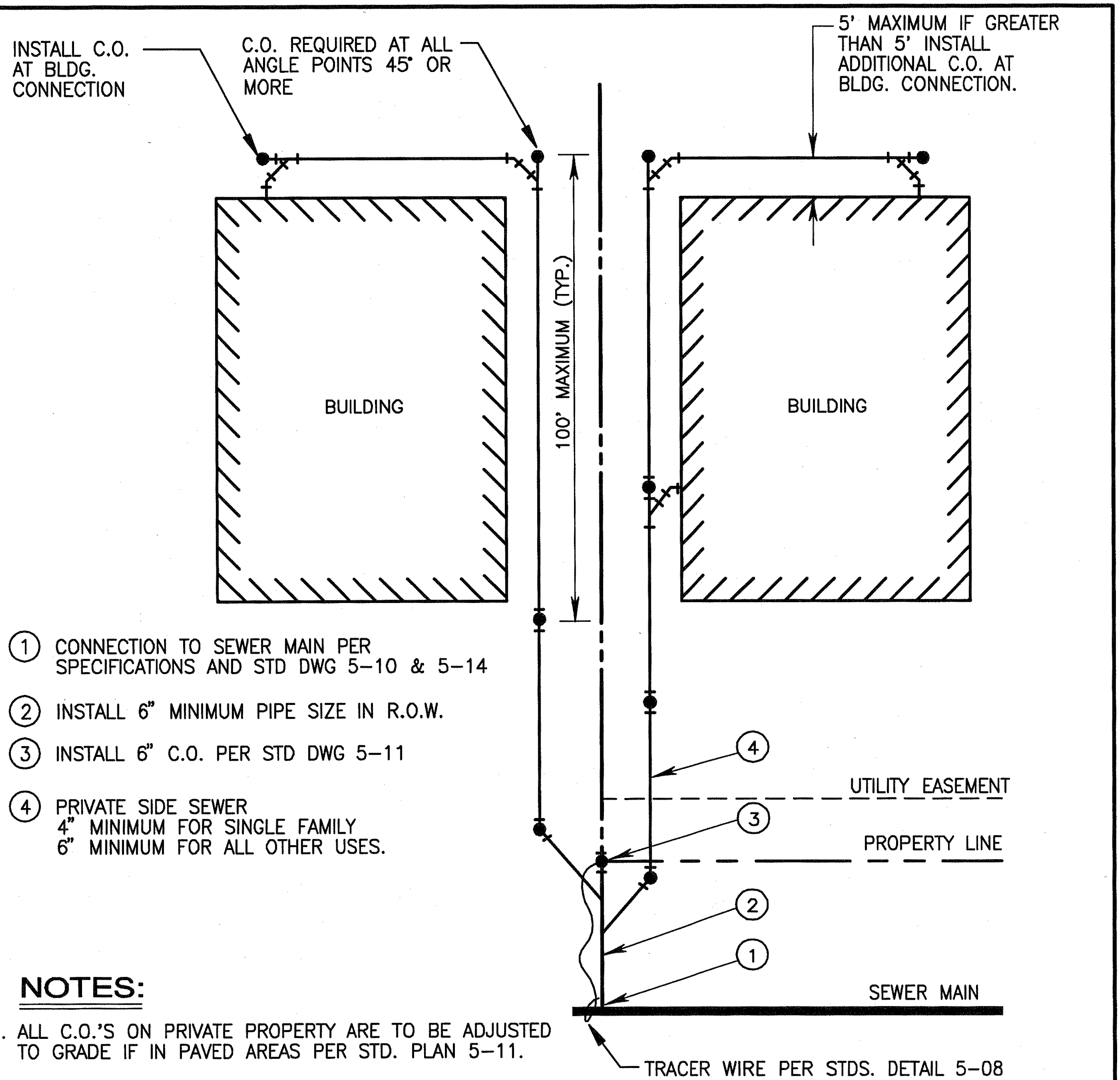


NOTES:

1. ALL C.O.'S ON PRIVATE PROPERTY ARE TO BE ADJUSTED TO GRADE IF IN PAVED AREAS PER STD. PLAN 5-11.
2. C.O.'S ARE TO BE CONSTRUCTED WITH WYES OR SANITARY "T"S (SWEEPS). STRAIGHT "T"S ARE NOT PERMITTED.
3. ALLOWABLE GRADES ARE 2% (1/4"/FT) MIN. TO 100% (FT/FT) MAXIMUM.
4. SEWER MUST BE STRAIGHT BETWEEN ANGLE POINTS, CHANGES IN LINE OR GRADE SHALL BE MADE WITH APPROVED FITTINGS.

SNOQUALMIE RIDGE II			
TYPICAL SINGLE SIDE SEWER LAYOUT			
DWN ER	CKD	DATE 09/30/04	DWG 5-08

Approved: AB#04-172 11/8/04
Attest: [signature] Jodi Warren/CMC City Clerk



NOTES:

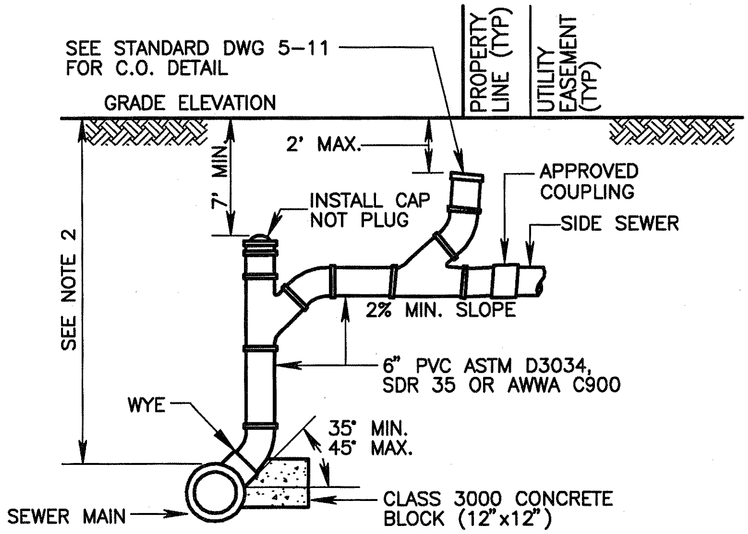
1. ALL C.O.'S ON PRIVATE PROPERTY ARE TO BE ADJUSTED TO GRADE IF IN PAVED AREAS PER STD. PLAN 5-11.
2. C.O.'S ARE TO BE CONSTRUCTED WITH WYES OR SANITARY "T"S (SWEEPS). STRAIGHT "T"S ARE NOT PERMITTED.
3. ALLOWABLE GRADES ARE 2% (1/4"/FT) MIN. TO 100% (FT/FT) MAXIMUM.
4. SEWER MUST BE STRAIGHT BETWEEN ANGLE POINTS, CHANGES IN LINE OR GRADE SHALL BE MADE WITH APPROVED FITTINGS.

SNOQUALMIE RIDGE II

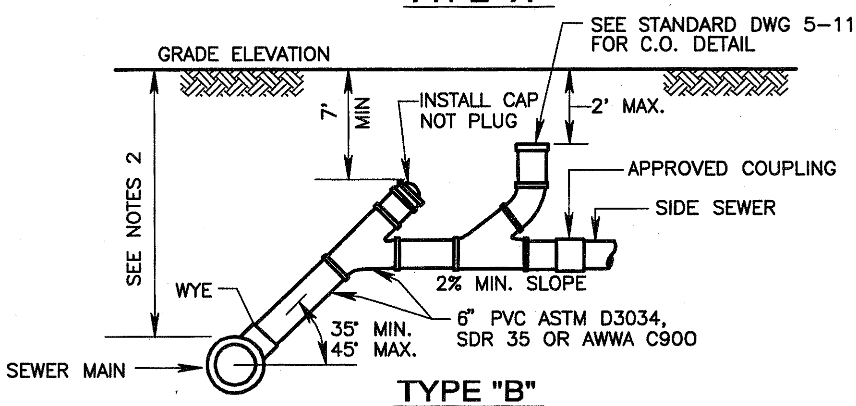
TYPICAL DOUBLE SIDE SEWER LAYOUT

DWN	CKD	DATE	DWG
ER		09/30/04	5-09

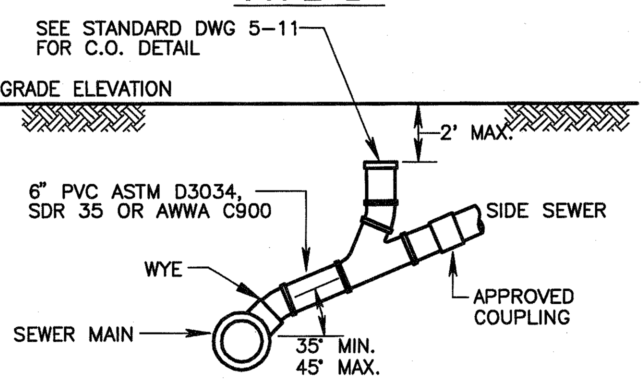
Approved: AB#04-172 11/8/04
Attest: Jodi Warren/CMC City Clerk



TYPE "A"



TYPE "B"



TYPE "C"

NOTES:

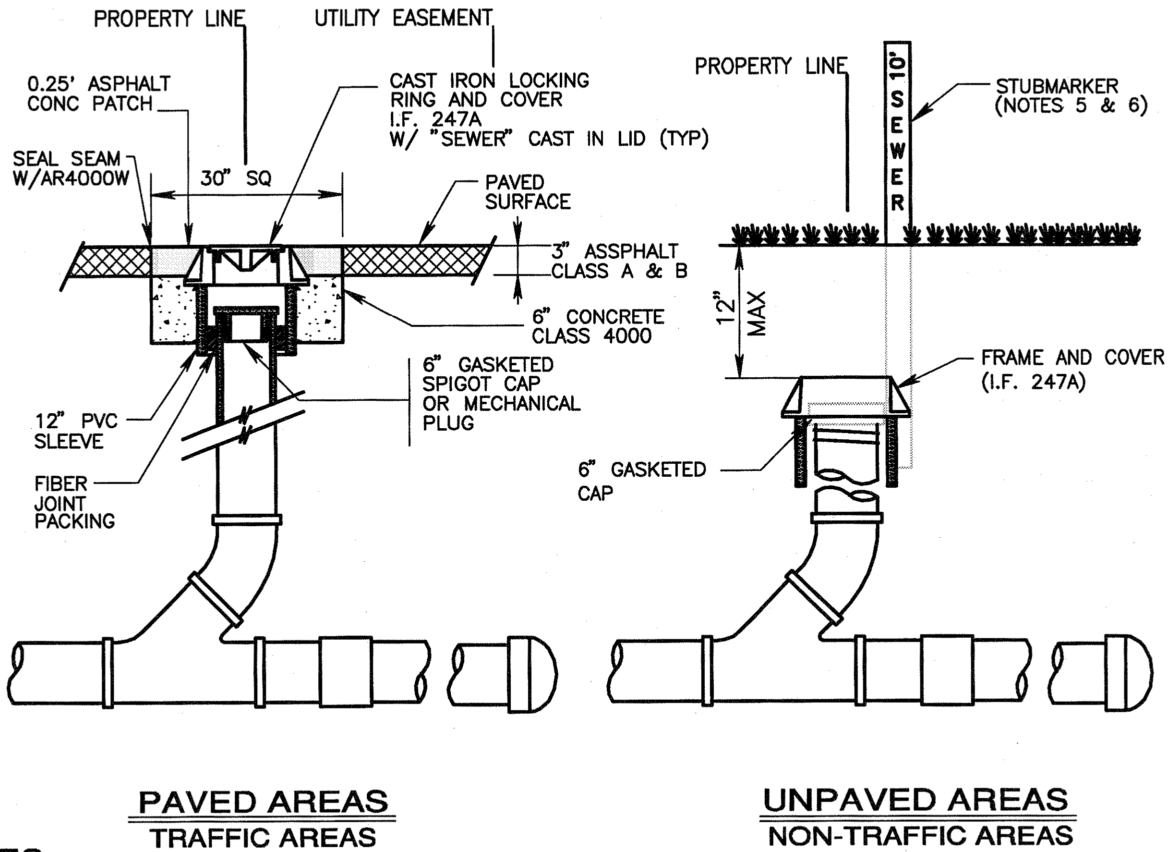
1. PVC SIDE SEWER CONNECTIONS TO NEW MAINS SHALL BE FACTORY WYES.
2. TYPE A & B SHALL BE USED ONLY WHEN MAIN DEPTH EXCEEDS 15 FEET OR AS APPROVED BY THE ENGINEER.

SNOQUALMIE RIDGE II

TYPICAL SIDE SEWER CONNECTION

DWN	CKD	DATE	DWG
ER		09/30/04	5-10

Approved: AB#04-172 11/8/04
Attest: Jodi Warren/CMC City Clerk



NOTES

1 CLEAN-OUT PIPE AND FITTINGS SHALL BE PVC.

2 A SANITARY TEE OR SWEEP MAY BE INSTALLED IN LIEU OF A WYE AS SHOWN. STRAIGHT TEES ARE NOT ACCEPTABLE.

3 FOR NEW PLATS THE VERTICAL RISER PORTION OF THE CLEAN-OUT WILL BE CONSTRUCTED AT TIME OF CONNECTION TO BUILDING TO MINIMIZE DAMAGE, THE 6" WYE AND 6" PVC PIPE W/GASKETED CAPS WILL BE INSTALLED PRIOR TO BUILDING CONNECTION.

4 SEWER STUB WILL BE EXTENDED 10' BEYOND PROPERTY LINE TO PREVENT DAMAGE TO CLEAN-OUT AND MINIMIZE CONFLICTS WITH OTHER UTILITIES WHEN SERVICE TO BUILDING IS ACCOMPLISHED.

5 A PRESSURE TREATED 2"x4" STUBMARKER SHALL EXTEND DOWN TO THE BOTTOM OF THE SEWER PIPE. A MINIMUM OF 3 FEET SHALL EXTEND ABOVE GROUND.

6 THE STUBMARKER SHALL BE PAINTED WITH WHITE TRAFFIC PAINT AND THE WORD "SEWER" AND THE LENGTH OF THE 2"x4" SHALL BE PAINTED ON THE MARKER WITH HIGH BLACK PAINTED LETTERS

SNOQUALMIE RIDGE II			
SIDE SEWER CLEAN-OUT			
DWN ER	CKD JSF	DATE 10/18/04	DWG 5-11

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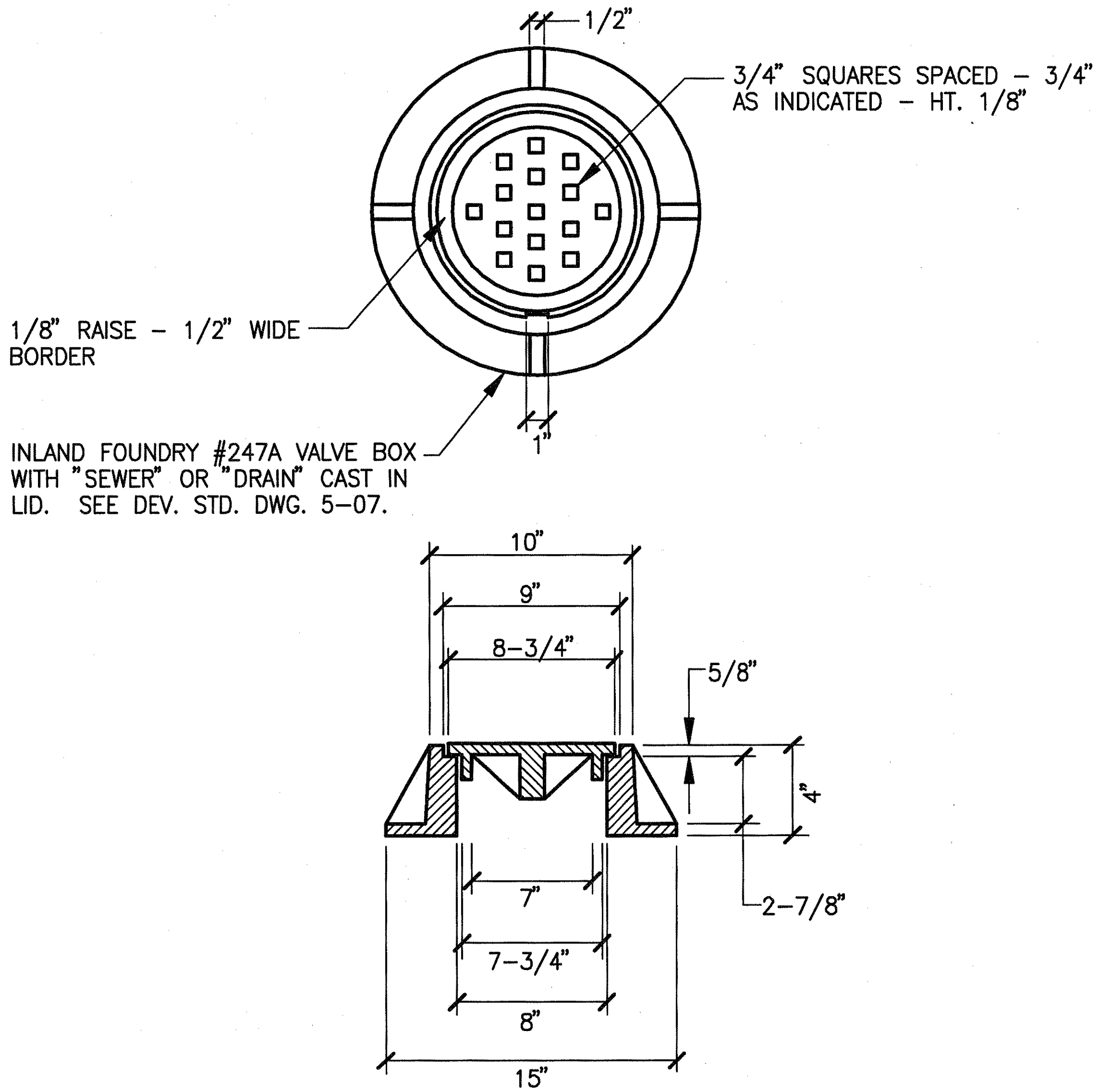
Approved: AB#04-172 11/8/04
Attest: Jodi Warren/CMC City Clerk



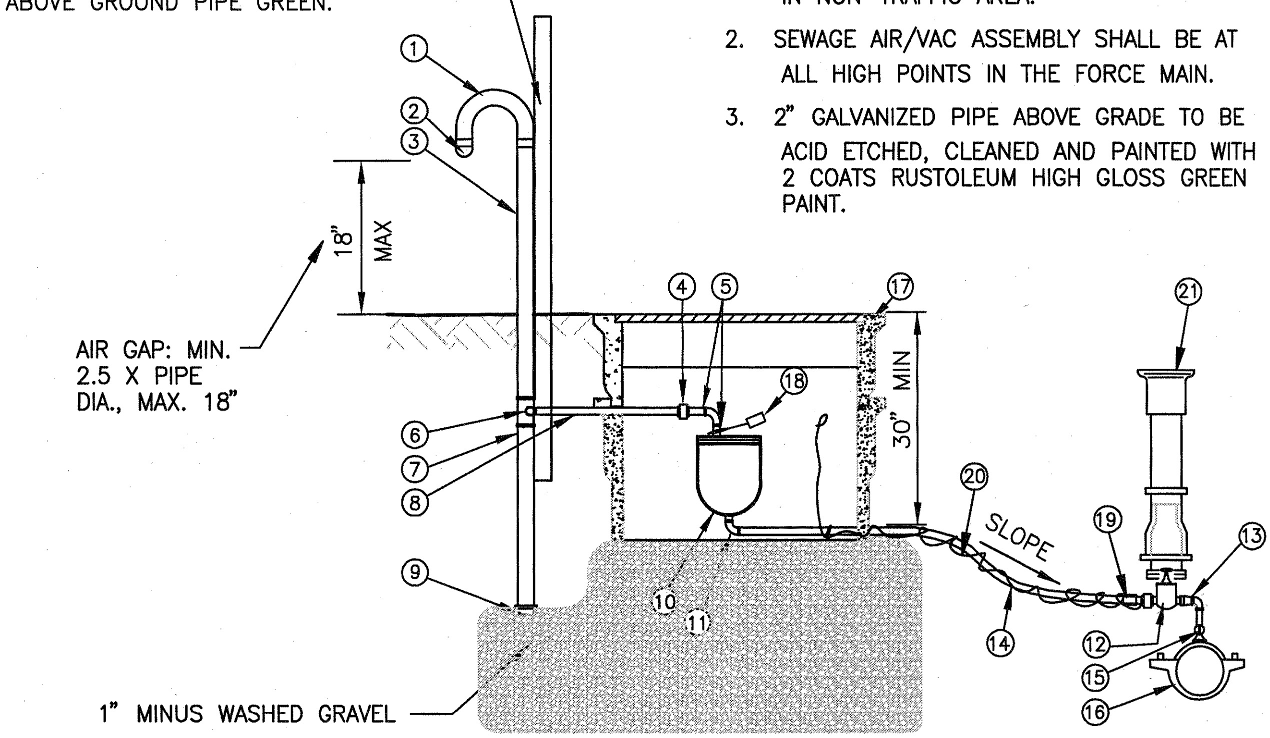
DUCTILE IRON BOLT-DOWN LOCKING RING AND COVER RATING H-20

NOTE:

1. ALL DRAINAGE AND SEWER STRUCTURES SHALL HAVE BOLT–DOWN LOCKING LIDS.
2. THE LIDS SHALL HAVE BLIND PICK NOTCHES.

SNOQUALMIE RIDGE II			
BOLT–DOWN LOCKING RING AND COVER			
DWN	CKD	DATE	DWG
ER		09/30/04	5–12

Approved: AB#04-172 11/8/04
Attest: Jodi Warren/CMC City Clerk



NOTES

1. AIR-VAC UNIT AND BOX TO BE INSTALLED IN NON-TRAFFIC AREA.
2. SEWAGE AIR/VAC ASSEMBLY SHALL BE AT ALL HIGH POINTS IN THE FORCE MAIN.
3. 2" GALVANIZED PIPE ABOVE GRADE TO BE ACID ETCHED, CLEANED AND PAINTED WITH 2 COATS RUSTOLEUM HIGH GLOSS GREEN PAINT.

1. 2" – 180 OPEN PATTERN, RETURN BEND
2. INSECT SCREEN STAINLESS STEEL
3. 2" GALV. IRON PIPE FIELD LOCATE
4. 2" UNION
5. 2" BRASS NIPPLE
6. 2"x2"x1" TEE, 2" CLOSE NIPPLE, 2" 90° BEND
7. 2" GALV. IRON PIPE TO FIT
8. 2" GALV. IRON PIPE TO FIT
9. 2" CAP WITH 1/8" HOLE FOR DRAIN
10. 2" AIR VACUUM SEWAGE VALVE ASSEMBLY, "FLOMATIC" SEWAIR OR EQUIVALENT.
11. 2" BRASS 90° BEND
12. 2" GATE VALVE-CAST IRON BODY, RESILIENT SEAT, SCREWED 2" SQUARE OPERATING NUT.
13. (2) 2" 90° BEND BRASS SWING JOINT.
14. 2" PIPE POSITIVE SLOPE TO AIR VAC
15. CORPORATION STOP-2" MIP X MIP FORD BALLCORP FB 5000 OR MUELLER ORISEAL H9969
16. FORCE MAIN
17. FOGTITE NO.2 CONCRETE METER BOXES STACKED WITH 3/8" STEEL TRAFFIC COVER.
18. AFFIX 2"X3" ALUMINUM TAG STAMPED "SEWER" WITH STAINLESS STEEL WIRE.
19. 2" CTS X 2" MIP COMPRESSION ADAPTOR.
20. TRACER WIRE.
21. VALVE BOX – RICH 940B WITH REGULAR BASE

SNOQUALMIE RIDGE II			
2" SEWAGE AIR & VACUUM VALVE ASSEMBLY			
DWN	CKD	DATE	DWG
ER		10/18/04	5-13

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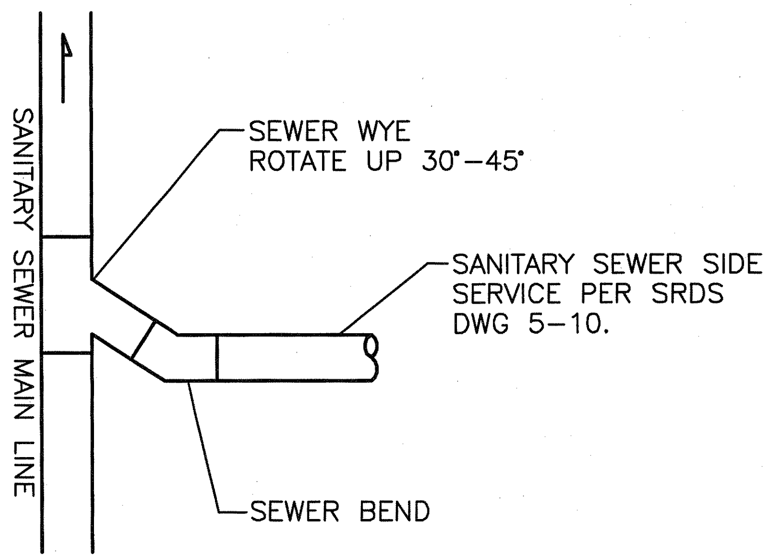
Approved: AB#04-172 11/8/04
Attest: Jodi Warren/CMC City Clerk



SNOQUALMIE RIDGE II			
WYE SIDE SEWER CONNECTION			
DWN ER	CKD	DATE 09/16/04	DWG 5-14

Approved: AB#04-172 11/8/04
Attest: Jodi Warren/CMC City Clerk

Appendix D

2012 to 2018 WRF Influent Flow and Loading Summaries

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Month-Yr	Flow (MGD)		BOD5 (ppd)[1]		TSS (ppd)[2]		% of NPDES Permit Max. Month Limit (Flow)[3]	% of NPDES Permit Max. Month Limit (BOD_5)[4]	% of NPDES Permit Max. Month Limit (TSS)[5]
	Monthly Average	Monthly Max.	Monthly Average	Monthly Max.	Monthly Average	Monthly Max.			
Jan-12	1.09	1.81	2,118	2,712	1,680	2,493	51%	41%	32%
Feb-12	1.05	1.55	2,335	3,441	1,682	2,639	49%	45%	32%
Mar-12	1.13	1.63	2,179	3,030	1,766	2,492	52%	42%	34%
Apr-12	0.90	1.19	2,242	2,960	1,833	2,037	42%	43%	35%
May-12	0.82	1.03	1,932	2,367	1,681	2,018	38%	37%	32%
Jun-12	0.81	0.98	1,891	3,307	1,557	2,360	38%	36%	30%
Jul-12	0.72	0.79	1,683	2,564	1,727	2,311	33%	32%	33%
Aug-12	0.76	0.87	1,649	2,003	2,123	2,988	35%	32%	41%
Sep-12	0.75	0.84	1,798	2,524	2,518	4,990	35%	34%	48%
Oct-12	0.76	1.11	1,725	3,291	1,747	2,609	35%	33%	33%
Nov-12	1.02	1.61	2,450	4,570	1,993	2,914	47%	47%	38%
Dec-12	1.22	1.90	2,355	3,626	2,169	3,025	57%	45%	42%
2012 AVG	**0.92**	**---**	**2,030**	**---**	**1,873**	**---**	**---**	**---**	**---**
2012 MAX	**1.22**	**1.90**	**2,450**	**4,570**	**2,518**	**4,990**	**57%**	**47%**	**48%**
Jan-13	0.90	1.26	2,108	3,703	1,858	2,946	42%	40%	36%
Feb-13	0.86	0.94	2,009	2,429	1,530	2,224	40%	38%	29%
Mar-13	0.91	1.14	1,939	2,616	1,997	3,632	42%	37%	38%
Apr-13	1.07	1.52	1,759	2,158	1,827	2,568	50%	34%	35%
May-13	0.80	0.98	1,682	2,365	1,793	2,837	37%	32%	34%
Jun-13	0.77	0.89	1,459	1,855	1,502	1,905	36%	28%	29%
Jul-13	0.69	0.76	1,201	1,620	1,222	2,068	32%	23%	23%
Aug-13[6]	0.70	0.79	1,350	2,029	1,398	1,962	33%	26%	27%
Sep-13	0.77	2.08	1,256	2,087	1,589	2,625	36%	24%	30%
Oct-13	0.90	1.34	1,714	2,313	1,664	3,187	42%	33%	32%
Nov-13	1.12	1.90	2,333	3,032	2,667	4,257	52%	45%	51%
Dec-13	1.05	1.64	2,481	3,502	2,361	3,084	49%	48%	45%
2013 AVG	**0.88**	**---**	**1,774**	**---**	**1,784**	**---**	**---**	**---**	**---**
2013 MAX	**1.12**	**2.08**	**2,481**	**3,703**	**2,667**	**4,257**	**52%**	**48%**	**51%**
Jan-14	1.16	1.79	2,276	2,837	2,583	3,753	54%	44%	49%
Feb-14	1.53	2.54	2,209	3,725	2,979	4,734	71%	42%	57%
Mar-14	1.71	2.58	2,117	2,476	3,162	4,198	80%	41%	61%
Apr-14	1.19	1.53	2,217	2,767	2,594	3,593	56%	42%	50%
May-14	1.16	1.65	2,748	3,340	3,030	4,249	54%	53%	58%
Jun-14	1.06	1.25	2,821	3,135	3,102	3,617	49%	54%	59%
Jul-14	1.04	1.27	2,687	3,656	2,781	3,637	48%	51%	53%
Aug-14	1.02	1.37	2,721	4,370	3,077	4,620	47%	52%	59%
Sep-14	1.02	1.18	2,871	3,541	3,009	5,110	48%	55%	58%
Oct-14[7]	1.25	1.80	2,904	3,410	3,047	4,025	58%	56%	58%
Nov-14	1.35	1.99	3,151	5,279	2,822	3,828	63%	60%	54%
Dec-14	1.34	1.81	3,523	6,453	3,046	3,902	62%	67%	58%
2014 AVG	**1.24**	**---**	**2,687**	**---**	**2,936**	**---**	**---**	**---**	**---**
2014 MAX	**1.71**	**2.58**	**3,523**	**6,453**	**3,162**	**5,110**	**80%**	**67%**	**61%**
Jan-15	1.32	2.29	2,966	4,496	2,645	3,921	61%	57%	51%
Feb-15	1.30	1.92	2,831	3,403	2,893	3,542	60%	54%	55%
Mar-15	1.11	1.53	3,202	3,663	3,053	3,792	52%	61%	58%
Apr-15	1.01	1.37	3,030	4,033	2,761	4,011	47%	58%	53%
May-15	0.93	1.08	3,008	4,869	2,967	4,326	43%	58%	57%
Jun-15	1.00	1.21	2,970	4,187	2,922	3,809	47%	57%	56%
Jul-15	0.93	1.12	2,876	4,444	2,638	4,448	43%	55%	51%
Aug-15	0.92	1.09	2,574	3,538	2,553	3,402	43%	49%	49%
Sep-15	0.86	0.99	2,686	3,722	2,144	2,471	40%	51%	41%
Oct-15	0.86	1.62	2,527	3,450	2,256	2,912	40%	48%	43%
Nov-15	1.47	3.07	3,818	7,283	2,674	6,159	68%	73%	51%
Dec-15	1.76	4.32	4,568	8,422	3,068	5,974	82%	88%	59%
2015 AVG	**1.12**	**---**	**3,088**	**---**	**2,715**	**---**	**---**	**---**	**---**
2015 MAX	**1.76**	**4.32**	**4,568**	**8,422**	**3,068**	**6,159**	**82%**	**88%**	**59%**
Jan-16	1.22	1.75	3,269	4,217	2,632	4,052	57%	63%	50%
Feb-16	1.28	1.54	3,525	4,533	3,029	3,975	59%	68%	58%
Mar-16	1.32	1.77	4,229	6,525	3,705	5,953	62%	81%	71%
Apr-16	1.03	1.13	3,335	3,959	2,519	3,563	48%	64%	48%
May-16	1.03	1.51	5,243	9,038	3,111	4,113	48%	100%	60%
Jun-16	1.07	1.27	4,069	5,896	3,163	4,737	50%	78%	61%
Jul-16	1.02	1.14	3,959	4,992	2,821	3,659	48%	76%	54%
Aug-16	1.04	1.17	3,730	4,554	2,823	3,572	48%	71%	54%
Sep-16	1.02	1.13	3,793	5,522	2,785	3,454	48%	73%	53%
Oct-16	1.34	1.88	4,968	8,143	3,087	4,335	62%	95%	59%
Nov-16	1.53	2.06	5,176	8,143	3,162	4,335	71%	99%	61%
Dec-16	1.31	1.77	4,209	5,153	2,906	4,082	61%	81%	56%
2016 AVG	**1.19**	**---**	**4,126**	**---**	**2,979**	**---**	**---**	**---**	**---**
2016 MAX	**1.53**	**2.06**	**5,243**	**9,038**	**3,705**	**5,953**	**71%**	**100%**	**71%**

Month-Yr	Flow (MGD)		BOD_5 (ppd)[1]		TSS (ppd)[2]		% of NPDES Permit Max. Month Limit (Flow)[3]	% of NPDES Permit Max. Month Limit (BOD_5)[4]	% of NPDES Permit Max. Month Limit (TSS)[5]
	Monthly Average	Monthly Max.	Monthly Average	Monthly Max.	Monthly Average	Monthly Max.			
Jan-17	1.03	1.65	4,179	5,348	3,071	4,274	48%	80%	59%
Feb-17	1.49	3.00	4,131	6,222	3,301	6,389	69%	79%	63%
Mar-17	1.55	2.30	3,317	3,802	2,560	3,344	72%	64%	49%
Apr-17	1.30	1.62	3,498	4,687	2,859	7,486	60%	67%	55%
May-17	1.14	1.45	4,414	6,523	2,961	3,748	53%	85%	57%
Jun-17	1.00	1.12	3,704	5,101	2,932	4,181	46%	71%	56%
Jul-17	1.00	1.28	3,061	4,469	2,582	3,291	47%	59%	49%
Aug-17	1.03	1.40	3,436	6,444	2,655	3,953	48%	66%	51%
Sep-17	0.94	1.03	3,310	4,316	2,369	2,957	44%	63%	45%
Oct-17	1.15	1.85	2,651	4,090	2,521	3,930	53%	51%	48%
Nov-17	1.50	2.40	3,059	4,764	2,260	2,754	70%	59%	43%
Dec-17	1.39	2.21	3,798	5,504	2,383	4,520	65%	73%	46%
2017 AVG	**1.21**	**---**	**3,547**	**---**	**2,705**	**---**	**---**	**---**	**---**
2017 MAX	**1.55**	**3.00**	**4,414**	**6,523**	**3,301**	**7,486**	**72%**	**85%**	**63%**
Jan-18	1.64	2.19	4,891	7,146	2,498	3,288	76%	94%	48%
Feb-18	1.30	1.86	4,407	6,645	2,708	3,543	60%	84%	52%
Mar-18	1.04	1.38	3,677	4,312	2,257	2,936	48%	70%	43%
Apr-18	1.35	2.11	3,720	5,817	2,447	3,274	63%	71%	47%
May-18	1.06	1.38	2,809	4,143	2,220	2,795	49%	54%	43%
Jun-18	0.92	1.03	2,319	2,907	2,089	2,448	43%	44%	40%
Jul-18	0.88	0.98	2,388	2,810	2,329	2,857	41%	46%	45%
Aug-18	0.83	0.89	2,117	2,557	2,027	2,793	39%	41%	39%
Sep-18	0.86	1.11	2,228	3,703	2,011	2,777	40%	43%	39%
Oct-18	0.88	1.50	2,278	3,128	1,761	2,538	41%	44%	34%
Nov-18	1.07	1.85	2,582	3,153	2,534	4,135	50%	49%	49%
Dec-18	1.26	1.80	2,932	3,784	3,106	4,067	59%	56%	59%
2018 AVG	**1.09**	**---**	**3,029**	**---**	**2,332**	**---**	**---**	**---**	**---**
2018 MAX	**1.64**	**2.19**	**4,891**	**7,146**	**3,106**	**4,135**	**76%**	**94%**	**59%**

Notes:

1 = The City used an adjustment factor for reporting influent BOD_5 loadings on its daily monitoring reports during the period reported (2012 through 2018). The historical total influent BOD_5 loadings at the WRF were determined by adding this adjustment factor, which is 258 ppd, to the values on the City's discharge monitoring reports.

2 = The City used an adjustment factor for reporting influent TSS loadings on its daily monitoring reports during the period reported (2012 through 2018). The historical total influent TSS loadings at the WRF were determined by adding this adjustment factor, which is 215 ppd, to the values on the City's discharge monitoring reports.

3 = The City's WRF is permitted for a maximum month average influent flow of 2.15 MGD.

4 = The City's WRF is permitted for a maximum month average influent BOD_5 loading of 5,220 ppd.

5 = The City's WRF is permitted for a maximum month average influent TSS loading of 5,220 ppd.

6 = The influent BOD_5 loading for August 7, 2013, was removed from these analyses because it was negative, which is not feasible.

7 = The influent flow and BOD_5 and TSS loadings for October 8, 2014, and October 9, 2014, were removed from these analyses since there was a significant water main failure on these days that entered the sewer system.

Appendix E

I/I Data and Analyses

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Year	Pop.
2012	11,261
2013	11,641
2014	12,071
2015	12,791
2016	13,051
2017	13,151
2018	13,391

Max. Flow for Inflow (gpcd)
275

(orange)	Max Inflow Day
(green)	Notable Rain Event (> 0.30 in.)
(red)	No Precipitation Data Available

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
Note: 1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification*.					
2012					
1-Jan	0.978	0.00	28	38	87
2-Jan	1.052	0.00	37	46	93
3-Jan	0.966	0.36	38	46	86
4-Jan	1.042	0.00	38	46	93
5-Jan	1.125	1.22	37	47	100
6-Jan	0.943	0.03	31	39	84
7-Jan	0.940	0.00	31	35	83
8-Jan	0.932	0.00	33	39	83
9-Jan	0.856	0.00	37	47	76
10-Jan	0.788	0.19	31	46	70
11-Jan	0.735	0.00	27	36	65
12-Jan	0.736	0.00	33	38	65
13-Jan	0.707	0.00	27	39	63
14-Jan	0.803	0.17	28	38	71
15-Jan	0.762	0.50	27	37	68
16-Jan	0.766	0.25	23	29	68
17-Jan	0.723	0.33	24	30	64
18-Jan	0.730	0.01	23	30	65
19-Jan	0.653	0.70	-	-	58
20-Jan	1.022	0.75	-	-	91
21-Jan	1.740	0.65	33	39	154
22-Jan	1.562	0.01	30	36	139
23-Jan	1.305	0.44	31	36	116
24-Jan	1.216	0.00	30	35	108
25-Jan	1.174	0.97	34	47	104
26-Jan	1.125	0.97	31	43	100
27-Jan	1.076	0.09	26	33	96
28-Jan	1.083	0.00	25	30	96
29-Jan	1.474	0.50	30	40	131
30-Jan	1.372	2.48	35	43	122
31-Jan	1.346	0.00	34	40	120
1-Feb	1.282	0.50	35	40	114
2-Feb	1.165	0.48	30	40	103
3-Feb	1.063	0.00	31	42	94
4-Feb	1.039	0.00	40	45	92
5-Feb	1.013	0.00	42	46	90

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
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6-Feb	0.893	0.00	41	49	79
7-Feb	0.836	0.00	42	49	74
8-Feb	0.779	0.00	37	48	69
9-Feb	0.772	0.03	38	43	69
10-Feb	0.747	0.09	40	47	66
11-Feb	0.782	0.11	38	49	69
12-Feb	0.783	0.03	35	41	69
13-Feb	0.757	0.09	34	41	67
14-Feb	0.725	0.09	32	39	64
15-Feb	0.693	0.14	30	36	62
16-Feb	0.702	0.03	31	38	62
17-Feb	0.750	0.11	35	40	67
18-Feb	0.994	1.08	32	46	88
19-Feb	1.066	1.14	32	37	95
20-Feb	0.953	0.00	29	36	85
21-Feb	1.259	1.11	31	43	112
22-Feb	1.471	2.75	31	48	131
23-Feb	1.212	0.42	31	39	108
24-Feb	1.281	0.06	32	39	114
25-Feb	1.162	1.20	31	39	103
26-Feb	1.141	0.31	30	34	101
27-Feb	1.082	0.17	21	31	96
28-Feb	1.012	0.03	21	35	90
29-Feb	0.984	0.06	27	34	87
1-Mar	0.912	0.50	28	34	81
2-Mar	0.893	0.11	29	34	79
3-Mar	1.028	0.64	32	42	91
4-Mar	0.946	0.00	32	45	84
5-Mar	0.971	0.11	34	43	86
6-Mar	0.894	0.72	27	38	79
7-Mar	0.838	0.00	22	32	74
8-Mar	0.828	0.00	23	37	74
9-Mar	0.797	0.00	32	49	71
10-Mar	0.937	0.22	36	46	83
11-Mar	1.195	1.03	32	40	106
12-Mar	1.167	0.28	30	35	104
13-Mar	1.263	0.72	29	35	112
14-Mar	1.245	0.19	27	32	111
15-Mar	1.549	0.78	29	37	138
16-Mar	1.524	1.08	31	42	135
17-Mar	1.354	0.19	31	39	120
18-Mar	1.261	0.14	31	37	112
19-Mar	1.079	0.19	24	33	96
20-Mar	1.149	0.25	30	38	102
21-Mar	1.085	0.92	28	35	96
22-Mar	1.043	0.09	28	36	93
23-Mar	0.967	#N/A	28	38	86

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
Note: 1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification* .					
24-Mar	0.940	0.00	28	42	83
25-Mar	0.978	0.00	32	49	87
26-Mar	0.906	0.11	35	47	80
27-Mar	0.840	0.03	34	42	75
28-Mar	0.759	0.00	35	47	67
29-Mar	0.956	0.28	35	47	85
30-Mar	1.112	1.53	37	42	99
31-Mar	1.078	0.14	33	42	96
1-Apr	1.066	0.44	33	42	95
2-Apr	0.950	0.33	33	39	84
3-Apr	0.883	0.00	33	50	78
4-Apr	0.810	0.09	32	49	72
5-Apr	0.783	0.06	33	49	69
6-Apr	0.837	0.17	32	41	74
7-Apr	0.879	0.03	28	41	78
8-Apr	0.908	0.00	29	52	81
9-Apr	0.787	0.00	40	58	70
10-Apr	0.720	0.00	40	64	64
11-Apr	0.721	0.00	40	61	64
12-Apr	0.737	0.31	38	46	65
13-Apr	0.697	0.36	32	51	62
14-Apr	0.725	0.00	32	51	64
15-Apr	0.749	0.00	34	55	66
16-Apr	0.735	0.47	38	56	65
17-Apr	0.700	0.00	35	47	62
18-Apr	0.697	0.14	34	45	62
19-Apr	0.732	0.11	34	47	65
20-Apr	1.003	1.83	36	51	89
21-Apr	0.878	0.22	37	45	78
22-Apr	0.883	0.00	43	61	78
23-Apr	0.806	0.00	46	70	72
24-Apr	0.761	0.00	45	69	68
25-Apr	0.790	0.03	45	54	70
26-Apr	0.871	0.72	44	54	77
27-Apr	0.774	0.42	35	45	69
28-Apr	0.972	0.09	37	48	86
29-Apr	1.127	0.03	37	54	100
30-Apr	1.094	0.80	42	53	97
1-May	0.861	0.83	37	47	76
2-May	0.805	0.19	35	43	71
3-May	0.845	0.00	36	48	75
4-May	0.948	1.11	38	47	84
5-May	0.942	0.42	34	46	84
6-May	0.953	0.03	34	46	85
7-May	0.851	0.00	35	57	76
8-May	0.789	0.00	41	69	70
9-May	0.755	0.00	38	64	67

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
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10-May	0.741	0.00	35	47	66
11-May	0.721	0.00	32	49	64
12-May	0.733	0.00	34	59	65
13-May	0.754	0.00	47	73	67
14-May	0.700	0.00	46	74	62
15-May	0.663	0.00	45	76	59
16-May	0.643	0.00	44	69	57
17-May	0.650	0.09	40	64	58
18-May	0.622	0.00	39	56	55
19-May	0.656	0.00	37	55	58
20-May	0.752	0.00	46	62	67
21-May	0.750	0.31	48	55	67
22-May	0.769	1.22	42	55	68
23-May	0.756	0.72	41	48	67
24-May	0.738	0.64	40	47	66
25-May	0.705	0.03	42	54	63
26-May	0.664	0.00	42	62	59
27-May	0.639	0.00	44	66	57
28-May	0.741	0.06	46	55	66
29-May	0.671	0.14	42	53	60
30-May	0.654	0.00	42	53	58
31-May	0.691	0.28	45	62	61
1-Jun	0.711	0.39	51	58	63
2-Jun	0.722	0.36	47	60	64
3-Jun	0.744	0.22	42	56	66
4-Jun	0.687	0.00	42	53	61
5-Jun	0.782	0.58	-	-	69
6-Jun	0.770	0.83	38	48	68
7-Jun	0.791	0.11	40	54	70
8-Jun	0.780	#N/A	40	53	69
9-Jun	0.760	0.22	41	49	68
10-Jun	0.902	0.03	42	52	80
11-Jun	0.701	0.00	44	58	62
12-Jun	0.695	0.00	44	69	62
13-Jun	0.690	0.25	44	57	61
14-Jun	0.668	0.00	43	53	59
15-Jun	0.660	0.00	41	55	59
16-Jun	0.694	0.00	42	66	62
17-Jun	0.724	0.36	53	65	64
18-Jun	0.760	0.56	45	57	67
19-Jun	0.806	0.42	44	51	72
20-Jun	0.676	0.00	44	56	60
21-Jun	0.641	0.00	46	68	57
22-Jun	0.697	0.00	50	72	62
23-Jun	0.791	0.86	48	52	70
24-Jun	0.768	0.39	42	54	68
25-Jun	0.707	0.11	42	58	63

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
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26-Jun	0.745	0.25	47	60	66
27-Jun	0.703	0.32	42	53	62
28-Jun	0.680	0.00	42	65	60
29-Jun	0.674	0.02	50	72	60
30-Jun	0.705	0.03	54	66	63
1-Jul	0.689	0.11	48	63	61
2-Jul	0.659	0.00	48	56	59
3-Jul	0.695	0.50	48	60	62
4-Jul	0.660	0.03	43	56	59
5-Jul	0.643	0.00	43	62	57
6-Jul	0.613	0.00	46	69	54
7-Jul	0.631	0.00	50	74	56
8-Jul	0.641	0.00	51	75	57
9-Jul	0.647	0.00	55	77	57
10-Jul	0.621	0.00	53	73	55
11-Jul	0.601	0.00	52	68	53
12-Jul	0.609	0.00	53	74	54
13-Jul	0.605	0.00	54	75	54
14-Jul	0.621	0.00	56	68	55
15-Jul	0.678	0.00	53	70	60
16-Jul	0.613	0.00	52	57	54
17-Jul	0.612	0.00	52	72	54
18-Jul	0.585	0.00	54	74	52
19-Jul	0.571	0.00	54	67	51
20-Jul	0.638	0.19	54	71	57
21-Jul	0.605	0.53	54	60	54
22-Jul	0.660	0.00	50	66	59
23-Jul	0.405	0.36	46	57	36
24-Jul	0.573	0.00	47	57	51
25-Jul	0.673	0.00	48	66	60
26-Jul	0.676	0.00	53	74	60
27-Jul	0.599	0.00	54	76	53
28-Jul	0.616	0.00	53	59	55
29-Jul	0.688	0.00	53	66	61
30-Jul	0.655	0.00	52	68	58
31-Jul	0.623	0.00	51	60	55
1-Aug	0.670	0.00	49	62	59
2-Aug	0.674	0.00	52	68	60
3-Aug	0.686	0.00	51	65	61
4-Aug	0.669	0.00	51	73	59
5-Aug	0.704	0.00	60	84	63
6-Aug	0.722	0.00	62	87	64
7-Aug	0.678	0.00	58	76	60
8-Aug	0.672	0.00	53	63	60
9-Aug	0.659	0.00	51	62	59
10-Aug	0.622	0.00	53	67	55
11-Aug	0.587	0.00	52	69	52

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
Note: 1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification* .					
12-Aug	0.637	0.00	52	74	57
13-Aug	0.667	0.00	56	79	59
14-Aug	0.641	0.00	56	78	57
15-Aug	0.642	0.00	55	75	57
16-Aug	0.638	0.00	55	77	57
17-Aug	0.658	0.00	61	88	58
18-Aug	0.733	0.00	56	85	65
19-Aug	0.777	0.00	56	73	69
20-Aug	0.690	0.00	54	62	61
21-Aug	0.661	0.00	52	71	59
22-Aug	0.657	0.00	51	66	58
23-Aug	0.642	0.00	51	62	57
24-Aug	0.597	0.00	44	60	53
25-Aug	0.690	0.00	45	63	61
26-Aug	0.732	0.00	45	72	65
27-Aug	0.688	0.00	50	69	61
28-Aug	0.682	0.00	50	69	61
29-Aug	0.680	0.00	50	68	60
30-Aug	0.659	0.00	48	62	59
31-Aug	0.666	0.00	48	65	59
1-Sep	0.630	0.00	44	63	56
2-Sep	0.633	0.00	45	65	56
3-Sep	0.750	0.00	45	65	67
4-Sep	0.699	0.00	47	64	62
5-Sep	0.651	0.00	48	69	58
6-Sep	0.647	0.00	50	73	57
7-Sep	0.647	0.00	55	74	57
8-Sep	0.667	0.00	54	83	59
9-Sep	0.727	0.00	50	79	65
10-Sep	0.730	0.12	44	58	65
11-Sep	0.684	0.03	40	56	61
12-Sep	0.670	0.00	39	57	59
13-Sep	0.647	0.00	40	64	57
14-Sep	0.622	0.00	55	76	55
15-Sep	0.681	0.00	51	73	60
16-Sep	0.690	0.00	48	69	61
17-Sep	0.665	0.00	49	66	59
18-Sep	0.648	0.00	50	72	58
19-Sep	0.640	0.00	48	75	57
20-Sep	0.636	0.00	48	70	56
21-Sep	0.676	0.00	48	70	60
22-Sep	0.666	0.00	50	55	59
23-Sep	0.714	0.00	44	53	63
24-Sep	0.639	0.00	47	59	57
25-Sep	0.641	0.00	47	61	57
26-Sep	0.613	0.00	45	58	54
27-Sep	0.632	0.00	44	60	56

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
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28-Sep	0.593	0.00	46	65	53
29-Sep	0.664	0.00	51	69	59
30-Sep	0.703	0.00	42	59	62
1-Oct	0.596	0.00	42	59	53
2-Oct	0.589	0.00	44	68	52
3-Oct	0.625	0.00	37	56	56
4-Oct	0.639	0.00	36	59	57
5-Oct	0.602	0.00	41	60	53
6-Oct	0.652	0.00	44	62	58
7-Oct	0.691	0.00	51	65	61
8-Oct	0.596	0.00	45	68	53
9-Oct	0.326	0.00	40	65	29
10-Oct	0.296	0.00	40	55	26
11-Oct	0.213	0.00	37	55	19
12-Oct	0.616	0.00	36	57	55
13-Oct	0.685	0.44	44	53	61
14-Oct	0.732	0.31	52	54	65
15-Oct	0.738	0.89	49	57	66
16-Oct	0.712	1.21	47	58	63
17-Oct	0.604	0.11	40	51	54
18-Oct	0.685	0.00	38	50	61
19-Oct	0.736	0.86	43	60	65
20-Oct	0.760	0.53	40	54	67
21-Oct	0.777	0.22	34	43	69
22-Oct	0.719	0.09	34	42	64
23-Oct	0.693	0.50	34	42	62
24-Oct	0.705	0.06	35	42	63
25-Oct	0.727	0.25	37	43	65
26-Oct	0.678	0.00	37	43	60
27-Oct	0.770	0.36	39	46	68
28-Oct	0.847	1.20	42	54	75
29-Oct	0.922	1.58	48	56	82
30-Oct	1.019	0.58	49	55	90
31-Oct	0.935	1.33	49	52	83
1-Nov	0.965	0.50	45	52	86
2-Nov	0.881	0.17	46	51	78
3-Nov	0.883	0.19	45	52	78
4-Nov	0.920	0.33	48	52	82
5-Nov	0.910	0.50	45	56	81
6-Nov	0.826	0.00	41	48	73
7-Nov	0.759	0.17	41	55	67
8-Nov	0.682	0.00	31	44	61
9-Nov	0.644	0.00	32	39	57
10-Nov	0.703	0.00	28	37	62
11-Nov	0.717	0.00	28	35	64
12-Nov	0.799	0.58	31	39	71
13-Nov	0.751	0.11	37	42	67

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14-Nov	0.736	0.42	40	45	65
15-Nov	0.706	0.03	35	44	63
16-Nov	0.696	0.00	34	43	62
17-Nov	0.748	0.00	37	46	66
18-Nov	0.923	0.44	37	46	82
19-Nov	1.518	1.20	37	41	135
20-Nov	1.352	1.50	38	41	120
21-Nov	1.266	0.36	36	44	112
22-Nov	1.147	0.28	32	39	102
23-Nov	1.303	0.22	32	43	116
24-Nov	1.335	1.22	39	45	119
25-Nov	1.171	0.03	33	41	104
26-Nov	1.027	0.00	34	38	91
27-Nov	0.908	0.00	32	42	81
28-Nov	0.885	0.00	34	44	79
29-Nov	0.866	0.09	39	47	77
30-Nov	0.868	0.09	41	46	77
1-Dec	1.096	0.58	39	47	97
2-Dec	1.359	0.44	38	44	121
3-Dec	1.814	1.22	37	42	161
4-Dec	1.723	0.78	37	43	153
5-Dec	1.516	1.00	33	44	135
6-Dec	1.496	0.25	35	38	133
7-Dec	1.228	1.30	34	39	109
8-Dec	1.174	0.39	31	40	104
9-Dec	1.134	0.00	30	34	101
10-Dec	1.062	0.53	31	36	94
11-Dec	1.020	0.03	33	39	91
12-Dec	1.025	0.61	34	39	91
13-Dec	0.960	0.11	32	36	85
14-Dec	0.971	0.36	31	35	86
15-Dec	0.999	0.06	27	33	89
16-Dec	1.149	0.14	29	34	102
17-Dec	1.271	0.83	31	38	113
18-Dec	1.064	0.06	29	38	94
19-Dec	1.113	0.22	28	31	99
20-Dec	1.511	0.58	28	36	134
21-Dec	1.285	0.28	29	35	114
22-Dec	1.147	0.03	32	39	102
23-Dec	1.067	0.00	32	39	95
24-Dec	0.981	0.19	31	38	87
25-Dec	0.958	0.11	31	36	85
26-Dec	0.921	0.17	31	36	82
27-Dec	0.952	0.75	31	36	85
28-Dec	0.880	0.11	32	35	78
29-Dec	0.867	0.00	30	34	77
30-Dec	0.855	0.09	27	33	76

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
31-Dec	0.799	0.00	26	30	71

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Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
Note: 1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification* .					
2013					
1-Jan	0.869	0.00	24	32	75
2-Jan	0.802	0.00	26	36	69
3-Jan	0.773	0.00	27	35	66
4-Jan	0.785	0.39	28	33	67
5-Jan	0.793	0.09	31	37	68
6-Jan	0.840	0.06	31	37	72
7-Jan	1.040	1.81	31	36	89
8-Jan	1.039	0.47	34	44	89
9-Jan	1.191	0.00	34	48	102
10-Jan	1.019	0.33	29	36	88
11-Jan	0.923	0.03	24	31	79
12-Jan	0.927	0.00	20	27	80
13-Jan	0.931	0.00	19	24	80
14-Jan	0.851	0.00	19	28	73
15-Jan	0.777	0.00	26	31	67
16-Jan	0.738	0.00	25	31	63
17-Jan	0.748	0.00	25	32	64
18-Jan	0.709	0.00	29	35	61
19-Jan	0.735	0.00	29	37	63
20-Jan	0.756	0.00	31	39	65
21-Jan	0.742	0.00	32	43	64
22-Jan	0.719	0.00	32	41	62
23-Jan	0.695	0.00	34	41	60
24-Jan	0.710	0.22	32	38	61
25-Jan	0.747	0.61	30	38	64
26-Jan	0.785	0.11	30	39	67
27-Jan	0.836	0.19	32	37	72
28-Jan	0.774	0.50	31	35	66
29-Jan	0.796	0.83	31	37	68
30-Jan	0.908	1.14	35	40	78
31-Jan	0.893	0.19	36	42	77
1-Feb	0.853	0.19	35	41	73
2-Feb	0.866	0.00	33	42	74
3-Feb	0.864	0.00	31	45	74
4-Feb	0.786	0.09	33	38	68
5-Feb	0.837	0.14	33	44	72
6-Feb	0.840	0.86	33	44	72
7-Feb	0.840	0.14	33	41	72
8-Feb	0.738	0.03	29	38	63
9-Feb	0.800	0.03	29	36	69
10-Feb	0.842	0.00	31	37	72
11-Feb	0.743	0.00	30	38	64
12-Feb	0.746	0.00	33	40	64
13-Feb	0.723	0.47	36	43	62
14-Feb	0.725	0.06	36	39	62
15-Feb	0.697	0.00	33	42	60

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16-Feb	0.761	0.06	32	46	65
17-Feb	0.784	0.61	32	41	67
18-Feb	0.736	0.00	30	37	63
19-Feb	0.692	0.00	28	39	59
20-Feb	0.658	0.00	29	41	57
21-Feb	0.693	0.06	31	37	60
22-Feb	0.798	0.72	31	37	69
23-Feb	0.822	0.42	32	39	71
24-Feb	0.853	0.39	31	37	73
25-Feb	0.825	0.42	32	38	71
26-Feb	0.775	0.03	31	40	67
27-Feb	0.803	0.22	31	38	69
28-Feb	0.859	0.25	32	41	74
1-Mar	0.955	1.14	38	50	82
2-Mar	0.959	0.00	38	51	82
3-Mar	1.057	0.89	31	49	91
4-Mar	0.930	0.00	27	34	80
5-Mar	0.856	0.00	27	40	74
6-Mar	0.832	0.00	37	43	71
7-Mar	0.895	0.61	31	40	77
8-Mar	0.807	0.06	29	40	69
9-Mar	0.813	0.00	30	43	70
10-Mar	0.825	0.00	30	48	71
11-Mar	0.744	0.11	33	38	64
12-Mar	0.840	0.28	34	46	72
13-Mar	0.797	0.78	44	47	68
14-Mar	0.779	0.25	42	48	67
15-Mar	0.773	0.22	42	51	66
16-Mar	0.850	0.14	41	51	73
17-Mar	0.856	0.50	32	42	74
18-Mar	0.771	0.19	32	38	66
19-Mar	0.763	0.03	30	39	66
20-Mar	0.945	0.56	34	44	81
21-Mar	0.838	0.44	32	41	72
22-Mar	0.839	0.60	28	41	72
23-Mar	0.844	0.00	24	35	72
24-Mar	0.890	0.00	26	37	76
25-Mar	0.793	0.00	34	40	68
26-Mar	0.760	0.00	34	47	65
27-Mar	0.737	0.00	35	52	63
28-Mar	0.745	0.00	35	51	64
29-Mar	0.724	0.14	36	53	62
30-Mar	0.746	0.03	36	54	64
31-Mar	0.771	0.00	35	59	66
1-Apr	0.717	0.00	38	64	62
2-Apr	0.697	0.00	38	56	60
3-Apr	0.682	0.00	38	47	59

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4-Apr	0.716	0.00	38	57	61
5-Apr	0.899	1.44	43	53	77
6-Apr	1.076	1.75	38	48	92
7-Apr	1.310	0.86	37	42	113
8-Apr	1.068	0.56	32	38	92
9-Apr	0.948	0.00	35	45	81
10-Apr	1.029	0.09	36	47	88
11-Apr	1.016	0.86	38	48	87
12-Apr	1.009	0.11	33	41	87
13-Apr	1.184	0.57	32	42	102
14-Apr	1.434	1.39	31	38	123
15-Apr	1.180	0.17	31	42	101
16-Apr	1.072	0.17	31	44	92
17-Apr	1.001	0.03	31	45	86
18-Apr	0.954	0.00	33	52	82
19-Apr	1.167	1.25	37	45	100
20-Apr	1.240	0.83	41	47	106
21-Apr	1.169	0.09	38	47	100
22-Apr	1.009	0.14	33	43	87
23-Apr	0.948	0.00	33	52	81
24-Apr	0.879	0.00	34	55	76
25-Apr	0.874	0.00	37	60	75
26-Apr	0.808	0.00	39	64	69
27-Apr	0.809	0.00	41	66	69
28-Apr	0.850	0.39	43	50	73
29-Apr	0.969	1.42	37	50	83
30-Apr	0.961	1.00	31	38	83
1-May	0.907	0.06	30	39	78
2-May	0.750	0.00	31	55	64
3-May	0.851	0.00	31	64	73
4-May	0.691	0.00	38	63	59
5-May	0.682	0.00	45	71	59
6-May	0.686	0.00	47	77	59
7-May	0.718	0.00	45	78	62
8-May	0.735	0.00	45	68	63
9-May	0.733	0.00	44	58	63
10-May	0.715	0.00	45	67	61
11-May	0.745	0.00	45	74	64
12-May	0.801	0.19	53	75	69
13-May	0.756	0.17	52	60	65
14-May	0.706	0.55	39	58	61
15-May	0.715	0.03	39	55	61
16-May	0.690	0.09	41	59	59
17-May	0.679	0.58	41	61	58
18-May	0.721	0.09	44	52	62
19-May	0.752	0.00	44	51	65
20-May	0.678	0.10	44	53	58

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21-May	0.686	0.06	41	62	59
22-May	0.694	0.12	36	49	60
23-May	0.698	0.32	35	44	60
24-May	0.682	0.15	41	47	59
25-May	0.657	0.03	42	52	56
26-May	0.673	0.02	43	55	58
27-May	0.788	0.36	45	56	68
28-May	0.767	0.45	46	51	66
29-May	0.757	0.40	45	53	65
30-May	0.743	0.17	42	50	64
31-May	0.735	0.11	43	52	63
1-Jun	0.763	0.01	44	56	66
2-Jun	0.806	0.10	46	65	69
3-Jun	0.725	0.00	44	59	62
4-Jun	0.712	0.00	46	64	61
5-Jun	0.703	0.00	46	72	60
6-Jun	0.706	0.00	50	70	61
7-Jun	0.697	0.00	51	72	60
8-Jun	0.703	0.00	46	65	60
9-Jun	0.748	0.00	47	65	64
10-Jun	0.690	0.00	42	60	59
11-Jun	0.657	0.00	44	60	56
12-Jun	0.667	0.10	44	56	57
13-Jun	0.659	0.07	45	58	57
14-Jun	0.650	0.02	46	55	56
15-Jun	0.666	0.00	43	58	57
16-Jun	0.683	0.00	45	70	59
17-Jun	0.670	0.01	49	69	58
18-Jun	0.658	0.07	49	69	57
19-Jun	0.648	0.03	48	61	56
20-Jun	0.673	0.10	48	56	58
21-Jun	0.694	0.85	47	52	60
22-Jun	0.660	0.01	46	58	57
23-Jun	0.700	0.01	47	69	60
24-Jun	0.708	0.22	52	64	61
25-Jun	0.650	0.22	50	57	56
26-Jun	0.667	0.23	51	62	57
27-Jun	0.677	0.30	52	63	58
28-Jun	0.657	0.01	55	64	56
29-Jun	0.642	0.00	56	80	55
30-Jun	0.670	0.00	58	76	58
1-Jul	0.640	0.00	61	84	55
2-Jul	0.641	0.00	60	84	55
3-Jul	0.628	0.00	54	75	54
4-Jul	0.596	0.00	52	71	51
5-Jul	0.624	0.00	52	63	54
6-Jul	0.654	0.00	52	62	56

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7-Jul	0.674	0.00	53	69	58
8-Jul	0.619	0.00	52	68	53
9-Jul	0.604	0.00	53	71	52
10-Jul	0.592	0.00	53	77	51
11-Jul	0.578	0.00	48	68	50
12-Jul	0.594	0.00	44	62	51
13-Jul	0.602	0.00	45	60	52
14-Jul	0.633	0.00	46	68	54
15-Jul	0.592	0.00	48	74	51
16-Jul	0.600	0.00	50	72	52
17-Jul	0.588	0.07	55	78	50
18-Jul	0.587	0.01	52	62	50
19-Jul	0.592	0.00	53	69	51
20-Jul	0.611	0.01	53	72	52
21-Jul	0.649	0.00	54	69	56
22-Jul	0.607	0.00	54	70	52
23-Jul	0.593	0.00	54	70	51
24-Jul	0.567	0.00	55	76	49
25-Jul	0.567	0.00	54	77	49
26-Jul	0.567	0.00	53	77	49
27-Jul	0.560	0.00	49	77	48
28-Jul	0.615	0.00	48	77	53
29-Jul	0.573	0.00	51	64	49
30-Jul	0.583	0.00	51	65	50
31-Jul	0.591	0.00	51	71	51
1-Aug	0.582	0.00	52	66	50
2-Aug	0.603	0.06	52	57	52
3-Aug	0.621	0.02	52	56	53
4-Aug	0.631	0.00	55	68	54
5-Aug	0.589	0.00	55	74	51
6-Aug	0.580	0.00	54	77	50
7-Aug	0.577	0.00	55	78	50
8-Aug	0.609	0.00	53	78	52
9-Aug	0.591	0.00	54	75	51
10-Aug	0.584	0.00	57	76	50
11-Aug	0.620	0.00	55	72	53
12-Aug	0.591	0.00	55	68	51
13-Aug	0.578	0.00	54	70	50
14-Aug	0.561	0.00	55	73	48
15-Aug	0.666	0.12	58	78	57
16-Aug	0.629	0.02	56	68	54
17-Aug	0.530	0.00	57	76	46
18-Aug	0.646	0.00	56	71	55
19-Aug	0.617	0.00	56	72	53
20-Aug	0.596	0.00	50	70	51
21-Aug	0.609	0.00	50	68	52
22-Aug	0.601	0.00	50	74	52

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
23-Aug	0.617	0.00	55	78	53
24-Aug	0.613	0.00	55	65	53
25-Aug	0.694	0.00	50	63	60
26-Aug	0.639	0.05	51	68	55
27-Aug	0.604	0.04	54	71	52
28-Aug	0.642	0.46	56	74	55
29-Aug	0.692	0.35	58	69	59
30-Aug	0.634	0.85	56	66	54
31-Aug	0.612	0.02	52	64	53
1-Sep	0.580	0.01	52	72	50
2-Sep	0.657	0.00	55	73	56
3-Sep	0.667	0.21	57	73	57
4-Sep	0.620	0.08	55	65	53
5-Sep	0.613	1.65	55	68	53
6-Sep	0.781	0.01	55	66	67
7-Sep	0.649	0.00	55	64	56
8-Sep	0.556	0.00	53	64	48
9-Sep	0.474	0.00	53	71	41
10-Sep	0.620	0.00	54	70	53
11-Sep	0.596	0.00	53	71	51
12-Sep	0.606	0.00	57	83	52
13-Sep	0.593	0.01	56	76	51
14-Sep	0.526	0.02	55	63	45
15-Sep	0.595	0.01	55	64	51
16-Sep	0.495	0.37	53	62	42
17-Sep	0.613	0.25	47	60	53
18-Sep	0.605	0.00	48	54	52
19-Sep	0.611	0.00	44	60	53
20-Sep	0.594	0.00	46	67	51
21-Sep	0.639	0.03	52	67	55
22-Sep	0.654	0.14	49	60	56
23-Sep	0.636	0.95	47	52	55
24-Sep	0.647	0.47	45	51	56
25-Sep	0.624	0.00	43	52	54
26-Sep	0.628	0.02	41	49	54
27-Sep	0.619	0.00	43	54	53
28-Sep	0.991	0.19	46	51	85
29-Sep	1.186	2.45	43	51	102
30-Sep	1.999	0.60	42	49	172
1-Oct	1.255	0.35	39	48	108
2-Oct	1.054	0.05	39	45	91
3-Oct	0.957	0.09	42	47	82
4-Oct	0.858	0.00	36	47	74
5-Oct	0.839	0.00	37	54	72
6-Oct	0.899	0.00	42	59	77
7-Oct	0.845	0.23	46	63	73
8-Oct	0.830	0.09	44	63	71

Note:
1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification*.

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
Note: 1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification* .					
9-Oct	0.778	0.58	35	45	67
10-Oct	0.768	0.00	35	50	66
11-Oct	0.746	0.09	40	52	64
12-Oct	0.758	0.14	42	48	65
13-Oct	0.786	0.00	40	48	67
14-Oct	0.701	0.00	36	49	60
15-Oct	0.690	0.00	36	50	59
16-Oct	0.696	0.00	36	56	60
17-Oct	0.671	0.00	39	47	58
18-Oct	0.663	0.00	39	49	57
19-Oct	0.670	0.00	41	57	58
20-Oct	0.727	0.00	37	52	62
21-Oct	0.908	0.00	37	47	78
22-Oct	0.921	0.00	42	57	79
23-Oct	0.867	0.03	46	61	74
24-Oct	0.861	0.01	47	65	74
25-Oct	0.815	0.02	39	64	70
26-Oct	0.766	0.01	39	45	66
27-Oct	0.741	0.03	40	43	64
28-Oct	0.799	0.00	39	44	69
29-Oct	0.898	0.00	34	47	77
30-Oct	0.855	0.00	33	47	73
31-Oct	0.825	0.17	35	49	71
1-Nov	0.908	0.01	43	48	78
2-Nov	0.749	0.52	44	52	64
3-Nov	0.937	0.13	34	50	80
4-Nov	0.868	0.00	31	40	75
5-Nov	0.850	0.11	30	38	73
6-Nov	0.923	0.13	37	46	79
7-Nov	1.181	0.42	38	44	101
8-Nov	1.104	1.20	40	45	95
9-Nov	0.881	0.04	35	44	76
10-Nov	0.824	0.09	36	45	71
11-Nov	0.926	0.00	40	47	80
12-Nov	0.875	0.06	45	52	75
13-Nov	0.900	0.13	45	48	77
14-Nov	0.951	0.01	42	49	82
15-Nov	1.147	0.28	37	43	99
16-Nov	1.641	1.60	32	43	141
17-Nov	1.215	0.01	36	41	104
18-Nov	1.461	0.97	40	44	125
19-Nov	1.817	0.00	38	49	156
20-Nov	1.250	0.09	26	38	107
21-Nov	1.226	0.00	24	30	105
22-Nov	1.162	0.00	24	31	100
23-Nov	0.965	0.04	30	43	83
24-Nov	0.946	0.00	36	48	81

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25-Nov	1.091	0.00	36	42	94
26-Nov	1.064	0.00	36	47	91
27-Nov	1.014	0.00	38	45	87
28-Nov	0.761	0.00	39	52	65
29-Nov	0.755	0.00	35	46	65
30-Nov	0.855	0.10	39	43	73
1-Dec	0.879	0.53	39	49	76
2-Dec	0.978	0.31	32	49	84
3-Dec	0.881	0.00	27	33	76
4-Dec	0.856	0.00	20	28	74
5-Dec	0.875	0.00	18	24	75
6-Dec	0.900	0.00	18	24	77
7-Dec	0.719	0.00	12	21	62
8-Dec	0.837	0.00	12	17	72
9-Dec	0.801	0.00	15	20	69
10-Dec	0.803	0.00	15	29	69
11-Dec	0.949	0.00	26	33	82
12-Dec	0.764	0.00	27	35	66
13-Dec	0.909	0.44	32	37	78
14-Dec	0.756	0.00	34	40	65
15-Dec	0.726	0.01	35	40	62
16-Dec	0.861	0.00	36	46	74
17-Dec	0.848	0.00	32	39	73
18-Dec	1.050	0.00	33	41	90
19-Dec	1.234	0.17	26	37	106
20-Dec	1.009	0.00	23	29	87
21-Dec	1.076	1.65	27	36	92
22-Dec	1.160	0.60	33	46	100
23-Dec	1.560	0.62	37	44	134
24-Dec	1.410	1.09	32	46	121
25-Dec	0.999	0.00	28	35	86
26-Dec	1.244	0.00	31	37	107
27-Dec	1.094	0.00	34	40	94
28-Dec	0.985	0.30	35	46	85
29-Dec	0.943	0.03	31	39	81
30-Dec	1.070	0.00	32	39	92
31-Dec	1.001	0.12	35	44	86

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2014					
1-Jan	0.962	0.01	32	41	80
2-Jan	1.042	0.12	32	40	86
3-Jan	1.286	1.10	32	46	107
4-Jan	0.887	0.04	28	35	73
5-Jan	1.038	0.00	28	31	86
6-Jan	0.953	0.00	30	40	79
7-Jan	1.063	0.21	35	41	88
8-Jan	1.162	0.21	37	40	96
9-Jan	1.254	0.63	37	41	104
10-Jan	1.068	0.56	36	42	88
11-Jan	1.677	0.00	38	51	139
12-Jan	1.710	1.45	31	41	142
13-Jan	1.378	0.10	32	45	114
14-Jan	1.128	0.00	40	44	93
15-Jan	1.214	0.03	33	44	101
16-Jan	1.033	0.00	33	42	86
17-Jan	1.089	0.05	34	41	90
18-Jan	0.904	0.00	34	44	75
19-Jan	0.941	0.00	31	42	78
20-Jan	0.949	0.00	31	45	79
21-Jan	0.951	0.00	39	48	79
22-Jan	0.943	0.00	37	46	78
23-Jan	0.918	0.00	32	40	76
24-Jan	0.913	0.00	37	50	76
25-Jan	0.868	0.00	34	49	72
26-Jan	0.910	0.00	32	47	75
27-Jan	0.885	0.00	32	46	73
28-Jan	0.832	0.00	37	45	69
29-Jan	1.289	1.04	35	42	107
30-Jan	1.229	0.96	35	42	102
31-Jan	1.119	0.17	32	38	93
1-Feb	0.969	0.13	31	36	80
2-Feb	0.947	0.09	28	37	78
3-Feb	0.978	0.00	25	34	81
4-Feb	1.007	0.00	23	30	83
5-Feb	0.962	0.00	13	25	80
6-Feb	0.979	0.00	12	17	81
7-Feb	0.876	0.00	13	19	73
8-Feb	1.225	0.00	18	29	102
9-Feb	1.065	0.00	23	31	88
10-Feb	1.401	0.55	23	32	116
11-Feb	1.429	1.22	28	42	118
12-Feb	1.388	0.00	36	48	115
13-Feb	1.436	0.45	35	45	119
14-Feb	1.459	0.27	34	45	121
15-Feb	1.621	0.15	32	44	134

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16-Feb	1.750	1.04	32	43	145
17-Feb	2.471	1.85	31	39	205
18-Feb	2.472	0.22	31	36	205
19-Feb	1.985	1.06	31	37	164
20-Feb	1.955	0.30	31	39	162
21-Feb	1.681	0.35	31	39	139
22-Feb	1.747	0.06	29	33	145
23-Feb	1.558	0.00	30	33	129
24-Feb	1.870	0.50	31	35	155
25-Feb	1.695	0.00	33	36	140
26-Feb	1.399	0.00	35	45	116
27-Feb	1.436	0.00	36	47	119
28-Feb	1.166	0.00	33	47	97
1-Mar	1.138	0.00	33	51	94
2-Mar	1.378	0.57	25	34	114
3-Mar	1.674	0.00	26	37	139
4-Mar	1.985	0.55	33	44	164
5-Mar	2.500	1.53	36	43	207
6-Mar	2.357	1.47	40	50	195
7-Mar	2.031	0.15	40	45	168
8-Mar	1.807	0.00	35	47	150
9-Mar	2.402	1.80	38	51	199
10-Mar	2.260	0.27	37	48	187
11-Mar	1.871	0.45	35	40	155
12-Mar	1.703	0.02	33	46	141
13-Mar	1.530	0.00	32	53	127
14-Mar	1.488	0.40	32	52	123
15-Mar	1.589	0.10	35	47	132
16-Mar	1.949	0.95	38	52	161
17-Mar	2.147	1.20	31	42	178
18-Mar	1.697	0.03	30	36	141
19-Mar	1.496	0.14	30	42	124
20-Mar	1.629	0.61	31	41	135
21-Mar	1.433	0.02	28	39	119
22-Mar	1.329	0.03	28	42	110
23-Mar	1.389	0.00	27	48	115
24-Mar	1.341	0.00	34	47	111
25-Mar	1.317	0.00	36	60	109
26-Mar	1.206	0.15	36	48	100
27-Mar	1.149	0.13	36	48	95
28-Mar	1.152	0.28	37	45	95
29-Mar	1.228	0.56	37	43	102
30-Mar	1.246	0.81	36	43	103
31-Mar	1.250	0.01	31	44	104
1-Apr	1.179	0.00	32	52	98
2-Apr	1.152	0.00	35	52	95
3-Apr	1.120	0.00	36	49	93

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4-Apr	1.088	0.44	36	53	90
5-Apr	1.016	0.00	38	44	84
6-Apr	0.967	0.22	38	46	80
7-Apr	1.024	0.00	41	48	85
8-Apr	1.112	0.01	40	62	92
9-Apr	0.940	0.38	36	57	78
10-Apr	1.225	0.00	34	47	101
11-Apr	0.936	0.01	34	51	78
12-Apr	0.823	0.00	34	52	68
13-Apr	0.996	0.00	35	51	82
14-Apr	0.952	0.00	36	62	79
15-Apr	1.040	0.08	37	66	86
16-Apr	1.003	0.22	38	52	83
17-Apr	1.244	1.17	41	46	103
18-Apr	1.273	0.00	38	47	105
19-Apr	1.078	0.00	35	47	89
20-Apr	1.213	0.23	37	52	100
21-Apr	1.079	0.00	39	52	89
22-Apr	1.279	0.63	34	56	106
23-Apr	1.290	0.35	33	46	107
24-Apr	1.456	0.60	33	45	121
25-Apr	1.244	0.24	33	47	103
26-Apr	1.110	0.06	36	48	92
27-Apr	1.170	0.17	37	50	97
28-Apr	1.256	0.13	36	43	104
29-Apr	1.205	0.02	37	52	100
30-Apr	1.120	0.00	51	66	93
1-May	1.139	0.00	56	74	94
2-May	1.109	0.00	46	81	92
3-May	0.929	0.21	43	67	77
4-May	1.229	0.50	43	51	102
5-May	1.569	1.56	41	50	130
6-May	1.399	0.00	41	52	116
7-May	1.199	0.08	41	51	99
8-May	1.289	0.00	42	58	107
9-May	1.279	0.51	42	54	106
10-May	1.219	0.27	38	48	101
11-May	1.069	0.06	39	48	89
12-May	1.169	0.00	41	57	97
13-May	0.999	0.00	44	68	83
14-May	1.029	0.00	48	73	85
15-May	1.099	0.00	50	77	91
16-May	0.999	0.00	48	79	83
17-May	0.939	0.00	47	63	78
18-May	0.949	0.00	46	60	79
19-May	0.969	0.05	46	61	80
20-May	1.039	0.00	44	58	86

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21-May	1.109	0.00	44	64	92
22-May	1.099	0.00	46	64	91
23-May	1.019	0.00	48	71	84
24-May	0.819	0.19	47	59	68
25-May	0.879	0.00	46	59	73
26-May	0.959	0.00	47	59	79
27-May	0.979	0.00	42	54	81
28-May	1.039	0.01	43	57	86
29-May	1.029	0.21	-	-	85
30-May	0.989	0.00	40	55	82
31-May	0.929	0.00	40	63	77
1-Jun	0.849	0.00	47	66	70
2-Jun	1.079	0.00	47	64	89
3-Jun	1.039	0.00	46	70	86
4-Jun	1.109	0.00	46	57	92
5-Jun	1.169	0.00	47	63	97
6-Jun	0.999	0.00	45	64	83
7-Jun	0.759	0.00	45	67	63
8-Jun	0.889	0.00	49	67	74
9-Jun	0.929	0.00	49	68	77
10-Jun	0.909	0.00	44	62	75
11-Jun	1.069	0.00	44	58	89
12-Jun	1.119	0.00	44	67	93
13-Jun	1.069	0.69	46	58	89
14-Jun	0.879	0.15	46	50	73
15-Jun	1.099	0.22	46	55	91
16-Jun	1.059	0.56	42	55	88
17-Jun	1.029	0.33	42	51	85
18-Jun	1.039	0.00	44	51	86
19-Jun	0.979	0.00	45	59	81
20-Jun	0.929	0.00	45	71	77
21-Jun	0.919	0.00	42	57	76
22-Jun	0.919	0.00	42	63	76
23-Jun	1.019	0.00	46	69	84
24-Jun	0.969	0.00	46	74	80
25-Jun	0.919	0.00	51	68	76
26-Jun	1.079	0.00	52	71	89
27-Jun	1.169	0.00	50	64	97
28-Jun	0.759	0.45	51	64	63
29-Jun	0.769	0.12	49	58	64
30-Jun	0.909	0.00	46	60	75
1-Jul	0.953	0.00	46	69	79
2-Jul	0.929	0.00	55	84	77
3-Jul	0.946	0.00	52	74	78
4-Jul	0.743	0.00	49	62	62
5-Jul	0.757	0.00	50	67	63
6-Jul	0.780	0.00	54	74	65

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7-Jul	0.944	0.00	56	77	78
8-Jul	0.907	0.00	56	72	75
9-Jul	0.832	0.00	54	76	69
10-Jul	0.974	0.00	52	74	81
11-Jul	1.037	0.00	52	74	86
12-Jul	0.977	0.00	55	80	81
13-Jul	1.024	0.00	60	82	85
14-Jul	1.087	0.01	58	80	90
15-Jul	0.978	0.00	59	78	81
16-Jul	1.087	0.00	58	82	90
17-Jul	1.054	0.00	53	82	87
18-Jul	1.048	0.00	49	71	87
19-Jul	0.856	0.00	49	70	71
20-Jul	0.876	0.06	52	75	73
21-Jul	1.016	0.02	49	57	84
22-Jul	1.096	0.00	52	65	91
23-Jul	1.087	0.65	54	61	90
24-Jul	0.939	1.10	49	58	78
25-Jul	0.815	0.00	48	58	68
26-Jul	0.833	0.00	49	65	69
27-Jul	0.851	0.00	51	71	71
28-Jul	0.877	0.00	52	74	73
29-Jul	1.045	0.00	56	77	87
30-Jul	1.104	0.00	54	77	91
31-Jul	1.184	0.00	54	75	98
1-Aug	1.282	0.00	55	77	106
2-Aug	1.026	0.02	58	75	85
3-Aug	1.069	0.00	57	76	89
4-Aug	1.014	0.00	58	79	84
5-Aug	0.995	0.00	54	82	82
6-Aug	0.893	0.00	54	73	74
7-Aug	0.915	0.00	53	73	76
8-Aug	1.016	0.00	51	72	84
9-Aug	0.836	0.00	49	68	69
10-Aug	0.996	0.00	49	71	82
11-Aug	1.052	0.00	54	78	87
12-Aug	1.056	0.00	68	87	87
13-Aug	1.106	1.02	59	73	92
14-Aug	0.933	0.03	57	65	77
15-Aug	0.856	0.00	56	63	71
16-Aug	0.821	0.08	57	64	68
17-Aug	0.838	0.00	58	69	69
18-Aug	0.838	0.00	56	71	69
19-Aug	0.818	0.00	58	75	68
20-Aug	0.805	0.00	51	74	67
21-Aug	0.961	0.00	49	65	80
22-Aug	0.955	0.00	49	64	79

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
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23-Aug	0.785	0.00	49	67	65
24-Aug	0.818	0.00	52	72	68
25-Aug	0.976	0.00	52	71	81
26-Aug	0.951	0.00	52	75	79
27-Aug	0.927	0.00	56	78	77
28-Aug	0.804	0.00	54	78	67
29-Aug	0.925	0.00	53	67	77
30-Aug	0.842	0.00	54	65	70
31-Aug	0.760	0.64	50	60	63
1-Sep	0.959	0.00	48	58	79
2-Sep	1.077	0.00	51	64	89
3-Sep	1.040	1.10	47	62	86
4-Sep	0.899	0.02	46	54	74
5-Sep	0.810	0.00	46	64	67
6-Sep	0.764	0.00	50	73	63
7-Sep	0.813	0.00	52	78	67
8-Sep	0.866	0.00	51	75	72
9-Sep	0.894	0.45	50	61	74
10-Sep	0.814	0.00	49	58	67
11-Sep	0.826	0.00	48	59	68
12-Sep	0.835	0.00	48	62	69
13-Sep	0.728	0.02	51	69	60
14-Sep	0.846	0.00	52	73	70
15-Sep	1.002	0.00	53	76	83
16-Sep	1.031	0.00	53	78	85
17-Sep	1.075	0.01	55	67	89
18-Sep	0.951	0.05	55	67	79
19-Sep	1.061	0.00	55	59	88
20-Sep	0.887	0.00	51	66	74
21-Sep	0.952	0.00	51	73	79
22-Sep	1.082	0.00	55	78	90
23-Sep	1.023	0.00	53	63	85
24-Sep	1.101	0.00	54	62	91
25-Sep	0.993	0.42	53	58	82
26-Sep	1.092	0.27	51	58	90
27-Sep	0.820	0.15	51	57	68
28-Sep	0.947	0.00	47	58	78
29-Sep	1.026	0.00	47	61	85
30-Sep	1.004	0.69	47	56	83
1-Oct	0.993	0.02	47	54	82
2-Oct	0.967	0.00	44	56	80
3-Oct	0.908	0.00	43	57	75
4-Oct	0.825	0.00	46	65	68
5-Oct	0.834	0.00	50	68	69
6-Oct	0.891	0.00	50	65	74
7-Oct	0.928	0.00	51	70	77
8-Oct	0.979	0.00	52	66	81

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9-Oct	1.706	0.02	48	62	141
10-Oct	1.143	0.02	47	62	95
11-Oct	1.087	0.11	47	63	90
12-Oct	1.033	0.61	47	56	86
13-Oct	0.989	0.03	47	55	82
14-Oct	1.215	0.59	47	62	101
15-Oct	1.081	0.20	47	54	90
16-Oct	1.103	0.27	44	51	91
17-Oct	1.032	0.03	46	55	85
18-Oct	1.158	0.48	49	55	96
19-Oct	0.928	0.12	51	60	77
20-Oct	1.336	0.32	52	65	111
21-Oct	1.127	0.43	47	55	93
22-Oct	1.719	0.81	47	51	142
23-Oct	1.512	1.09	44	50	125
24-Oct	1.392	0.33	42	46	115
25-Oct	1.335	0.31	41	53	111
26-Oct	1.251	0.72	44	55	104
27-Oct	1.322	0.38	39	46	110
28-Oct	1.397	0.26	39	47	116
29-Oct	1.398	0.81	44	49	116
30-Oct	1.456	0.03	46	54	121
31-Oct	1.543	0.82	46	55	128
1-Nov	1.216	0.53	42	47	101
2-Nov	1.196	0.00	40	45	99
3-Nov	1.393	0.00	42	48	115
4-Nov	1.631	0.73	47	50	135
5-Nov	1.263	0.08	46	52	105
6-Nov	1.444	0.20	46	54	120
7-Nov	1.288	0.49	42	53	107
8-Nov	1.211	0.02	37	46	100
9-Nov	1.211	0.39	37	46	100
10-Nov	1.309	0.27	-	-	108
11-Nov	1.180	0.02	33	42	98
12-Nov	1.251	0.00	-	-	104
13-Nov	1.182	0.00	-	-	98
14-Nov	1.081	0.00	28	33	90
15-Nov	0.973	0.00	25	35	81
16-Nov	0.961	0.00	28	36	80
17-Nov	1.066	0.00	32	42	88
18-Nov	1.046	0.00	34	43	87
19-Nov	0.896	0.00	35	44	74
20-Nov	0.988	0.10	35	47	82
21-Nov	1.156	0.14	36	42	96
22-Nov	1.121	0.00	39	46	93
23-Nov	1.202	1.33	35	42	100
24-Nov	1.208	0.00	34	44	100

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25-Nov	1.681	1.33	35	51	139
26-Nov	1.721	0.00	45	53	143
27-Nov	1.260	0.06	47	53	104
28-Nov	1.907	0.58	47	53	158
29-Nov	1.647	1.62	28	49	136
30-Nov	1.530	0.00	18	28	127
1-Dec	1.365	0.00	22	28	113
2-Dec	1.380	0.00	24	32	114
3-Dec	1.449	0.00	25	39	120
4-Dec	1.199	0.12	35	41	99
5-Dec	1.392	0.19	35	41	115
6-Dec	1.046	0.00	38	48	87
7-Dec	1.216	0.05	37	46	101
8-Dec	1.387	0.03	43	50	115
9-Dec	1.683	0.46	44	49	139
10-Dec	1.734	0.89	44	51	144
11-Dec	1.494	0.37	38	55	124
12-Dec	1.069	0.08	42	52	89
13-Dec	1.121	0.00	37	45	93
14-Dec	0.988	0.00	31	45	82
15-Dec	1.132	0.00	36	43	94
16-Dec	1.030	0.44	40	43	85
17-Dec	1.014	0.08	38	42	84
18-Dec	1.057	0.06	37	44	88
19-Dec	1.116	0.55	36	43	92
20-Dec	1.128	0.42	36	43	93
21-Dec	1.075	0.00	37	52	89
22-Dec	1.048	0.00	39	47	87
23-Dec	1.367	2.00	35	42	113
24-Dec	1.727	0.32	31	49	143
25-Dec	1.338	0.31	32	36	111
26-Dec	1.289	0.00	30	37	107
27-Dec	1.194	0.45	31	37	99
28-Dec	1.304	0.00	32	41	108
29-Dec	1.355	0.00	30	36	112
30-Dec	1.340	0.00	21	30	111
31-Dec	1.171	0.00	21	26	97

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2015					
1-Jan	1.002	0.00	23	28	78
2-Jan	1.165	0.02	26	32	91
3-Jan	0.956	0.18	31	37	75
4-Jan	1.132	0.10	31	36	89
5-Jan	2.209	1.77	33	51	173
6-Jan	1.864	0.34	40	51	146
7-Jan	1.485	0.07	38	45	116
8-Jan	1.307	0.05	36	45	102
9-Jan	1.326	0.00	36	54	104
10-Jan	1.135	0.15	37	47	89
11-Jan	1.084	0.15	37	42	85
12-Jan	1.070	0.01	37	42	84
13-Jan	1.176	0.00	32	41	92
14-Jan	1.029	0.00	-	-	80
15-Jan	1.008	0.00	33	42	79
16-Jan	1.153	0.44	33	41	90
17-Jan	1.177	0.00	32	43	92
18-Jan	1.643	1.60	40	50	128
19-Jan	1.482	1.24	37	45	116
20-Jan	1.323	0.03	34	42	103
21-Jan	1.327	0.00	33	40	104
22-Jan	1.194	0.22	38	44	93
23-Jan	1.226	0.28	38	42	96
24-Jan	1.252	0.00	42	53	98
25-Jan	1.250	0.00	42	53	98
26-Jan	1.203	0.00	41	48	94
27-Jan	1.177	0.00	38	52	92
28-Jan	1.087	0.14	39	47	85
29-Jan	1.058	0.04	36	42	83
30-Jan	1.079	0.03	36	45	84
31-Jan	0.973	0.00	33	45	76
1-Feb	0.954	0.00	35	49	75
2-Feb	1.126	0.12	36	45	88
3-Feb	1.119	0.23	37	47	87
4-Feb	0.985	0.11	35	44	77
5-Feb	1.178	0.48	41	45	92
6-Feb	1.834	1.35	42	47	143
7-Feb	1.826	1.15	42	47	143
8-Feb	1.832	0.95	41	47	143
9-Feb	1.514	0.25	42	52	118
10-Feb	1.535	0.41	45	49	120
11-Feb	1.369	0.05	39	48	107
12-Feb	1.304	0.00	43	54	102
13-Feb	1.184	0.21	43	56	93
14-Feb	1.104	0.00	44	59	86
15-Feb	1.217	0.00	34	47	95

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16-Feb	0.975	0.00	34	45	76
17-Feb	1.059	0.00	39	52	83
18-Feb	1.036	0.00	38	56	81
19-Feb	1.006	0.10	37	49	79
20-Feb	0.924	0.32	41	49	72
21-Feb	0.906	0.08	37	44	71
22-Feb	0.958	0.00	33	41	75
23-Feb	0.962	0.00	33	47	75
24-Feb	1.096	0.00	33	50	86
25-Feb	1.038	0.07	32	50	81
26-Feb	1.356	0.22	37	42	106
27-Feb	1.469	0.83	38	46	115
28-Feb	1.001	0.10	31	44	78
1-Mar	0.973	0.00	31	46	76
2-Mar	0.994	0.00	28	40	78
3-Mar	1.058	0.00	28	48	83
4-Mar	0.965	0.00	27	44	75
5-Mar	0.899	0.00	28	46	70
6-Mar	0.933	0.00	32	52	73
7-Mar	0.844	0.00	34	55	66
8-Mar	0.809	0.00	35	55	63
9-Mar	0.873	0.00	35	56	68
10-Mar	0.905	0.00	36	57	71
11-Mar	0.878	0.08	35	58	69
12-Mar	0.857	0.12	45	49	67
13-Mar	0.873	0.00	41	55	68
14-Mar	1.016	0.84	41	62	79
15-Mar	1.288	0.90	42	52	101
16-Mar	1.451	1.40	37	47	113
17-Mar	1.210	0.05	38	49	95
18-Mar	1.117	0.06	37	53	87
19-Mar	1.046	0.01	36	51	82
20-Mar	0.959	0.00	41	56	75
21-Mar	1.027	0.40	41	57	80
22-Mar	1.021	0.95	36	45	80
23-Mar	1.105	0.28	37	46	86
24-Mar	1.158	0.00	37	43	91
25-Mar	1.277	0.65	35	44	100
26-Mar	1.154	0.39	39	53	90
27-Mar	1.095	0.00	42	60	86
28-Mar	1.007	0.26	43	65	79
29-Mar	1.018	0.00	42	53	80
30-Mar	0.971	0.03	42	55	76
31-Mar	1.212	0.07	41	58	95
1-Apr	1.295	1.55	31	46	101
2-Apr	1.165	0.18	34	44	91
3-Apr	1.255	0.00	35	46	98

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4-Apr	1.005	0.00	34	48	79
5-Apr	1.095	0.11	32	46	86
6-Apr	0.945	0.00	32	54	74
7-Apr	0.975	0.00	34	44	76
8-Apr	0.845	0.00	38	50	66
9-Apr	0.825	0.00	37	49	64
10-Apr	0.915	0.10	37	55	72
11-Apr	0.865	0.42	36	53	68
12-Apr	0.905	0.05	37	43	71
13-Apr	1.005	0.00	36	49	79
14-Apr	0.995	0.61	31	50	78
15-Apr	0.965	0.06	31	44	75
16-Apr	0.915	0.00	32	48	72
17-Apr	0.905	0.00	33	58	71
18-Apr	0.845	0.00	38	61	66
19-Apr	0.905	0.00	38	61	71
20-Apr	0.895	0.00	39	64	70
21-Apr	0.865	0.00	42	68	68
22-Apr	0.765	0.20	36	62	60
23-Apr	0.845	0.00	37	50	66
24-Apr	0.875	0.00	36	50	68
25-Apr	0.905	0.38	34	50	71
26-Apr	0.895	0.08	33	48	70
27-Apr	0.835	0.16	33	55	65
28-Apr	0.815	0.00	45	71	64
29-Apr	0.815	0.26	40	55	64
30-Apr	0.785	0.00	41	52	61
1-May	0.768	0.00	41	57	60
2-May	0.778	0.00	37	62	61
3-May	0.828	0.00	38	58	65
4-May	0.748	0.00	42	64	58
5-May	0.788	0.08	40	57	62
6-May	0.818	0.29	38	50	64
7-May	0.808	0.05	38	50	63
8-May	0.798	0.00	39	58	62
9-May	0.788	0.00	43	67	62
10-May	0.898	0.00	46	73	70
11-May	0.788	0.00	45	68	62
12-May	0.768	0.06	45	68	60
13-May	0.838	0.32	44	50	66
14-May	0.788	0.18	43	48	62
15-May	0.748	0.00	44	55	58
16-May	0.728	0.00	45	53	57
17-May	0.788	0.00	45	52	62
18-May	0.788	0.00	45	55	62
19-May	0.978	0.00	46	69	76
20-May	0.898	0.00	50	62	70

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21-May	0.918	0.00	51	67	72
22-May	0.958	0.00	50	71	75
23-May	0.958	0.03	47	56	75
24-May	0.858	0.03	47	55	67
25-May	0.938	0.00	46	58	73
26-May	0.888	0.00	46	54	69
27-May	0.868	0.00	48	58	68
28-May	0.888	0.00	51	67	69
29-May	0.948	0.00	52	74	74
30-May	0.948	0.00	48	76	74
31-May	0.998	0.00	51	76	78
1-Jun	0.812	0.00	52	71	63
2-Jun	1.032	0.12	48	55	81
3-Jun	0.872	0.23	47	54	68
4-Jun	0.852	0.00	47	55	67
5-Jun	0.852	0.00	47	61	67
6-Jun	1.042	0.00	50	71	81
7-Jun	1.132	0.00	53	76	88
8-Jun	0.942	0.00	54	79	74
9-Jun	1.022	0.00	54	80	80
10-Jun	0.942	0.00	48	77	74
11-Jun	1.052	0.00	48	71	82
12-Jun	0.832	0.00	48	69	65
13-Jun	0.982	0.00	43	60	77
14-Jun	0.902	0.00	43	65	70
15-Jun	1.032	0.00	47	73	81
16-Jun	0.932	0.00	50	78	73
17-Jun	0.982	0.00	46	69	77
18-Jun	0.882	0.00	46	69	69
19-Jun	0.932	0.03	49	70	73
20-Jun	0.772	0.03	45	70	60
21-Jun	0.912	0.00	46	68	71
22-Jun	0.952	0.00	49	72	74
23-Jun	0.822	0.00	46	70	64
24-Jun	0.932	0.00	46	72	73
25-Jun	0.822	0.00	54	73	64
26-Jun	0.922	0.00	55	79	72
27-Jun	0.862	0.00	57	82	67
28-Jun	0.942	0.00	62	84	74
29-Jun	0.872	0.10	61	83	68
30-Jun	0.892	0.00	58	83	70
1-Jul	0.907	0.00	56	80	71
2-Jul	0.917	0.00	58	81	72
3-Jul	0.807	0.00	61	85	63
4-Jul	0.887	0.00	58	84	69
5-Jul	1.047	0.00	60	83	82
6-Jul	0.897	0.00	59	87	70

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7-Jul	0.837	0.00	54	82	65
8-Jul	0.857	0.00	54	76	67
9-Jul	0.947	0.00	57	83	74
10-Jul	0.907	0.00	55	82	71
11-Jul	0.827	0.00	55	62	65
12-Jul	0.867	0.00	55	63	68
13-Jul	0.957	0.01	55	71	75
14-Jul	0.837	0.00	50	70	65
15-Jul	0.847	0.00	51	72	66
16-Jul	0.947	0.00	53	72	74
17-Jul	0.857	0.00	49	69	67
18-Jul	0.837	0.00	51	73	65
19-Jul	1.017	0.00	56	82	79
20-Jul	0.867	0.00	57	88	68
21-Jul	0.787	0.00	53	76	62
22-Jul	0.787	0.00	52	66	62
23-Jul	0.797	0.00	53	66	62
24-Jul	0.817	0.00	50	68	64
25-Jul	0.717	0.10	51	68	56
26-Jul	0.797	0.00	51	60	62
27-Jul	0.707	0.60	48	61	55
28-Jul	0.707	0.00	49	62	55
29-Jul	0.807	0.00	49	71	63
30-Jul	0.867	0.00	53	81	68
31-Jul	0.817	0.00	56	86	64
1-Aug	0.783	0.00	57	86	61
2-Aug	0.873	0.00	58	84	68
3-Aug	0.903	0.00	58	83	71
4-Aug	0.793	0.00	54	76	62
5-Aug	0.803	0.00	50	72	63
6-Aug	0.813	0.13	51	67	64
7-Aug	0.813	0.00	50	66	64
8-Aug	0.733	0.00	50	73	57
9-Aug	0.813	0.00	52	73	64
10-Aug	0.873	0.00	54	75	68
11-Aug	0.683	0.00	56	78	53
12-Aug	0.933	0.00	57	75	73
13-Aug	0.763	0.00	58	78	60
14-Aug	0.953	0.00	56	79	74
15-Aug	0.983	0.70	51	59	77
16-Aug	0.943	0.00	47	62	74
17-Aug	0.833	0.00	50	68	65
18-Aug	0.733	0.00	51	73	57
19-Aug	0.813	0.00	54	79	64
20-Aug	0.823	0.00	56	81	64
21-Aug	0.783	0.00	51	67	61
22-Aug	0.723	0.00	49	62	57

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
23-Aug	0.863	0.00	48	76	67
24-Aug	1.013	0.00	50	77	79
25-Aug	0.813	0.00	-	-	64
26-Aug	0.893	0.00	46	72	70
27-Aug	0.803	0.00	52	76	63
28-Aug	0.823	0.01	54	78	64
29-Aug	0.793	0.21	55	71	62
30-Aug	1.003	0.96	-	-	78
31-Aug	0.863	0.25	-	-	67
1-Sep	0.887	0.05	-	-	69
2-Sep	0.817	0.40	49	58	64
3-Sep	0.837	0.15	45	58	65
4-Sep	0.777	0.09	43	55	61
5-Sep	0.777	0.50	43	50	61
6-Sep	0.797	0.20	45	59	62
7-Sep	0.867	0.25	46	54	68
8-Sep	0.817	0.12	49	61	64
9-Sep	0.817	0.00	50	66	64
10-Sep	0.797	0.00	51	68	62
11-Sep	0.767	0.00	51	69	60
12-Sep	0.827	0.00	52	76	65
13-Sep	0.907	0.00	54	75	71
14-Sep	0.827	0.00	46	62	65
15-Sep	0.757	0.04	46	55	59
16-Sep	0.737	0.00	42	56	58
17-Sep	0.767	0.16	49	60	60
18-Sep	0.717	0.25	48	55	56
19-Sep	0.727	0.00	48	62	57
20-Sep	0.807	0.00	54	64	63
21-Sep	0.767	0.35	44	64	60
22-Sep	0.707	0.05	42	57	55
23-Sep	0.707	0.01	42	56	55
24-Sep	0.727	0.23	42	61	57
25-Sep	0.717	0.17	48	68	56
26-Sep	0.727	0.03	42	52	57
27-Sep	0.737	0.00	39	53	58
28-Sep	0.727	0.00	39	54	57
29-Sep	0.687	0.00	39	60	54
30-Sep	0.697	0.02	45	65	54
1-Oct	0.738	0.01	46	61	58
2-Oct	0.728	0.00	45	61	57
3-Oct	0.738	0.17	47	52	58
4-Oct	0.768	0.04	46	52	60
5-Oct	0.728	0.00	46	63	57
6-Oct	0.808	0.00	47	67	63
7-Oct	0.828	0.06	51	62	65
8-Oct	0.778	0.00	51	55	61

Note:
1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification* .

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
Note: 1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification* .					
9-Oct	0.758	0.00	54	66	59
10-Oct	1.038	0.15	55	59	81
11-Oct	0.868	1.95	47	58	68
12-Oct	0.828	0.00	46	56	65
13-Oct	0.778	0.18	46	59	61
14-Oct	0.708	0.00	42	53	55
15-Oct	0.748	0.00	41	59	58
16-Oct	0.698	0.00	55	68	55
17-Oct	0.728	0.00	52	70	57
18-Oct	0.778	0.11	51	63	61
19-Oct	0.738	0.14	51	54	58
20-Oct	0.668	0.06	47	56	52
21-Oct	0.698	0.00	44	55	55
22-Oct	0.698	0.14	45	57	55
23-Oct	0.688	0.00	39	53	54
24-Oct	0.728	0.00	40	49	57
25-Oct	0.808	0.02	45	56	63
26-Oct	0.768	0.04	44	60	60
27-Oct	0.738	0.04	41	49	58
28-Oct	0.758	0.00	40	56	59
29-Oct	0.758	0.25	48	51	59
30-Oct	0.878	0.41	47	54	69
31-Oct	1.548	1.60	-	-	121
1-Nov	1.679	1.97	-	-	131
2-Nov	1.279	0.73	42	47	100
3-Nov	1.009	0.20	37	46	79
4-Nov	0.889	0.03	33	41	70
5-Nov	0.869	0.04	33	42	68
6-Nov	0.859	0.07	38	44	67
7-Nov	0.909	0.00	42	49	71
8-Nov	1.069	0.88	40	48	84
9-Nov	1.119	0.60	38	44	88
10-Nov	0.999	0.06	35	42	78
11-Nov	1.179	0.75	35	44	92
12-Nov	1.009	0.02	36	42	79
13-Nov	2.129	1.64	36	52	166
14-Nov	2.999	3.22	39	52	234
15-Nov	2.389	0.80	31	42	187
16-Nov	1.769	0.09	31	37	138
17-Nov	2.989	0.00	32	50	234
18-Nov	2.629	2.04	35	52	206
19-Nov	1.909	0.10	36	41	149
20-Nov	1.549	0.02	28	36	121
21-Nov	1.359	0.02	29	38	106
22-Nov	1.189	0.02	33	38	93
23-Nov	1.199	0.02	34	40	94
24-Nov	1.179	0.27	33	44	92

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
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25-Nov	1.099	0.03	29	36	86
26-Nov	1.049	0.00	27	31	82
27-Nov	0.909	0.00	27	37	71
28-Nov	0.929	0.00	32	41	73
29-Nov	0.969	0.00	30	39	76
30-Nov	0.919	0.00	27	37	72
1-Dec	0.920	0.08	27	35	72
2-Dec	0.930	0.28	30	38	73
3-Dec	1.120	0.00	32	42	88
4-Dec	1.040	0.37	36	46	81
5-Dec	1.220	0.01	35	41	95
6-Dec	1.650	1.79	36	41	129
7-Dec	1.770	0.46	39	44	138
8-Dec	3.260	1.90	39	50	255
9-Dec	4.250	2.20	-	-	332
10-Dec	2.670	0.07	-	-	209
11-Dec	2.100	0.40	35	42	164
12-Dec	1.830	0.25	35	42	143
13-Dec	1.760	0.64	34	42	138
14-Dec	1.720	0.70	31	38	134
15-Dec	1.520	0.05	30	35	119
16-Dec	1.410	0.22	30	38	110
17-Dec	1.530	0.03	29	35	120
18-Dec	1.890	1.47	30	34	148
19-Dec	1.580	0.56	31	35	124
20-Dec	1.570	0.28	31	35	123
21-Dec	1.800	0.50	31	36	141
22-Dec	2.020	1.20	31	34	158
23-Dec	1.860	0.00	31	35	145
24-Dec	1.900	0.70	31	34	149
25-Dec	1.320	0.26	31	33	103
26-Dec	1.560	0.06	26	32	122
27-Dec	1.400	0.02	28	32	109
28-Dec	1.300	0.25	29	33	102
29-Dec	1.190	0.00	29	32	93
30-Dec	1.150	0.00	24	32	90
31-Dec	1.110	0.00	25	28	87

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
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2016					
1-Jan	1.049	0.00	26	30	80
2-Jan	1.009	0.00	29	36	77
3-Jan	1.039	0.00	26	33	80
4-Jan	1.079	0.63	28	33	83
5-Jan	1.039	0.18	29	39	80
6-Jan	1.039	0.03	35	41	80
7-Jan	0.969	0.02	33	43	74
8-Jan	0.909	0.00	33	38	70
9-Jan	0.929	0.00	32	39	71
10-Jan	0.949	0.00	31	37	73
11-Jan	0.909	0.00	31	36	70
12-Jan	0.979	0.00	33	41	75
13-Jan	1.159	0.90	34	43	89
14-Jan	1.039	0.50	32	37	80
15-Jan	0.959	0.05	30	38	73
16-Jan	1.119	0.41	32	39	86
17-Jan	1.169	0.25	33	43	90
18-Jan	1.109	0.41	35	43	85
19-Jan	1.059	0.02	35	43	81
20-Jan	1.089	0.50	34	42	83
21-Jan	1.399	0.95	35	42	107
22-Jan	1.349	0.42	39	48	103
23-Jan	1.429	0.45	36	45	110
24-Jan	1.399	0.01	34	39	107
25-Jan	1.249	0.03	31	40	96
26-Jan	1.259	0.04	33	44	96
27-Jan	1.209	0.52	39	44	93
28-Jan	1.679	1.06	42	48	129
29-Jan	1.529	0.14	37	47	117
30-Jan	1.339	0.34	31	41	103
31-Jan	1.289	0.02	32	38	99
1-Feb	1.209	0.11	32	38	93
2-Feb	1.129	0.00	32	36	86
3-Feb	1.139	0.03	31	36	87
4-Feb	1.209	0.90	32	39	93
5-Feb	1.189	0.15	36	41	91
6-Feb	1.149	0.37	37	47	88
7-Feb	1.109	0.02	31	42	85
8-Feb	1.079	0.00	35	47	83
9-Feb	1.039	0.00	44	56	80
10-Feb	1.009	0.00	42	56	77
11-Feb	1.009	0.06	39	51	77
12-Feb	1.229	0.00	43	53	94
13-Feb	1.129	0.20	37	49	86
14-Feb	1.189	0.36	37	44	91
15-Feb	1.449	0.56	41	50	111

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16-Feb	1.469	0.63	43	48	113
17-Feb	1.369	0.03	41	50	105
18-Feb	1.369	0.55	38	53	105
19-Feb	1.439	0.33	37	43	110
20-Feb	1.449	0.00	32	42	111
21-Feb	1.379	0.02	33	42	106
22-Feb	1.279	0.00	35	44	98
23-Feb	1.189	0.22	30	39	91
24-Feb	1.109	0.00	37	47	85
25-Feb	1.059	0.00	37	54	81
26-Feb	1.029	0.00	37	57	79
27-Feb	1.089	0.52	42	58	83
28-Feb	1.249	0.07	38	47	96
29-Feb	1.259	1.07	34	43	96
1-Mar	1.492	0.32	36	44	114
2-Mar	1.702	1.59	36	45	130
3-Mar	1.612	0.66	39	46	124
4-Mar	1.392	0.05	37	47	107
5-Mar	1.312	0.24	42	53	101
6-Mar	1.332	0.26	39	54	102
7-Mar	1.502	0.30	36	44	115
8-Mar	1.282	0.59	34	42	98
9-Mar	1.412	0.30	33	43	108
10-Mar	1.522	1.21	34	45	117
11-Mar	1.352	0.21	33	47	104
12-Mar	1.282	0.35	40	51	98
13-Mar	1.292	0.12	34	42	99
14-Mar	1.312	0.40	32	44	101
15-Mar	1.232	0.42	31	37	94
16-Mar	1.182	0.20	33	43	91
17-Mar	1.052	0.00	29	40	81
18-Mar	1.082	0.00	29	50	83
19-Mar	1.052	0.00	41	51	81
20-Mar	1.102	0.00	47	60	84
21-Mar	1.082	0.46	39	56	83
22-Mar	1.022	0.22	38	48	78
23-Mar	1.042	0.03	39	45	80
24-Mar	1.052	0.36	36	44	81
25-Mar	1.012	0.12	37	44	78
26-Mar	1.012	0.01	33	44	78
27-Mar	1.292	0.22	34	55	99
28-Mar	1.292	1.25	31	41	99
29-Mar	1.302	0.03	32	42	100
30-Mar	1.162	0.00	32	52	89
31-Mar	1.122	0.00	36	62	86
1-Apr	1.059	0.00	40	64	81
2-Apr	1.049	0.00	40	65	80

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3-Apr	1.049	0.00	41	60	80
4-Apr	1.029	0.30	41	64	79
5-Apr	0.979	0.01	40	50	75
6-Apr	0.979	0.00	37	47	75
7-Apr	0.969	0.00	37	62	74
8-Apr	0.929	0.00	51	76	71
9-Apr	0.959	0.00	41	73	74
10-Apr	0.999	0.00	41	62	77
11-Apr	0.969	0.00	41	51	74
12-Apr	0.969	0.00	40	49	74
13-Apr	0.959	0.00	36	51	74
14-Apr	0.959	0.00	37	49	74
15-Apr	0.939	0.03	36	50	72
16-Apr	0.929	0.00	37	49	71
17-Apr	0.989	0.00	38	59	76
18-Apr	0.929	0.00	55	73	71
19-Apr	0.969	0.00	53	79	74
20-Apr	0.939	0.00	50	79	72
21-Apr	0.929	0.00	50	78	71
22-Apr	0.899	0.00	48	67	69
23-Apr	0.929	0.07	43	67	71
24-Apr	1.009	0.44	42	55	77
25-Apr	0.959	0.00	36	45	74
26-Apr	0.909	0.12	34	44	70
27-Apr	0.929	0.01	35	53	71
28-Apr	0.919	0.00	41	47	70
29-Apr	0.929	0.05	42	52	71
30-Apr	0.909	0.17	40	48	70
1-May	0.939	0.00	42	58	72
2-May	0.941	0.00	45	74	72
3-May	0.939	0.00	48	79	72
4-May	0.891	0.00	45	69	68
5-May	0.961	0.04	42	51	74
6-May	0.877	0.02	42	58	67
7-May	0.993	0.00	46	68	76
8-May	0.949	0.00	42	75	73
9-May	0.911	0.00	40	54	70
10-May	0.975	0.00	40	50	75
11-May	0.882	0.00	41	65	68
12-May	0.946	0.00	42	74	72
13-May	0.935	0.00	46	72	72
14-May	0.893	0.15	57	78	68
15-May	0.756	0.25	46	57	58
16-May	0.978	0.11	41	49	75
17-May	0.875	0.00	45	51	67
18-May	0.894	0.00	46	62	68
19-May	0.943	0.84	41	61	72

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20-May	0.940	0.03	41	57	72
21-May	0.995	0.52	42	57	76
22-May	0.996	0.14	44	59	76
23-May	1.241	0.17	45	56	95
24-May	1.438	0.00	45	53	110
25-May	0.940	0.01	45	55	72
26-May	0.924	0.00	45	60	71
27-May	1.001	0.47	42	52	77
28-May	0.886	0.05	42	52	68
29-May	0.854	0.20	42	53	65
30-May	0.943	0.00	40	57	72
31-May	1.005	0.00	44	63	77
1-Jun	0.986	0.00	46	73	76
2-Jun	0.968	0.61	50	71	74
3-Jun	0.933	0.00	48	57	71
4-Jun	0.882	0.00	49	74	68
5-Jun	1.067	0.00	55	80	82
6-Jun	1.186	0.00	58	86	91
7-Jun	1.200	0.00	54	79	92
8-Jun	1.010	0.00	53	78	77
9-Jun	0.905	0.00	48	67	69
10-Jun	1.057	0.15	44	55	81
11-Jun	0.980	0.45	44	56	75
12-Jun	0.960	0.08	44	55	74
13-Jun	0.993	0.00	45	60	76
14-Jun	0.966	0.11	41	57	74
15-Jun	0.928	0.22	41	49	71
16-Jun	0.953	0.54	41	55	73
17-Jun	1.050	0.29	41	58	80
18-Jun	1.035	0.31	43	61	79
19-Jun	0.998	0.16	43	53	76
20-Jun	0.978	0.01	44	62	75
21-Jun	1.079	0.19	48	66	83
22-Jun	0.986	0.00	48	66	76
23-Jun	0.962	0.04	49	67	74
24-Jun	1.035	0.20	45	60	79
25-Jun	0.982	0.70	47	57	75
26-Jun	0.983	0.00	49	63	75
27-Jun	1.024	0.00	51	73	78
28-Jun	1.014	0.00	50	77	78
29-Jun	0.982	0.00	52	72	75
30-Jun	0.921	0.02	52	64	71
1-Jul	0.927	0.03	49	61	71
2-Jul	0.852	0.00	52	68	65
3-Jul	0.906	0.05	50	69	69
4-Jul	0.852	0.05	48	61	65
5-Jul	0.971	0.05	48	58	74

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6-Jul	0.922	0.10	48	59	71
7-Jul	0.962	0.05	49	65	74
8-Jul	0.976	0.43	53	62	75
9-Jul	1.057	1.20	50	62	81
10-Jul	0.998	0.34	50	60	76
11-Jul	0.963	0.05	50	57	74
12-Jul	1.013	0.02	50	63	78
13-Jul	0.965	0.00	50	64	74
14-Jul	0.902	0.00	48	64	69
15-Jul	0.943	0.00	49	67	72
16-Jul	0.863	0.00	51	63	66
17-Jul	0.972	0.00	51	63	75
18-Jul	0.943	0.01	54	65	72
19-Jul	0.953	0.30	53	62	73
20-Jul	0.913	0.00	52	65	70
21-Jul	0.944	0.00	52	71	72
22-Jul	0.998	0.30	54	76	76
23-Jul	0.907	0.10	53	62	69
24-Jul	0.939	0.00	50	63	72
25-Jul	1.017	0.00	50	73	78
26-Jul	0.920	0.00	55	76	71
27-Jul	0.978	0.00	55	69	75
28-Jul	0.949	0.00	55	76	73
29-Jul	0.941	0.00	57	79	72
30-Jul	0.843	0.00	55	81	65
31-Jul	0.968	0.00	50	68	74
1-Aug	0.969	0.00	49	67	74
2-Aug	0.918	0.00	49	70	70
3-Aug	0.841	0.14	51	62	64
4-Aug	0.991	0.00	50	65	76
5-Aug	0.921	0.00	51	73	71
6-Aug	0.857	0.00	48	72	66
7-Aug	0.953	0.00	49	61	73
8-Aug	0.870	0.23	50	61	67
9-Aug	0.961	0.03	51	59	74
10-Aug	0.934	0.00	52	62	72
11-Aug	0.943	0.00	52	64	72
12-Aug	0.940	0.00	53	73	72
13-Aug	0.835	0.00	57	80	64
14-Aug	1.014	0.00	55	81	78
15-Aug	1.009	0.00	55	75	77
16-Aug	0.909	0.00	53	75	70
17-Aug	0.983	0.00	53	74	75
18-Aug	1.011	0.00	53	72	77
19-Aug	0.931	0.00	58	78	71
20-Aug	0.979	0.00	60	87	75
21-Aug	1.003	0.00	54	84	77

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
Note: 1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification* .					
22-Aug	0.990	0.00	49	69	76
23-Aug	1.004	0.00	48	64	77
24-Aug	1.031	0.00	48	69	79
25-Aug	1.017	0.00	53	74	78
26-Aug	1.001	0.00	56	80	77
27-Aug	0.931	0.00	56	82	71
28-Aug	1.052	0.00	49	68	81
29-Aug	1.046	0.00	52	67	80
30-Aug	0.925	0.00	52	74	71
31-Aug	1.096	0.00	51	61	84
1-Sep	0.981	0.17	52	63	75
2-Sep	0.941	0.00	48	59	72
3-Sep	0.894	0.12	48	55	69
4-Sep	0.890	0.05	45	57	68
5-Sep	0.977	0.00	46	58	75
6-Sep	1.058	0.12	48	57	81
7-Sep	1.010	0.11	49	59	77
8-Sep	0.972	0.06	51	58	75
9-Sep	0.956	0.09	45	60	73
10-Sep	0.905	0.00	45	65	69
11-Sep	0.964	0.00	48	68	74
12-Sep	0.964	0.00	45	69	74
13-Sep	0.918	0.00	44	63	70
14-Sep	0.979	0.00	47	67	75
15-Sep	0.945	0.00	46	69	72
16-Sep	0.953	0.00	45	66	73
17-Sep	0.988	0.38	48	69	76
18-Sep	0.954	0.48	48	57	73
19-Sep	1.021	0.10	49	58	78
20-Sep	0.959	0.11	42	53	73
21-Sep	0.919	0.00	42	57	70
22-Sep	0.924	0.00	42	58	71
23-Sep	0.879	0.00	44	60	67
24-Sep	0.889	0.08	44	60	68
25-Sep	0.967	0.01	47	58	74
26-Sep	1.009	0.00	51	68	77
27-Sep	0.922	0.00	51	73	71
28-Sep	0.949	0.00	45	60	73
29-Sep	0.896	0.00	44	57	69
30-Sep	0.922	0.00	41	56	71
1-Oct	0.882	0.02	41	57	68
2-Oct	0.940	0.10	40	55	72
3-Oct	0.919	0.02	40	56	70
4-Oct	0.933	0.07	46	51	71
5-Oct	0.921	0.10	44	51	71
6-Oct	0.910	0.01	45	58	70
7-Oct	0.976	0.49	47	53	75

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
8-Oct	1.110	0.20	46	53	85
9-Oct	1.109	1.20	46	56	85
10-Oct	1.081	0.28	42	49	83
11-Oct	0.964	0.00	37	48	74
12-Oct	0.945	0.00	40	53	72
13-Oct	1.309	0.82	41	55	100
14-Oct	1.732	1.61	45	50	133
15-Oct	1.657	1.50	43	46	127
16-Oct	1.625	0.64	44	51	124
17-Oct	1.603	0.00	44	50	123
18-Oct	1.330	0.20	42	49	102
19-Oct	1.215	0.03	42	49	93
20-Oct	1.806	1.22	41	52	138
21-Oct	1.443	0.52	44	54	111
22-Oct	1.295	0.12	42	53	99
23-Oct	1.282	0.07	42	51	98
24-Oct	1.233	0.00	44	56	95
25-Oct	1.179	0.26	42	59	90
26-Oct	1.579	0.06	43	52	121
27-Oct	1.706	1.81	44	51	131
28-Oct	1.399	0.06	44	50	107
29-Oct	1.280	0.08	44	51	98
30-Oct	1.298	0.05	42	51	99
31-Oct	1.532	0.29	46	52	117
1-Nov	1.781	1.40	43	48	136
2-Nov	1.628	0.38	42	48	125
3-Nov	1.449	0.31	44	52	111
4-Nov	1.330	0.00	42	56	102
5-Nov	1.534	0.03	49	60	118
6-Nov	1.165	1.42	43	51	89
7-Nov	1.553	0.02	44	48	119
8-Nov	1.417	0.00	46	57	109
9-Nov	1.253	0.09	45	58	96
10-Nov	1.171	0.16	45	58	90
11-Nov	1.120	0.03	49	62	86
12-Nov	1.094	0.00	49	60	84
13-Nov	1.163	0.19	41	54	89
14-Nov	1.394	0.76	43	47	107
15-Nov	1.889	1.07	42	46	145
16-Nov	1.982	0.95	37	45	152
17-Nov	1.718	0.05	37	41	132
18-Nov	1.544	0.04	34	42	118
19-Nov	1.421	0.06	40	44	109
20-Nov	1.448	0.08	41	47	111
21-Nov	1.364	0.33	41	48	105
22-Nov	1.350	0.05	36	43	103
23-Nov	1.360	0.32	37	45	104

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Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
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24-Nov	1.497	0.58	37	41	115
25-Nov	1.523	0.93	37	41	117
26-Nov	1.422	0.13	37	46	109
27-Nov	1.546	0.32	35	46	118
28-Nov	1.282	0.64	35	40	98
29-Nov	1.180	0.25	37	42	90
30-Nov	1.827	0.00	34	41	140
1-Dec	1.241	0.24	33	41	95
2-Dec	1.270	0.09	36	38	97
3-Dec	1.280	0.32	37	42	98
4-Dec	1.692	0.93	31	42	130
5-Dec	1.506	0.12	28	33	115
6-Dec	1.383	0.04	24	31	106
7-Dec	1.290	0.00	20	27	99
8-Dec	1.202	0.00	20	34	92
9-Dec	1.156	0.14	23	26	89
10-Dec	1.212	0.76	24	27	93
11-Dec	1.478	0.26	27	35	113
12-Dec	1.523	0.00	31	34	117
13-Dec	1.427	0.30	27	35	109
14-Dec	1.299	0.00	24	29	100
15-Dec	1.162	0.00	24	28	89
16-Dec	1.119	0.00	20	29	86
17-Dec	0.975	0.00	15	24	75
18-Dec	1.123	0.00	18	26	86
19-Dec	1.220	0.24	25	35	93
20-Dec	1.288	0.45	33	46	99
21-Dec	1.169	0.25	30	41	90
22-Dec	1.130	0.00	29	37	87
23-Dec	1.187	0.15	31	39	91
24-Dec	1.141	0.30	30	33	87
25-Dec	1.056	0.10	25	31	81
26-Dec	1.101	0.10	25	25	84
27-Dec	1.174	0.61	25	35	90
28-Dec	1.068	0.13	33	36	82
29-Dec	1.174	0.00	31	37	90
30-Dec	1.265	0.00	31	38	97
31-Dec	1.113	0.00	25	32	85

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2017					
1-Jan	1.099	0.27	26	32	84
2-Jan	1.029	0.00	19	30	78
3-Jan	0.899	0.00	19	22	68
4-Jan	0.829	0.00	19	22	63
5-Jan	0.789	0.00	17	24	60
6-Jan	0.749	0.00	18	25	57
7-Jan	0.949	0.00	18	24	72
8-Jan	1.039	0.00	24	34	79
9-Jan	0.949	0.34	29	35	72
10-Jan	0.889	0.07	28	32	68
11-Jan	0.849	0.00	22	29	65
12-Jan	0.719	0.00	19	28	55
13-Jan	0.699	0.00	19	26	53
14-Jan	0.869	0.00	19	29	66
15-Jan	0.869	0.00	25	34	66
16-Jan	0.879	0.00	26	33	67
17-Jan	1.049	0.05	29	38	80
18-Jan	1.579	1.46	32	38	120
19-Jan	1.299	0.53	33	40	99
20-Jan	1.159	0.11	31	38	88
21-Jan	1.079	0.03	33	41	82
22-Jan	1.109	0.04	33	41	84
23-Jan	0.989	0.25	29	41	75
24-Jan	0.889	0.00	26	36	68
25-Jan	0.949	0.01	26	36	72
26-Jan	0.909	0.06	31	35	69
27-Jan	0.899	0.00	29	38	68
28-Jan	0.929	0.01	29	38	71
29-Jan	0.949	0.00	32	42	72
30-Jan	0.889	0.12	33	42	68
31-Jan	0.839	0.05	31	37	64
1-Feb	0.733	0.00	24	31	56
2-Feb	0.823	0.00	25	31	63
3-Feb	0.923	0.10	25	32	70
4-Feb	1.373	0.70	26	34	104
5-Feb	1.633	1.03	31	35	124
6-Feb	1.443	1.50	27	32	110
7-Feb	1.303	0.08	24	33	99
8-Feb	1.373	0.07	24	32	104
9-Feb	2.923	0.00	30	36	222
10-Feb	2.033	0.80	33	46	155
11-Feb	1.603	0.29	32	37	122
12-Feb	1.433	0.05	28	37	109
13-Feb	1.283	0.00	30	40	98
14-Feb	1.203	0.05	37	52	91
15-Feb	1.613	0.58	35	50	123

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16-Feb	2.273	1.35	38	44	173
17-Feb	1.663	0.10	34	43	126
18-Feb	1.443	0.01	33	42	110
19-Feb	1.383	0.40	33	38	105
20-Feb	1.363	0.21	34	39	104
21-Feb	1.333	0.52	33	38	101
22-Feb	1.303	0.36	31	37	99
23-Feb	1.163	0.11	28	37	88
24-Feb	1.113	0.03	26	34	85
25-Feb	1.093	0.00	24	34	83
26-Feb	1.263	0.35	26	35	96
27-Feb	1.153	0.19	28	34	88
28-Feb	1.233	0.52	27	33	94
1-Mar	1.302	0.20	26	36	99
2-Mar	1.242	0.09	32	38	94
3-Mar	1.372	0.30	32	38	104
4-Mar	1.362	0.57	30	40	104
5-Mar	1.292	0.13	29	35	98
6-Mar	1.172	0.06	29	36	89
7-Mar	1.282	0.11	28	33	97
8-Mar	1.272	0.30	30	36	97
9-Mar	1.412	0.12	31	33	107
10-Mar	1.682	0.98	32	43	128
11-Mar	1.552	0.06	35	45	118
12-Mar	1.452	0.52	37	46	110
13-Mar	1.522	0.14	37	46	116
14-Mar	1.612	0.88	39	47	123
15-Mar	2.222	1.18	40	48	169
16-Mar	1.742	0.43	35	46	132
17-Mar	1.572	0.03	31	44	120
18-Mar	2.122	1.05	39	46	161
19-Mar	1.742	0.44	29	43	132
20-Mar	1.512	0.05	30	44	115
21-Mar	1.412	0.03	40	53	107
22-Mar	1.302	0.15	37	53	99
23-Mar	1.172	0.21	35	47	89
24-Mar	1.272	0.35	35	51	97
25-Mar	1.292	0.42	36	45	98
26-Mar	1.322	0.13	35	41	101
27-Mar	1.302	0.40	36	44	99
28-Mar	1.362	0.41	37	43	104
29-Mar	1.662	0.53	37	43	126
30-Mar	1.642	0.70	34	48	125
31-Mar	1.352	0.13	31	42	103
1-Apr	1.304	0.13	31	49	99
2-Apr	1.354	0.27	34	45	103
3-Apr	1.294	0.05	32	43	98

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4-Apr	1.434	0.22	32	46	109
5-Apr	1.324	0.17	42	54	101
6-Apr	1.144	0.20	41	49	87
7-Apr	1.104	0.19	40	51	84
8-Apr	1.014	0.07	35	52	77
9-Apr	0.994	0.04	33	42	76
10-Apr	1.024	0.13	33	49	78
11-Apr	1.174	0.42	31	43	89
12-Apr	1.494	0.16	31	54	114
13-Apr	1.544	0.52	36	51	117
14-Apr	1.314	0.45	35	48	100
15-Apr	1.154	0.04	35	44	88
16-Apr	1.304	0.00	33	50	99
17-Apr	1.184	0.02	42	55	90
18-Apr	1.524	0.26	41	55	116
19-Apr	1.334	0.39	38	52	101
20-Apr	1.304	0.68	38	49	99
21-Apr	1.084	0.10	35	49	82
22-Apr	1.234	0.00	35	61	94
23-Apr	1.304	0.13	41	55	99
24-Apr	1.144	0.54	38	46	87
25-Apr	1.114	0.03	38	47	85
26-Apr	1.064	0.19	40	50	81
27-Apr	1.164	0.29	37	49	88
28-Apr	0.984	0.20	36	47	75
29-Apr	1.124	0.00	34	47	85
30-Apr	1.094	0.10	35	52	83
1-May	1.187	0.41	38	44	90
2-May	1.027	0.14	38	42	78
3-May	1.137	0.19	39	55	86
4-May	1.087	0.02	47	67	83
5-May	1.377	1.05	49	80	105
6-May	1.257	0.44	33	55	96
7-May	1.167	0.03	36	46	89
8-May	1.157	0.00	38	54	88
9-May	1.157	0.00	39	58	88
10-May	1.177	0.00	39	65	90
11-May	1.147	0.00	44	68	87
12-May	0.957	0.32	36	58	73
13-May	0.957	0.11	37	49	73
14-May	1.017	0.04	39	47	77
15-May	1.027	0.10	40	49	78
16-May	1.297	0.82	37	46	99
17-May	1.237	0.68	34	42	94
18-May	1.127	0.02	38	47	86
19-May	1.067	0.00	43	58	81
20-May	1.017	0.00	44	65	77

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21-May	1.047	0.00	46	65	80
22-May	0.997	0.00	48	74	76
23-May	0.997	0.00	51	77	76
24-May	0.947	0.00	42	78	72
25-May	0.967	0.00	40	53	74
26-May	0.957	0.00	42	63	73
27-May	0.907	0.00	47	72	69
28-May	0.847	0.00	51	78	64
29-May	1.027	0.00	50	80	78
30-May	0.927	0.00	49	75	71
31-May	0.907	0.18	47	51	69
1-Jun	0.890	0.07	49	67	68
2-Jun	1.030	0.05	47	57	78
3-Jun	0.840	0.00	48	63	64
4-Jun	0.900	0.00	45	56	68
5-Jun	0.920	0.00	41	57	70
6-Jun	1.030	0.00	41	66	78
7-Jun	0.910	0.00	47	79	69
8-Jun	1.050	0.25	50	75	80
9-Jun	0.890	0.23	42	55	68
10-Jun	0.840	0.23	43	55	64
11-Jun	0.890	0.05	43	54	68
12-Jun	0.890	0.00	44	60	68
13-Jun	0.920	0.00	45	53	70
14-Jun	0.850	0.00	42	56	65
15-Jun	1.000	0.00	44	59	76
16-Jun	1.030	1.22	48	54	78
17-Jun	0.950	0.00	46	55	72
18-Jun	0.910	0.15	48	61	69
19-Jun	0.960	0.00	51	65	73
20-Jun	0.910	0.00	54	72	69
21-Jun	1.010	0.00	42	67	77
22-Jun	0.890	0.00	43	61	68
23-Jun	1.050	0.00	44	68	80
24-Jun	1.020	0.00	49	74	78
25-Jun	0.920	0.00	53	86	70
26-Jun	0.870	0.00	57	93	66
27-Jun	0.850	0.00	48	66	65
28-Jun	0.900	0.00	48	64	68
29-Jun	0.840	0.00	48	64	64
30-Jun	0.880	0.00	50	73	67
1-Jul	0.812	0.00	49	76	62
2-Jul	0.802	0.00	49	66	61
3-Jul	0.802	0.00	50	69	61
4-Jul	0.702	0.00	50	60	53
5-Jul	0.822	0.00	51	69	63
6-Jul	0.912	0.00	51	78	69

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7-Jul	0.882	0.00	53	79	67
8-Jul	0.852	0.00	51	67	65
9-Jul	0.902	0.00	51	73	69
10-Jul	0.842	0.00	54	72	64
11-Jul	0.852	0.00	49	66	65
12-Jul	0.972	0.00	48	66	74
13-Jul	1.002	0.00	49	71	76
14-Jul	0.952	0.00	48	66	72
15-Jul	1.062	0.00	48	73	81
16-Jul	1.022	0.00	49	71	78
17-Jul	0.982	0.00	46	63	75
18-Jul	0.962	0.00	47	68	73
19-Jul	0.982	0.00	48	74	75
20-Jul	0.892	0.00	49	72	68
21-Jul	0.932	0.00	50	64	71
22-Jul	0.812	0.00	51	71	62
23-Jul	0.772	0.00	56	78	59
24-Jul	0.992	0.00	50	69	75
25-Jul	1.072	0.00	50	74	82
26-Jul	1.072	0.00	54	78	82
27-Jul	0.922	0.00	54	77	70
28-Jul	1.032	0.00	50	64	78
29-Jul	1.032	0.00	50	71	78
30-Jul	1.062	0.00	50	74	81
31-Jul	1.212	0.00	51	74	92
1-Aug	1.327	0.00	56	76	101
2-Aug	1.177	0.00	58	81	90
3-Aug	1.037	0.00	60	85	79
4-Aug	0.987	0.00	61	89	75
5-Aug	0.967	0.00	55	85	74
6-Aug	1.007	0.00	56	76	77
7-Aug	0.957	0.00	58	78	73
8-Aug	0.997	0.00	59	81	76
9-Aug	0.967	0.00	-	-	74
10-Aug	0.997	0.00	-	-	76
11-Aug	0.927	0.00	-	-	71
12-Aug	0.977	0.00	53	83	74
13-Aug	0.907	0.11	53	70	69
14-Aug	0.997	0.02	49	63	76
15-Aug	0.937	0.00	47	64	71
16-Aug	0.917	0.00	48	69	70
17-Aug	0.897	0.00	50	71	68
18-Aug	0.947	0.00	51	69	72
19-Aug	0.877	0.00	52	70	67
20-Aug	0.887	0.00	50	68	67
21-Aug	0.897	0.00	51	70	68
22-Aug	0.937	0.00	51	75	71

Note:
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Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
23-Aug	0.937	0.00	55	81	71
24-Aug	0.867	0.00	49	76	66
25-Aug	0.827	0.00	46	60	63
26-Aug	0.837	0.00	46	66	64
27-Aug	0.937	0.00	50	75	71
28-Aug	0.947	0.00	55	80	72
29-Aug	0.857	0.00	57	84	65
30-Aug	0.957	0.00	54	83	73
31-Aug	0.877	0.00	54	69	67
1-Sep	0.875	0.00	52	68	67
2-Sep	0.835	0.00	51	76	64
3-Sep	0.865	0.00	57	82	66
4-Sep	0.915	0.00	59	82	70
5-Sep	0.895	0.00	59	85	68
6-Sep	0.915	0.00	59	90	70
7-Sep	0.855	0.00	58	77	65
8-Sep	0.905	0.00	57	77	69
9-Sep	0.835	0.00	54	68	64
10-Sep	0.875	0.11	51	65	67
11-Sep	0.865	0.00	48	64	66
12-Sep	0.835	0.00	48	75	64
13-Sep	0.865	0.00	49	73	66
14-Sep	0.815	0.00	47	73	62
15-Sep	0.875	0.00	46	64	67
16-Sep	0.865	0.00	46	67	66
17-Sep	0.905	0.00	52	68	69
18-Sep	0.875	0.25	44	60	67
19-Sep	0.955	0.44	42	56	73
20-Sep	0.865	1.31	42	49	66
21-Sep	0.855	0.03	42	47	65
22-Sep	0.805	0.22	44	53	61
23-Sep	0.815	0.00	44	58	62
24-Sep	0.865	0.00	44	61	66
25-Sep	0.835	0.02	45	63	64
26-Sep	0.795	0.01	48	58	60
27-Sep	0.865	0.00	48	65	66
28-Sep	0.875	0.00	51	74	67
29-Sep	0.865	0.00	53	77	66
30-Sep	0.815	0.10	48	59	62
1-Oct	0.893	0.15	45	53	68
2-Oct	0.853	0.21	42	50	65
3-Oct	0.843	0.00	40	50	64
4-Oct	0.833	0.00	40	57	63
5-Oct	0.813	0.00	41	58	62
6-Oct	0.803	0.00	41	60	61
7-Oct	0.863	0.13	41	61	66
8-Oct	0.913	0.95	35	51	69

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Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
Note: 1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification* .					
9-Oct	0.873	0.01	38	49	66
10-Oct	0.893	0.00	38	52	68
11-Oct	0.803	0.08	38	50	61
12-Oct	0.833	0.04	36	45	63
13-Oct	0.873	0.47	36	41	66
14-Oct	0.843	0.00	32	40	64
15-Oct	0.873	0.00	36	47	66
16-Oct	0.853	0.00	39	55	65
17-Oct	0.793	0.00	41	57	60
18-Oct	0.883	0.23	39	52	67
19-Oct	1.503	1.80	40	57	114
20-Oct	1.423	0.83	42	47	108
21-Oct	1.593	0.21	38	43	121
22-Oct	1.783	1.82	38	54	136
23-Oct	1.453	0.00	42	50	110
24-Oct	1.633	0.00	42	53	124
25-Oct	1.463	0.02	42	59	111
26-Oct	1.273	0.13	42	53	97
27-Oct	1.263	0.03	43	48	96
28-Oct	1.193	0.00	47	65	91
29-Oct	1.233	0.00	42	63	94
30-Oct	1.223	0.00	42	53	93
31-Oct	1.103	0.00	36	51	84
1-Nov	1.187	0.03	36	52	90
2-Nov	1.167	0.11	39	45	89
3-Nov	1.137	0.53	31	42	86
4-Nov	0.887	0.08	29	31	67
5-Nov	1.297	0.72	30	33	99
6-Nov	1.257	0.28	29	31	96
7-Nov	1.197	0.00	29	35	91
8-Nov	1.177	0.00	32	41	89
9-Nov	1.127	0.06	36	44	86
10-Nov	1.127	0.43	35	44	86
11-Nov	1.097	0.00	35	41	83
12-Nov	1.147	0.24	38	45	87
13-Nov	1.327	0.43	41	47	101
14-Nov	1.447	1.08	38	46	110
15-Nov	1.507	0.52	37	44	115
16-Nov	1.367	0.40	35	39	104
17-Nov	1.197	0.30	34	38	91
18-Nov	1.527	0.00	37	40	116
19-Nov	1.317	0.00	33	40	100
20-Nov	1.607	0.85	35	44	122
21-Nov	1.977	0.79	40	44	150
22-Nov	2.087	1.10	41	49	159
23-Nov	2.327	1.62	48	54	177
24-Nov	1.727	0.27	40	49	131

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
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25-Nov	1.577	0.05	37	44	120
26-Nov	1.707	0.45	37	51	130
27-Nov	1.537	0.43	36	49	117
28-Nov	1.707	0.09	35	41	130
29-Nov	1.567	0.00	35	39	119
30-Nov	1.457	0.06	36	42	111
1-Dec	1.411	0.21	33	40	107
2-Dec	1.461	0.32	33	40	111
3-Dec	1.531	0.61	33	38	116
4-Dec	1.371	0.10	29	35	104
5-Dec	1.451	0.00	28	33	110
6-Dec	1.551	0.00	28	42	118
7-Dec	1.361	0.03	39	46	104
8-Dec	1.251	0.00	35	46	95
9-Dec	1.261	0.00	34	39	96
10-Dec	1.261	0.00	34	38	96
11-Dec	1.241	0.00	35	43	94
12-Dec	1.121	0.00	31	39	85
13-Dec	1.011	0.00	31	42	77
14-Dec	1.021	0.00	32	44	78
15-Dec	0.931	0.06	33	42	71
16-Dec	0.941	0.13	31	38	72
17-Dec	1.031	0.07	35	38	78
18-Dec	1.411	0.75	37	46	107
19-Dec	1.921	1.26	34	40	146
20-Dec	1.531	0.63	30	40	116
21-Dec	1.291	0.00	25	31	98
22-Dec	1.281	0.15	25	31	97
23-Dec	1.191	0.00	24	32	91
24-Dec	1.171	0.00	24	29	89
25-Dec	1.061	0.10	24	29	81
26-Dec	1.121	0.00	25	29	85
27-Dec	1.101	0.00	24	31	84
28-Dec	1.211	0.15	31	35	92
29-Dec	2.131	2.26	33	37	162
30-Dec	1.671	0.25	35	47	127
31-Dec	1.401	0.05	29	39	107

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2018					
1-Jan	1.468	0.05	30	37	110
2-Jan	1.308	0.05	30	38	98
3-Jan	1.238	0.00	37	45	92
4-Jan	1.178	0.00	37	46	88
5-Jan	1.178	0.07	39	46	88
6-Jan	1.148	0.33	37	43	86
7-Jan	1.178	0.35	35	39	88
8-Jan	1.198	0.36	35	39	89
9-Jan	1.468	0.60	35	41	110
10-Jan	1.408	1.00	34	40	105
11-Jan	1.928	0.55	34	39	144
12-Jan	1.998	1.23	36	45	149
13-Jan	1.648	0.22	40	44	123
14-Jan	1.498	0.22	40	51	112
15-Jan	1.398	0.00	47	53	104
16-Jan	1.358	0.25	40	51	101
17-Jan	1.438	0.04	38	44	107
18-Jan	1.668	0.95	34	48	125
19-Jan	1.538	0.30	33	40	115
20-Jan	1.548	0.46	31	37	116
21-Jan	1.578	0.31	31	40	118
22-Jan	1.568	0.55	34	39	117
23-Jan	1.668	0.00	34	39	125
24-Jan	1.968	0.81	34	39	147
25-Jan	1.758	0.51	31	40	131
26-Jan	1.648	0.26	30	34	123
27-Jan	1.658	0.75	31	35	124
28-Jan	2.088	0.38	35	42	156
29-Jan	1.988	0.01	37	41	148
30-Jan	2.118	1.22	35	45	158
31-Jan	1.678	0.03	34	39	125
1-Feb	1.524	0.05	33	36	114
2-Feb	1.704	0.92	35	43	127
3-Feb	1.614	0.15	41	49	120
4-Feb	1.784	0.71	44	51	133
5-Feb	1.734	0.10	40	51	129
6-Feb	1.584	0.10	38	43	118
7-Feb	1.444	0.06	38	41	108
8-Feb	1.334	0.00	40	48	100
9-Feb	1.174	0.21	33	48	88
10-Feb	1.074	0.24	29	39	80
11-Feb	1.084	0.00	29	36	81
12-Feb	1.004	0.00	26	35	75
13-Feb	0.984	0.00	26	36	73
14-Feb	1.064	0.35	27	40	79
15-Feb	0.974	0.13	30	33	73

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16-Feb	1.084	0.32	30	35	81
17-Feb	1.504	0.95	31	40	112
18-Feb	1.244	0.42	-	-	93
19-Feb	1.114	0.00	-	-	83
20-Feb	1.004	0.10	-	-	75
21-Feb	0.984	0.15	20	29	73
22-Feb	0.924	0.00	17	29	69
23-Feb	0.914	0.00	17	29	68
24-Feb	0.934	0.00	17	32	70
25-Feb	1.054	0.31	30	36	79
26-Feb	0.984	0.22	27	35	73
27-Feb	1.104	0.04	27	37	82
28-Feb	1.364	0.70	32	37	102
1-Mar	1.302	0.57	31	38	97
2-Mar	1.142	0.14	30	37	85
3-Mar	1.052	0.00	29	35	79
4-Mar	1.082	0.10	29	41	81
5-Mar	1.022	0.14	31	36	76
6-Mar	0.962	0.05	30	38	72
7-Mar	0.962	0.00	29	41	72
8-Mar	1.022	0.03	31	46	76
9-Mar	1.012	0.60	34	43	76
10-Mar	0.952	0.00	28	41	71
11-Mar	0.972	0.00	31	52	73
12-Mar	1.012	0.00	47	55	76
13-Mar	0.962	0.00	49	61	72
14-Mar	0.932	0.56	37	59	70
15-Mar	0.902	0.00	29	41	67
16-Mar	0.882	0.00	29	47	66
17-Mar	0.882	0.00	29	50	66
18-Mar	0.882	0.23	31	44	66
19-Mar	0.842	0.02	35	44	63
20-Mar	0.852	0.00	30	45	64
21-Mar	0.862	0.00	30	48	64
22-Mar	0.912	0.52	31	55	68
23-Mar	0.862	0.17	31	40	64
24-Mar	0.912	0.43	30	37	68
25-Mar	0.942	0.01	29	38	70
26-Mar	0.932	0.06	29	40	70
27-Mar	0.982	0.00	31	42	73
28-Mar	0.972	0.22	36	45	73
29-Mar	0.912	0.02	36	42	68
30-Mar	0.892	0.00	36	46	67
31-Mar	0.872	0.00	39	48	65
1-Apr	0.946	0.03	36	52	71
2-Apr	0.996	0.65	30	39	74
3-Apr	0.966	0.01	30	41	72

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4-Apr	0.986	0.10	33	44	74
5-Apr	0.976	0.48	34	42	73
6-Apr	0.996	0.25	40	48	74
7-Apr	1.166	0.50	42	57	87
8-Apr	1.546	0.80	37	47	115
9-Apr	1.356	0.69	37	43	101
10-Apr	1.246	0.00	41	56	93
11-Apr	1.166	0.27	38	48	87
12-Apr	1.076	0.33	34	48	80
13-Apr	1.186	0.35	35	41	89
14-Apr	1.826	1.13	36	46	136
15-Apr	1.876	1.00	39	44	140
16-Apr	2.036	0.33	35	43	152
17-Apr	1.896	1.33	34	39	142
18-Apr	1.626	0.08	35	44	121
19-Apr	1.436	0.11	34	51	107
20-Apr	1.266	0.00	34	55	95
21-Apr	1.186	0.13	38	58	89
22-Apr	1.146	0.02	34	48	86
23-Apr	1.416	0.01	35	52	106
24-Apr	1.476	0.00	36	65	110
25-Apr	1.286	0.00	43	71	96
26-Apr	1.166	0.00	47	70	87
27-Apr	0.986	0.00	43	79	74
28-Apr	0.956	0.08	41	51	71
29-Apr	0.986	0.65	41	46	74
30-Apr	1.116	0.05	40	49	83
1-May	1.133	0.15	40	47	85
2-May	1.143	0.05	40	49	85
3-May	1.303	0.00	40	61	97
4-May	1.043	0.00	43	70	78
5-May	0.983	0.00	43	59	73
6-May	1.023	0.01	40	58	76
7-May	1.033	0.04	49	70	77
8-May	1.083	0.00	47	62	81
9-May	1.003	0.38	48	76	75
10-May	1.103	0.08	43	76	82
11-May	1.003	0.58	42	52	75
12-May	0.973	0.04	42	54	73
13-May	0.953	0.00	45	76	71
14-May	0.943	0.00	45	76	70
15-May	0.963	0.00	51	80	72
16-May	0.953	0.00	48	80	71
17-May	0.903	0.06	47	80	67
18-May	0.903	0.00	47	56	67
19-May	0.873	0.00	47	54	65
20-May	0.903	0.16	47	65	67

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21-May	0.913	0.02	47	53	68
22-May	0.983	0.00	46	60	73
23-May	0.953	0.00	46	73	71
24-May	1.043	0.00	46	74	78
25-May	0.853	0.00	47	63	64
26-May	0.753	0.00	44	58	56
27-May	0.853	0.00	44	54	64
28-May	0.963	0.00	44	67	72
29-May	1.033	0.00	44	60	77
30-May	0.913	0.00	38	53	68
31-May	0.863	0.00	42	55	64
1-Jun	0.842	0.05	42	53	63
2-Jun	0.792	0.00	43	57	59
3-Jun	0.862	0.00	48	69	64
4-Jun	0.872	0.00	44	62	65
5-Jun	0.852	0.03	41	55	64
6-Jun	0.862	0.00	43	63	64
7-Jun	0.842	0.00	45	67	63
8-Jun	0.822	0.00	49	56	61
9-Jun	0.842	0.18	43	57	63
10-Jun	0.862	0.53	42	54	64
11-Jun	0.822	0.43	40	51	61
12-Jun	0.842	0.05	42	57	63
13-Jun	0.842	0.25	43	64	63
14-Jun	0.922	0.70	42	64	69
15-Jun	0.802	0.00	45	55	60
16-Jun	0.772	0.01	44	60	58
17-Jun	0.832	0.00	45	65	62
18-Jun	0.782	0.00	46	76	58
19-Jun	0.842	0.00	53	79	63
20-Jun	0.832	0.00	54	78	62
21-Jun	0.952	0.00	54	82	71
22-Jun	0.892	0.00	51	63	67
23-Jun	0.952	0.35	49	63	71
24-Jun	0.872	0.00	49	61	65
25-Jun	0.852	0.36	50	74	64
26-Jun	0.852	0.25	47	59	64
27-Jun	0.862	0.02	44	60	64
28-Jun	0.732	0.00	46	62	55
29-Jun	0.852	0.00	47	56	64
30-Jun	0.822	0.00	51	60	61
1-Jul	0.819	0.09	51	56	61
2-Jul	0.849	0.05	45	59	63
3-Jul	0.859	0.00	43	55	64
4-Jul	0.739	0.00	44	64	55
5-Jul	0.899	0.00	53	77	67
6-Jul	0.869	0.06	54	77	65

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7-Jul	0.809	0.10	51	73	60
8-Jul	0.779	0.00	50	65	58
9-Jul	0.839	0.00	50	72	63
10-Jul	0.839	0.05	52	72	63
11-Jul	0.839	0.00	48	64	63
12-Jul	0.809	0.00	50	72	60
13-Jul	0.769	0.00	54	79	57
14-Jul	0.769	0.00	53	78	57
15-Jul	0.769	0.00	56	78	57
16-Jul	0.799	0.00	56	83	60
17-Jul	0.779	0.00	58	82	58
18-Jul	0.839	0.00	54	81	63
19-Jul	0.789	0.00	50	70	59
20-Jul	0.769	0.00	50	63	57
21-Jul	0.749	0.00	46	64	56
22-Jul	0.729	0.00	50	67	54
23-Jul	0.789	0.00	51	77	59
24-Jul	0.789	0.00	57	81	59
25-Jul	0.809	0.00	56	80	60
26-Jul	0.789	0.00	57	81	59
27-Jul	0.759	0.00	57	82	57
28-Jul	0.769	0.00	57	78	57
29-Jul	0.759	0.00	60	77	57
30-Jul	0.789	0.00	61	86	59
31-Jul	0.799	0.00	60	85	60
1-Aug	0.798	0.00	54	78	60
2-Aug	0.778	0.00	52	78	58
3-Aug	0.708	0.00	52	59	53
4-Aug	0.688	0.06	50	62	51
5-Aug	0.748	0.00	53	71	56
6-Aug	0.768	0.00	57	77	57
7-Aug	0.768	0.00	58	80	57
8-Aug	0.788	0.00	59	82	59
9-Aug	0.748	0.00	61	87	56
10-Aug	0.738	0.00	62	85	55
11-Aug	0.748	0.00	55	81	56
12-Aug	0.778	0.04	53	67	58
13-Aug	0.758	0.00	52	65	57
14-Aug	0.788	0.00	55	73	59
15-Aug	0.768	0.00	56	80	57
16-Aug	0.738	0.00	55	80	55
17-Aug	0.718	0.00	50	71	54
18-Aug	0.688	0.00	50	67	51
19-Aug	0.728	0.00	56	71	54
20-Aug	0.758	0.00	55	72	57
21-Aug	0.748	0.00	60	71	56
22-Aug	0.728	0.00	59	84	54

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
Note: 1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification*.					
23-Aug	0.748	0.00	52	82	56
24-Aug	0.708	0.00	49	65	53
25-Aug	0.738	0.00	47	61	55
26-Aug	0.788	0.00	49	56	59
27-Aug	0.778	0.15	50	58	58
28-Aug	0.808	0.00	50	63	60
29-Aug	0.778	0.00	50	73	58
30-Aug	0.778	0.00	53	73	58
31-Aug	0.708	0.00	53	66	53
1-Sep	0.699	0.00	51	58	52
2-Sep	0.689	0.00	46	60	51
3-Sep	0.809	0.00	46	67	60
4-Sep	0.789	0.00	46	65	59
5-Sep	0.699	0.00	46	68	52
6-Sep	0.739	0.00	48	74	55
7-Sep	0.719	0.00	48	77	54
8-Sep	0.719	0.05	48	73	54
9-Sep	0.799	0.00	51	61	60
10-Sep	0.809	0.25	50	69	60
11-Sep	0.899	0.00	49	59	67
12-Sep	0.909	0.58	49	56	68
13-Sep	0.899	0.62	48	56	67
14-Sep	0.769	0.30	48	56	57
15-Sep	0.739	0.20	45	58	55
16-Sep	0.889	0.35	46	56	66
17-Sep	0.709	0.60	42	53	53
18-Sep	0.749	0.00	43	55	56
19-Sep	0.739	0.00	43	56	55
20-Sep	1.029	0.40	43	59	77
21-Sep	0.959	0.00	47	56	72
22-Sep	0.789	0.24	50	65	59
23-Sep	0.729	0.11	45	55	54
24-Sep	0.739	0.00	42	53	55
25-Sep	0.739	0.00	42	57	55
26-Sep	0.749	0.00	43	59	56
27-Sep	0.729	0.00	44	62	54
28-Sep	0.749	0.00	46	64	56
29-Sep	0.689	0.00	55	72	51
30-Sep	0.719	0.00	48	70	54
1-Oct	0.762	0.00	48	56	57
2-Oct	0.872	0.45	49	56	65
3-Oct	0.832	0.26	35	56	62
4-Oct	0.792	0.00	35	50	59
5-Oct	0.802	0.00	39	50	60
6-Oct	0.712	0.66	40	46	53
7-Oct	0.732	0.00	39	46	55
8-Oct	0.802	0.04	39	50	60

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
Note: 1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification*.					
9-Oct	1.032	1.26	46	51	77
10-Oct	0.802	0.00	45	49	60
11-Oct	0.742	0.00	40	52	55
12-Oct	0.692	0.00	40	55	52
13-Oct	0.682	0.00	36	54	51
14-Oct	0.732	0.00	37	52	55
15-Oct	0.702	0.00	40	55	52
16-Oct	0.722	0.00	42	56	54
17-Oct	0.732	0.00	47	65	55
18-Oct	0.732	0.00	44	66	55
19-Oct	0.672	0.00	42	65	50
20-Oct	0.692	0.00	41	65	52
21-Oct	0.732	0.00	39	54	55
22-Oct	0.732	0.02	42	55	55
23-Oct	0.722	0.00	44	59	54
24-Oct	0.732	0.01	44	50	55
25-Oct	0.792	0.00	46	53	59
26-Oct	0.842	0.92	47	54	63
27-Oct	0.842	0.21	38	56	63
28-Oct	1.422	1.45	38	53	106
29-Oct	1.092	0.40	41	46	82
30-Oct	0.922	0.06	41	46	69
31-Oct	0.932	0.25	42	47	70
1-Nov	1.011	0.17	43	55	75
2-Nov	1.001	0.58	49	55	75
3-Nov	0.991	0.06	46	53	74
4-Nov	1.191	0.62	49	50	89
5-Nov	1.061	0.25	44	51	79
6-Nov	1.001	0.28	41	47	75
7-Nov	0.941	0.00	37	45	70
8-Nov	0.891	0.02	31	42	67
9-Nov	0.841	0.00	31	36	63
10-Nov	0.841	0.17	32	39	63
11-Nov	0.841	0.00	30	39	63
12-Nov	0.841	0.00	31	43	63
13-Nov	0.761	0.01	38	48	57
14-Nov	0.821	0.08	39	49	61
15-Nov	0.781	0.02	42	51	58
16-Nov	0.791	0.26	44	48	59
17-Nov	0.781	0.00	35	47	58
18-Nov	0.821	0.05	38	44	61
19-Nov	0.831	0.01	39	46	62
20-Nov	0.801	0.00	44	50	60
21-Nov	0.811	0.00	42	51	61
22-Nov	0.891	0.34	37	46	67
23-Nov	1.081	1.05	37	42	81
24-Nov	0.961	0.38	31	40	72

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)
Note: 1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these I/I analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification*.					
25-Nov	0.961	0.00	31	38	72
26-Nov	1.231	0.21	31	46	92
27-Nov	1.771	0.97	40	44	132
28-Nov	1.681	0.92	40	46	126
29-Nov	1.301	0.03	36	44	97
30-Nov	1.201	0.04	35	41	90
1-Dec	1.074	0.14	35	40	80
2-Dec	1.074	0.06	32	37	80
3-Dec	0.974	0.04	29	39	73
4-Dec	0.984	0.04	29	34	73
5-Dec	0.924	0.03	29	36	69
6-Dec	0.894	0.01	30	35	67
7-Dec	0.844	0.00	30	33	63
8-Dec	0.814	0.02	31	34	61
9-Dec	1.004	0.00	32	41	75
10-Dec	1.024	0.51	32	39	76
11-Dec	1.394	0.23	34	38	104
12-Dec	1.484	1.35	36	47	111
13-Dec	1.364	0.67	35	42	102
14-Dec	1.234	0.00	37	47	92
15-Dec	1.114	0.08	35	47	83
16-Dec	1.224	0.18	35	44	91
17-Dec	1.144	0.09	37	46	85
18-Dec	1.684	1.18	38	42	126
19-Dec	1.474	0.24	38	45	110
20-Dec	1.354	0.12	38	47	101
21-Dec	1.214	0.33	31	48	91
22-Dec	1.124	0.02	30	38	84
23-Dec	1.274	0.35	32	40	95
24-Dec	1.204	0.45	33	37	90
25-Dec	1.054	0.03	29	35	79
26-Dec	1.114	0.04	29	35	83
27-Dec	1.024	0.10	31	33	76
28-Dec	1.084	0.04	31	36	81
29-Dec	1.494	0.50	32	46	112
30-Dec	1.724	0.35	31	47	129
31-Dec	1.394	0.05	28	36	104

Year	Pop.
2012	11,261
2013	11,641
2014	12,071
2015	12,791
2016	13,051
2017	13,151
2018	13,391

(orange)	Max Inflow Day
(blue)	Max Dry-Weather Infiltration - First Day
(green)	Notable Rain Event (> 0.30 in.)
(red)	No Precipitation Data Available

Max. Flow for Infiltration (gpcd)
120

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)	Dry-Weather Average Flow (MGD)[2]	Dry-Weather Average Flow per Capita (gpcd)[2]	Notes
2014								
10-Feb	1.401	0.55	23	32	116			
11-Feb	1.429	1.22	28	42	118			
12-Feb	1.388	0.00	36	48	115			
13-Feb	1.436	0.45	35	45	119			
14-Feb	1.459	0.27	34	45	121			
15-Feb	1.621	0.15	32	44	134			
16-Feb	1.750	1.04	32	43	145			
17-Feb	2.471	1.85	31	39	205			
18-Feb	2.472	0.22	31	36	205			
19-Feb	1.985	1.06	31	37	164			
20-Feb	1.955	0.30	31	39	162			
21-Feb	1.681	0.35	31	39	139			
22-Feb	1.747	0.06	29	33	145			
23-Feb	1.558	0.00	30	33	129			
24-Feb	1.870	0.50	31	35	155			
25-Feb	1.695	0.00	33	36	140	1.367	113	
26-Feb	1.399	0.00	35	45	116			
27-Feb	1.436	0.00	36	47	119			
28-Feb	1.166	0.00	33	47	97			
1-Mar	1.138	0.00	33	51	94			
2-Mar	1.378	0.57	25	34	114			

Notes:
1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification*.
2 = Dry-weather average flow is the average influent WRF flow from February 25th through March 1st only; influent WRF flows for February 10th through February 24th could be attributed to inflow events.

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)	Dry-Weather Average Flow (MGD)	Dry-Weather Average Flow per Capita (gpcd)	Notes
2016								
14-Nov	1.394	0.76	43	47	107			
15-Nov	1.889	1.07	42	46	145			
16-Nov	1.982	0.95	37	45	152			
17-Nov	1.718	0.05	37	41	132	1.533	117	
18-Nov	1.544	0.04	34	42	118			
19-Nov	1.421	0.06	40	44	109			
20-Nov	1.448	0.08	41	47	111			
21-Nov	1.364	0.33	41	48	105			

Notes:
1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification*.
2 = Dry-weather average flow is the average influent WRF flow from November 17th through November 20th only; influent WRF flows for November 14th through November 16th could be attributed to inflow events.

Date	Flow without Casino (MGD)[1]	Precip. (in.)	Min. Temp. (°F)	Max. Temp. (°F)	Flow per Capita (gpcd)	Dry-Weather Average Flow (MGD)	Dry-Weather Average Flow per Capita (gpcd)	Notes
2017								
10-Nov	1.127	0.43	35	44	86			
11-Nov	1.097	0.00	35	41	83			
12-Nov	1.147	0.24	38	45	87			
13-Nov	1.327	0.43	41	47	101			
14-Nov	1.447	1.08	38	46	110			
15-Nov	1.507	0.52	37	44	115			
16-Nov	1.367	0.40	35	39	104			
17-Nov	1.197	0.30	34	38	91			
18-Nov	1.527	0.00	37	40	116			
19-Nov	1.317	0.00	33	40	100			
20-Nov	1.607	0.85	35	44	122			
21-Nov	1.977	0.79	40	44	150			
22-Nov	2.087	1.10	41	49	159			
23-Nov	2.327	1.62	48	54	177			
24-Nov	1.727	0.27	40	49	131			
25-Nov	1.577	0.05	37	44	120			
26-Nov	1.707	0.45	37	51	130			
27-Nov	1.537	0.43	36	49	117			
28-Nov	1.707	0.09	35	41	130	1.536	117	
29-Nov	1.567	0.00	35	39	119			
30-Nov	1.457	0.06	36	42	111			
1-Dec	1.411	0.21	33	40	107			
2-Dec	1.461	0.32	33	40	111			

Notes:
1 = The average flow from the Casino for 2012 through 2018 exceeds 50,000 gallons per day (gpd) so flows from the Casino were removed from the WRF influent flow for these analyses, which is in conformance with the guidelines provided in EPA's *Infiltration/Inflow, I/I Analysis and Project Certification*.
2 = Dry-weather average flow is the average influent WRF flow from November 28th through December 1st only; influent WRF flows for November 10th through November 27th could be attributed to inflow events.

Appendix F

Casino Service Agreement

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FIFTH AMENDMENT TO AGREEMENT BETWEEN THE CITY OF SNOQUALMIE AND THE SNOQUALMIE TRIBE FOR THE PROVISION OF AND SEWER UTILITY SERVICE TO THE TRIBE'S INITIAL RESERVATION

THIS FIFTH AMENDMENT TO AGREEMENT is made this _____ day of _________, 2022, between the CITY OF SNOQUALMIE ("the City"), a Washington municipal corporation, and THE SNOQUALMIE TRIBE ("the Tribe"), a federally recognized Indian Tribe.

I. RECITALS

A. The City is a municipal corporation of the State of Washington, organized under the Optional Municipal Code, Title 35A RCW, located in King County, Washington.

B. The Tribe is a federally recognized Indian Tribe, and is the developer of certain real property within the City's Snoqualmie Hills Planning Area held in trust for the Tribe by the United States and commonly known as the Snoqualmie Indian Reservation ("the Property"). The Tribe has developed a gaming and entertainment facility on the Property, commonly known as "the Snoqualmie Casino," followed by a gas station, convenience store and other appurtenances.

C. The City and the Tribe entered into a certain agreement entitled "Agreement between the City of Snoqualmie and the Snoqualmie Tribe for the Provision of Police, Fire and Emergency Medical Services to the Snoqualmie Hills Project and Sewer Utility Services to the Tribe's Initial Reservation" dated April 26, 2004 ("the Services Agreement"). The Services Agreement provided, among other things, that the City would provide police, fire and EMS and sewer utility services to the Snoqualmie Casino.

D. The City and the Tribe entered into the First Amendment to the Services Agreement on January 28, 2008. The First Amendment provided that the City would cease providing police services, but would continue providing fire, EMS and sewer utility services to the Casino.

E. The City and the Tribe entered into the Second Amendment to the Services Agreement on October 16, 2015. The Second Amendment extended the term of the Services Agreement until November 30, 2016.

F. The City and Tribe entered into the Third Amendment to the Services Agreement on September 26, 2016. The Third Amendment deleted provisions related to City provision of fire and EMS, extended the term of the Services Agreement for sewer utility services until November 30, 2020.

G. The City and the Tribe entered into the Fourth Amendment to the Services Agreement on May 28, 2020. The Fourth Amendment solely extended the term of the Services Agreement for sewer utility services until November 30, 2026.

H. The Tribe desires to expand and add additional uses to and expand the Casino, including one or more new garages; 210-room hotel; and related resort amenities ("the Hotel and Casino Expansion"). The Tribe has made certain representations to the City concerning the estimated wastewater flow and load (measured in terms of Biochemical Oxygen Demand ("BOD")) that the Hotel and Casino Expansion is expected to generate, and has provided certain documents and information to the City's engineers concerning the basis of those representations. The Tribe desires to contract with the City for additional wastewater collection and treatment services at the Snoqualmie Water Reclamation Facility ("SWRF"), in order to facilitate construction and operation of the Hotel and Casino Expansion.

I. The City is willing to provide wastewater collection and treatment services for the Hotel and Casino Expansion provided that: (1) the Hotel and Casino Expansion is initially constructed and operated, and generates the wastewater flow and load, substantially as represented to the City by the Tribe; (2) at the time the Expansion is connected, the City has adequate wastewater system conveyance capacity and SWRF treatment capacity to provide service for the estimated flow and load from the Hotel and Casino Expansion in addition to meeting its obligations to serve the City and projected growth within the City, the Project, and the City's Urban Growth Area during the term of the planning period described in the City's 2021 general sewer plan ("GSP"); and (3) the Tribe contributes general facilities charges ("GFCs") for the Hotel and Casino Expansion's pro-rata share of the existing City wastewater system, planned improvements set forth in the GSP, and such other improvements necessitated by the Hotel and Casino expansion, as specified herein.

J. The City and the Tribe desire to amend the Services Agreement as set forth in this Fifth Amendment to provide for City sewer utility service to the Hotel and Casino Expansion. This Fifth Amendment is made upon the basis of the foregoing recitals, and in consideration of the mutual promises and covenants herein, and the mutual benefits to be derived by the parties therefrom.

II. AGREEMENT

2.1. Assurances

2.1. Amendment of Section 2.1. Section 2.1 of the Services Agreement is amended to read as follows:

2.1.1. The Tribe will use all commercially reasonable efforts to commence and develop the Project and the Hotel and Casino Expansion in accordance with this Agreement as amended.

2.1.2. The City will use its best efforts to provide the Project and the Hotel and Casino Expansion with the Services in accordance with this Agreement as amended.

2.1.3. The Tribe and the City will each use their best efforts to timely seek and obtain the regulatory and governmental approvals necessary to construct, maintain and provide for the provision of the Services in accordance with this Agreement as amended.

2. Provision of Sewer Services

2.1. Amendment of Section 2.6. Section 2.6 of the Services Agreement is amended to read as follows:

2.6 Provision of Sewer Service to the Project and Hotel and Casino Expansion

2.6.1.1 The Tribe shall direct, and the City shall accept into the wastewater collection system and SWRF wastewater effluent from the Project, subject to all of the provisions of this section 2.6. For purposes of this section 2.6.1.1, wastewater effluent from the Project shall not exceed any of the following limitations: 135,000 gallons per day (gpd) of wastewater flow on an average annual basis; 155,000 gallons per day during the maximum month; 110 gallons per minute in the peak hour; 375 pounds per day of Biochemical Oxygen Demand ("BOD") on an average annual basis and 556 pounds per day of BOD during the maximum month. These limitations can be understood as also generally encompassing the following standard of 750 Equivalent

Residential Units ("ERUs"), where one ERU is one half-pound BOD per day and flow of One Hundred Eighty (180) gallons per day, and "750 ERUs" means a monthly average (measured on an annual basis) of three hundred seventy-five (375) pounds Biochemical Oxygen Demand ("BOD") and wastewater flow of One Hundred Thirty-Five Thousand (135,000) gallons per day on an average annual basis. The limitations of this Section 2.6.1.1 shall be effective until connection of the Hotel and Casino Expansion to the municipal sewer system and completion of the milestones set forth in Section 2.6.1.3.

2.6.1.2 The Tribe shall direct, and the City shall accept into the wastewater collection system and SWRF, wastewater effluent from the Hotel and Casino Expansion, subject to all of the provisions of this Section 2.6 and the following limitations: (a) the Hotel and Casino Expansion shall not exceed 210 hotel rooms; and (b) the wastewater effluent from the Project and Hotel and Casino Expansion, combined, shall not exceed any of the following limits: 216,000 gallons per day on an average annual basis; 245,000 gallons per day during the maximum month; 254 gallons per minute during the peak hour; 684 pounds per day of BOD on an average annual basis and 921 pounds per day of BOD during the maximum month. These limitations can be understood as also generally encompassing the following standards: (i) 1200 Equivalent Residential Units ("ERUs") of flow on an average annual basis, where one ERU of flow is equal to One Hundred Eighty (180) gallons per day and 1200 ERUs of flow means 216,000 gallons of wastewater flow per day on an average annual basis; and (ii) 1368 ERUs of BOD, where one ERU means one-half pound per day of BOD and 1368 ERUs of BOD means a monthly average (measured on an annual basis) of six hundred eighty-four (684) pounds per day of BOD. The parties agree that, to the extent allowed by law, documents and information provided by the Tribe concerning the wastewater flow and loading estimates shall be considered confidential and treated as valuable designs / drawings under RCW 42.56.270(1).

2.6.1.3 The City will be making wastewater collection and treatment system modifications, including without limitation the Phase 3 SWRF improvement project, that the Parties agree are necessary to provide the City sufficient wastewater collection, conveyance and treatment capacity to meet future demand, including the services to the Tribe contemplated by this Fifth Amendment. The Parties agree that regular communication between them is necessary to coordinate the timing of construction of the wastewater collection and treatment system modifications, and the anticipated timing of construction of the Hotel and Casino Expansion. To that end, the parties agree to follow the following processes:

a. Commencing three (3) months following the Effective Date of this Fifth Amendment, the Tribe will provide the City with an update on the progress of construction of the Hotel and Casino Expansion, and to provide regular updates every three (3) months thereafter, or on such other schedule as City may reasonably request in order to coordinate the City wastewater modifications. The updates will identify progress towards finalization of Hotel and Casino Expansion design; anticipated dates for substantial completion of construction, testing of plumbing and wastewater facilities, "soft opening" of the Expansion and desired date for full opening of Hotel and Casino Expansion. The updates will include final notice of the desired Hotel and Casino full opening date no later than ninety (90) days before said opening, which the Tribe agrees will not be prior to substantial completion of the City's Phase 3 SWRF improvement project, as provided in Section 2.6.1.3(c)(iii) below. As part of its updates, the Tribe will inform the City whether and to what extent any of the physical parameters of the Hotel and Casino Expansion affecting wastewater flow and load (see Ex. B) have changed from the documents and information provided to the City under Recital H and Section 2.6.1.2. If the physical parameters have changed such that the anticipated wastewater flow or load generated by the Hotel and Casino Expansion is anticipated to be greater than the described in the information described in Recital H, the Tribe will provide the City such documents and information reasonably requested by the City in order to verify that the wastewater flow and load to be generated by the Expansion will not exceed the flow and load limitations in Section 2.6.1.2. If the City determines based on technical review that the wastewater flow or load generated by the revised parameters of the Hotel and Casino Expansion will exceed the limitations in Section 2.6.1.2, the City shall so notify the Tribe, and the Parties will consult and cooperate concerning any modifications needed to ensure that the wastewater flow and load from the Expansion and the Expansion and Project combined will comply with the limitations in 2.6.1.2.

b. Commencing six (6) months following the Effective Date of this Fifth Amendment, the City will provide the Tribe with an update concerning the status of the wastewater collection, conveyance and treatment system projects needed to provide capacity for services contemplated by this Fifth Amendment, and will provide regular updates every three (3) months thereafter, or on such other schedule reasonably requested by the Tribe to coordinate with the Hotel and Casino Expansion. As part of its updates, the City agrees to regularly provide design and construction progress and schedule information to the Tribe. If such information indicates that the Phase 3 improvements may not be substantially complete by December 31, 2024, the Parties agree to consult and cooperate concerning any possible modifications to the project schedules and/or this Agreement that could facilitate substantial completion of the Phase 3 improvements by December 31, 2024, or that otherwise ensure that the wastewater flow and load generated by the Hotel and Casino Expansion remain within the limitations of this Agreement. The City agrees to make commercially reasonable, best efforts to ensure that all wastewater collection, conveyance and treatment system modifications needed to provide full service under this Fifth Amendment are substantially complete by December 31, 2024.

c. The Tribe may connect the Hotel and Casino Expansion to the municipal wastewater sewer system at the milestone provided in the construction schedule, subject to the following limitations:

(i) As part of completion of construction, after July 31, 2024 and 30 days' notice to the City, the Tribe may commence testing the plumbing and wastewater facilities within the Hotel and Casino Expansion, provided that such testing generates additional wastewater flow only and minimal or no additional wastewater BOD load, and provided that combined wastewater flow and load from the existing Project combined with the Hotel and Casino Expansion remain less than the limitations set forth in Section 2.6.1.1.

(ii) The Tribe may implement a "soft opening" of the Hotel and Casino Expansion subsequent to both of the following events: October 1, 2024 and the City's completion of conversion of the first (of two) oxidation ditches as part of the Phase 3 SWRF improvement project; provided, however, that the "soft opening" shall not include operation of Hotel laundry facilities or the Expansion's "steakhouse" restaurant, and provided that wastewater flow and load from the existing Project combined with the "soft opening" of Hotel and Casino Expansion may not exceed the following limitations:

175,000 gallons per day (gpd) of wastewater flow on an average annual basis;
200,000 gallons per day during the maximum month;
200 gallons per minute in the peak hour;
530 pounds per day of Biochemical Oxygen Demand ("BOD") on an average annual basis; and
740 pounds per day of BOD during the maximum month.

(iii) To ensure the City has adequate wastewater collection, conveyance and treatment capacity necessary to serve the Hotel and Casino Expansion, the Tribe agrees that it will not commence full, public operation of the Hotel and Casino Expansion, including operation of the Hotel laundry facilities or Expansion "steakhouse" restaurant, prior to the City's issuance of a determination of substantial completion of the City's Phase 3 SWRF improvement project.

2.6.2 The Tribe previously paid connection and latecomer charges to the City for waste water treatment plant capacity for the Project. To pay for its pro rata share of the capital cost of the City's existing wastewater collection system and SWRF and planned expansions thereto, the Tribe shall pay the City general facilities charges ("GFCs") for the Hotel and Casino Expansion calculated on the basis of the increase in number of Equivalent Residential Units of BOD (618 ERUs) multiplied by the 2022 GFC rate ($8,902) in the amount of $5,501,436-(618 ERUs x $8,902 = $5,501,436) within ten (10) business days of the effective date of this Fifth Amendment. For the purposes of this section 2.6.2, an Equivalent Residential Unit of BOD is equal to one-half pound of BOD per day on an average annual basis. The Tribe shall also pay an amount equal to the difference between the 2022 BOD GFC and the 2024 BOD GFC rate; multiplied by 618 ERUs; the Tribe shall pay such additional GFC payment ten (10) business days following the date on which the Hotel and Casino Expansion is opened to the public. In addition to the foregoing, due to the capital cost of additional aeration improvements to the SWRF specifically necessitated by the Hotel and Casino Expansion, the Tribe shall also pay the cost of the aeration improvements, which the parties agree is the amount of $1.1 million*, within ten (10) business days of the effective date of this Fifth Amendment.

Summary of payments due within ten (10) business days of the effective date of this Fifth Amendment under this Section 2.6.2:

$5,501,436 2022 GFC $8,902/ERU x 618 ERUs = 5,501,436
$1,100,000 Aeration improvements
$6,601,436 Total

* The cost of the aeration improvements was determined by the Parties using the table set forth in Exhibit A to this Fifth Amendment.

2.6.3 Monitoring; Remedies for Exceedances.

2.6.3.1 Effluent flow and strength (aka "load") shall be periodically monitored at the Tribe's sole cost at a frequency determined appropriate by the City after discussion with and input from the Tribe. The City will provide reports from such monitoring to the Tribe, at such intervals and including such parameters determined appropriate by the City after discussion with and input from the Tribe. If wastewater effluent flow or load from the Project on the effective date of this Fifth Amendment exceeds the limitations in Section 2.6.1.1, and/or if wastewater effluent flow or load from the Hotel and Casino Expansion, or the Project and Hotel and Casino Expansion combined, exceed any of the limitations in Section 2.6.1.2, , the Tribe shall take such steps as may be necessary to bring waste water treatment demand below or equal to said limitations, including but not limited to construction and operation of on-site wastewater effluent pre-treatment or flow equalization facilities, installation of low flow toilets, faucet flow restrictors, composting of food waste from restaurant kitchens, diversion of fat and grease, or similar measures identified following consultation between the parties. By pre-treating its effluent and/or equalizing wastewater flow rates, the Tribe may generate waste water exceeding said limit within the Project, or within the Project and Hotel and Casino Expansion combined, so long as the waste water effluent as measured at the point of connection to the City municipal sewer system does not exceed the limitations in Section 2.6.1.1 and 2.6.1.2.

2.6.3.2 In the event that discharges from the Project and/or Hotel and Casino Expansion exceed the limitations in Section 2.6.1.1, 2.6.1.2 and/or 2.6.1.3~~2~~ ("Exceedances") notwithstanding any steps taken under 2.6.3.1, the Parties agree that calculating actual damages to the City will be difficult to calculate. Exceedances may result in a number of adverse consequences to the City, including but not limited to: penalties and/or fines for violations of application permit limitations or regulations; the need for design and construction of additional capital improvements to the wastewater conveyance and treatment system; loss or delay in receipt of economic development, services, and/or tax / utility rate revenue; and/or increased operation and maintenance or capital costs of the wastewater conveyance and treatment system. Due to the difficulty in calculating actual damages arising from these potential consequences, the Tribe agrees to annually pay the City, as liquidated damages and not as a penalty additional GFCs calculated at the rate of three (3) times the GFC dollar rate in the applicable year multiplied by the number of ERUs of flow or load in excess of the limitations, along with payment of 125% of the then-applicable monthly wastewater rate, for the following specified exceedance of the limitations of Sections 2.6.1.1 or 2.6.1.2: (a) exceedance of the peak hourly flow limit seven (7) or more times in one (1) month; (b) exceedance of the daily flow limit (average annual basis) or daily BOD load limit (average annual basis) one or more times in one (1) year; or (c) exceedance of the daily flow limit (maximum month) or daily BOD load limit (maximum month) three or more times in one (1) year. Liquidated damages are good faith estimates of additional capital and/or operating costs that City will incur in the event the wastewater flow and load limitations in Sections 2.6.1.1 and 2.6.1.2 are exceeded.

2.6.4 The Tribe covenants that it shall not discharge nor permit or suffer to be discharged to the City's sewer system any pollutants, greases or oils in quantities that exceed the limits of Snoqualmie Municipal Code 13.04.430. Compliance with the provisions of Snoqualmie Municipal Code 13.04.010 through 13.04.470 inclusive, which are hereby incorporated herein by this reference as contractual obligations, shall be a condition precedent to the City's obligation to accept wastewater effluent from the Project.

2.6.5 For wastewater treatment services provided under this Agreement and amendments for the Project and Hotel and Casino Expansion, the Tribe will pay the then-applicable BOD-based commercial sewer service rate at any time as established by the City Council plus the Tribe's share of the then generally-applicable utility tax.

The cost of BOD testing shall be paid to the City by the Tribe in addition to the rate for waste water treatment. The City shall record the measurements from said facilities and bill the Tribe at no greater frequency than monthly, and the Tribe shall duly pay the bill within thirty (30) days of receipt.

2.6.6 The City shall not be obligated to accept any wastewater effluent in excess of the limitations in Section 2.6.1.1 and 2.6.1.2 unless and until this Agreement is amended in writing to provide for such additional wastewater treatment.

2.6.7 The City shall not be liable for any damages of any nature whatsoever for any delay in the commencement of provision of sewer service of for interruptions in provision of sewer service, unless the City is reckless or intentional in its conduct.

2.6.8 Except in the event of suspension of service under Section 2.7 below, in the event of delay in the commencement of sewer service or interruption in sewer service, the City shall be responsible for providing temporary facilities for the collection of effluent at the Property and trucking the effluent from the Property to the waste water treatment plant, or for paying the cost thereof, and the City shall further accept the trucked sewage effluent at the waste water treatment plant at no charge to the Tribe.

2.6.9 The sewer service provided for in this Section 2.6 is sewer collection and treatment service for the Tribe only, and only for wastewater effluent generated by the uses specifically set forth herein and located on the Property. The Tribe may not assign the sewer service provided for herein to any other party or for uses on any property or location other than the Property. Nothing in this Agreement shall be interpreted or construed as conveying any fee, title, property, lease, license or other ownership or interest in the City of Snoqualmie municipal sewer system, the SWRF, or any portion or capacity thereof.

2. Remedies and Term.

Section 2.17.3 of the Services Agreement is amended to read as follows:

> Both Parties agree and recognize that, due to the size and scope of the Project, including the major infrastructure improvements that must be made in the initial phases of the Project, the design and placement of various discrete uses and structures, and the functional and economic interrelationships of the various components of the Project, as a practical matter it will not be possible physically, financially and as a matter of land use planning, to restore the Project to its former state once any significant portion of the Project is developed and/or any portion of the infrastructure is constructed. For the above reasons it may not be possible to determine an amount of monetary damages which would adequately and properly compensate Tribe for this work. Therefore, the Parties agree that, except as provided in Section 2.6.8, the Tribe's sole remedy shall be specific performance.

Section 2.17.4 of the Services Agreement is amended to read as follows:

> The City's sole remedies under this Agreement shall be the collection of sums due it under this Agreement for payments on the Bonds, sums due it for the Services, subject to the provisions for Dispute Resolution, sums due it for

liquidated damages, or specific performance of the Agreement's wastewater limitations.

Section 2.19 of the Services Agreement is amended to read as follows:

2.19 Term.

This Agreement shall be effective, and shall be in full force and effect unless otherwise modified by mutual written agreement of the Tribe and City.

3. General Provisions

3.1 Other Provisions of Agreement Not Affected. All other provisions of the Services Agreement and the First, Second, Third, and Fourth Amendments thereto not specifically amended herein shall remain in full force and effect, and are not to be affected by this Fifth Amendment.

3.2. Amendment. This Fifth Amendment may not be modified, supplemented or otherwise amended, except by written instrument duly executed by all parties and approved by the Tribal Council and the City Council.

Executed as of this________ day of __________ 2022.

CITY OF SNOQUALMIE

By:_________________________________
Katherine Ross, Mayor

SNOQUALMIE TRIBE

By: Robert M. de los Angeles
Robert M. de los Angeles, Tribal Chairman

STATE OF ____________ }
COUNTY OF __________ } ss.

On this day personally appeared before me, Katherine Ross, to me known to be the Mayor of the City of Snoqualmie, the Washington municipal corporation that executed the foregoing instrument, and acknowledged such instrument to be the free and voluntary act and deed of such municipal corporation, for the uses and purposes therein mentioned, and on oath stated that she was duly authorized to execute such instrument.

GIVEN UNDER MY HAND AND OFFICIAL SEAL this _____ day of __________, 2022.

____

Printed Name ______________________________

NOTARY PUBLIC in and for the State of ______________,
residing at ______________________________

My Commission Expires ______________________

STATE OF Washington }
COUNTY OF King } ss.

On this day personally appeared before me Robert M. de los Angeles, to me known to be the Tribal Chairman of the Snoqualmie Indian Tribe, the federally-recognized Indian Tribe that executed the foregoing instrument, and acknowledged such instrument to be the free and voluntary act and deed of such Indian Tribe, for the uses and purposes therein mentioned, and on oath stated that he was duly authorized to execute such instrument.

GIVEN UNDER MY HAND AND OFFICIAL SEAL this 19th day of May, 2022.

CARREY L. FINCHAM GALLOWAY
78965
NOTARY
PUBLIC
COMMISSION EXPIRES 12-28-25
STATE OF WASHINGTON

Carrey L Fincham-Galloway

Printed Name Carrey L. Fincham-Galloway

NOTARY PUBLIC in and for the State of Washington,
residing at Lake Kachess, WA

My Commission Expires 12-28-25

EXHIBIT A

Estimated Capital Cost of Aerobic Digester Aeration Improvements

Item Description	Total Cost[1, 2]
Mobilization (10%)	$ 49,000
Demolition	$ 45,000
Mechanical and Equipment for 2 Jet Headers and Recycle Pumps	$340,000
Electrical and Automatic Control	$102,000
SUBTOTAL	$536,000
Sales Tax (8.9%)	$ 47,704
Planning-Level Contingency (30%)	$161,000
CONSTRUCTION TOTAL	$744,704
Indirect Costs (20%)	$149,000
PROJECT TOTAL	$893,704[1]
Inflation (3 years @ approx. 7.5% annually)	$206,296
INFLATION-ADJUSTED PROJECT TOTAL	$1,100,000

1. All values are in 2021 dollars.
2. All values have been rounded to the nearest $1,000

EXHIBIT B

Physical Parameters Affecting Wastewater Flow and Load

Physical parameters of the Hotel and Casino Expansion that may affect the Expansion's wastewater flow and load rates/amounts include but are not limited to the following:

Number and capacity of plumbing fixtures such as sinks, toilets and other restroom facilities, bathtubs, showers, laundry washing machines;

Number and size of swimming pools, hot tubs or soaking tubs;

Number of restrooms; and

Square footage and number of seats in a casino, conference or banquet room, concert or auditorium, restaurant, bar, and/or café.

FOURTH AMENDMENT TO AGREEMENT BETWEEN THE CITY OF SNOQUALMIE AND THE SNOQUALMIE TRIBE FOR THE PROVISION OF SEWER UTILITY SERVICE TO THE TRIBE'S INITIAL RESERVATION

THIS FOURTH AMENDMENT TO AGREEMENT is made this 28TH day of MAY, 2020, between the CITY OF SNOQUALMIE ("the City"), a Washington municipal corporation, and THE SNOQUALMIE TRIBE ("the Tribe"), a federally recognized Indian tribe.

RECITALS

A. The City is a municipal corporation of the State of Washington, organized under the Optional Municipal Code, title 35 RCW, located in King County, Washington.

B. The Tribe is a federally recognized Indian tribe, and is the developer of certain real property within the City's Snoqualmie Hills Planning Area held in trust for the Tribe by the United States and commonly known as the Snoqualmie Indian Reservation ("the Property").

C. The City and the Tribe entered into a certain agreement entitled "Agreement between the City of Snoqualmie and the Snoqualmie Tribe for the Provision of Police, Fire and Emergency Medical Services to the Snoqualmie Hills Project and Sewer Utility Services to the Tribe's Initial Reservation" dated April 26, 2004 ("the Services Agreement"). The Services Agreement provided, among other things, that the Tribe would develop a gaming and entertainment facility on the Property, commonly known as "the Snoqualmie Casino," and that the City would provide police, fire and EMS and sewer utility services to the Snoqualmie Casino.

D. The City and the Tribe entered into the First Amendment to the Services Agreement on January 28, 2008. The First Amendment provided that the City would cease providing police services, but would continue providing fire, EMS and sewer utility services to the Casino.

E. The City and the Tribe entered into the Second Amendment to the Services Agreement on October 16, 2015. The Second Amendment extended the term of the Services Agreement until November 30, 2016.

F. The City and Tribe entered into the Third Amendment to the Services Agreement on September 26, 2016. The Third Amendment deleted provisions related to City provision of fire and EMS, extended the term of the Services Agreement for sewer utility services until November 30, 2020.

G. The City and the Tribe desire to amend the Services Agreement as set forth in this Fourth Amendment, which is made upon the basis of the foregoing recitals, and in consideration of the mutual promises and covenants herein, and the mutual benefits to be derived by the parties therefrom.

AGREEMENT

1. Term.

Section 2.19 of the Services Agreement is amended to read as follows:

2.19 Term.

This Agreement shall be effective, and shall be in full force ~~commencing December 1, 2016 and remain in full force~~ and effect until November 30, 2026~~0~~ ("Expiration Date"). This Agreement may be renewed, extended or otherwise modified by mutual written agreement of the Tribe and City at any time prior to the Expiration Date.

2. General Provisions

3.1 Other Provisions of Agreement Not Affected. All other provisions of the Services Agreement and the First, Second and Third Amendments thereto not specifically amended herein shall remain in full force and effect, and are not to be affected by this Fourth Amendment.

3.2. Amendment. This Fourth Amendment may not be modified, supplemented or otherwise amended, except by written instrument duly executed by all parties and approved by the Tribal Council and the City Council.

Executed as of this 28TH day of MAY 2020.

CITY OF SNOQUALMIE

By: [signature]
Matthew R. Larson, Mayor

SNOQUALMIE TRIBE

By: Robert M. de los Angeles
Robert de los Angeles, Tribal Chairman

STATE OF Washington
COUNTY OF King } ss.

On this day personally appeared before me Matthew R. Larson, to me known to be the Mayor of the City of Snoqualmie, the Washington municipal corporation that executed the foregoing instrument, and acknowledged such instrument to be the free and voluntary act and deed of such municipal corporation, for the uses and purposes therein mentioned, and on oath stated that he was duly authorized to execute such instrument. This notarial act involved the use of communication technology.

GIVEN UNDER MY HAND AND OFFICIAL SEAL this 19th day of May, 2020.

REINA MCCAULEY
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES 1-19-23
123232

Printed Name Reina McCauley
NOTARY PUBLIC in and for the State of Washington,
residing at City of Snoqualmie
My Commission Expires 1/19/23

STATE OF Washington
COUNTY OF King } ss.

On this day personally appeared before me Robert de los Angeles, to me known to be the Secretary of the Snoqualmie Indian Tribe, the federally-recognized Indian tribe that executed the foregoing instrument, and acknowledged such instrument to be the free and voluntary act and deed of such Indian tribe, for the uses and purposes therein mentioned, and on oath stated that she was duly authorized to execute such instrument. This notarial act involved the use of communication technology.

GIVEN UNDER MY HAND AND OFFICIAL SEAL this 28 day of May, 2020.

CARREY L GALLOWAY
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES 12-28-21

Printed Name Carrey Galloway
NOTARY PUBLIC in and for the State of Washington
residing at Lake Kachess, WA
My Commission Expires 12-28-21

THIRD AMENDMENT TO AGREEMENT BETWEEN THE CITY OF SNOQUALMIE AND THE SNOQUALMIE TRIBE FOR THE PROVISION OF POLICE, FIRE AND EMERGENCY MEDICAL SERVICES TO THE SNOQUALMIE HILLS PROJECT AND SEWER UTILITY SERVICE TO THE TRIBE'S INITIAL RESERVATION

THIS THIRD AMENDMENT TO AGREEMENT is made this 1st day of December, 2016, between the CITY OF SNOQUALMIE ("the City"), a Washington municipal corporation, and THE SNOQUALMIE TRIBE ("the Tribe"), a federally recognized Indian tribe.

RECITALS

A. The City is a municipal corporation of the State of Washington, organized under the Optional Municipal Code, title 35 RCW, located in King County, Washington.

B. The Tribe is a federally recognized Indian tribe, and is the developer of certain real property within the City's Snoqualmie Hills Planning Area held in trust for the Tribe by the United States and commonly known as the Snoqualmie Indian Reservation ("the Property"). The Tribe has developed a gaming and entertainment facility along with a gas station, convenience store and other appurtenances on the Property, commonly known as "the Snoqualmie Casino."

C. The City and the Tribe entered into a certain agreement entitled "Agreement between the City of Snoqualmie and the Snoqualmie Tribe for the Provision of Police, Fire and Emergency Medical Services to the Snoqualmie Hills Project and Sewer Utility Services to the Tribe's Initial Reservation" dated April 26, 2004 ("the Services Agreement"). The Services Agreement provided, among other things, that the City would provide police, fire and EMS and sewer utility services to the Snoqualmie Casino.

D. The City and the Tribe entered into the First Amendment to the Services Agreement on January 28, 2008. The First Amendment provided that the City would cease providing police services, but would continue providing fire, EMS and sewer utility services to the Casino.

E. The City and the Tribe entered into the Second Amendment to the Services Agreement on October 16, 2015. The Second Amendment extended the term of the Services Agreement until November 30, 2016.

F. By letter dated November 30, 2015, the Tribe provided written notice of termination of the fire / EMS portion of the Services Agreement.

G. The City and the Tribe desire to amend the Services Agreement as set forth in this Third Amendment, which is made upon the basis of the foregoing recitals, and in consideration of the mutual promises and covenants herein, and the mutual benefits to be derived by the parties therefrom.

AGREEMENT

1. Fire and Emergency Medical Services.

Sections 1.10 and 2.3 of the Services Agreement, and Section 2.2 of the First Amendment to the Services Agreement, are deleted in their entirety. Section 1.7 of the Services Agreement is modified to remove references to "Fire and Emergency Medical Services" from the definition of "the Services." The City shall have no obligation under the Services Agreement to provide fire and/or emergency medical services to the Snoqualmie Casino, and the Tribe shall have no obligation under the Services Agreement to pay the City for such services.

2. Provision of Sewer Services

2.1. Amendment of Section 2.6. Section 2.6 of the Services Agreement is amended to read as follows:

2.6 Provision of Sewer Service to the Project

2.6.1 The City shall accept waste water effluent not exceeding Seven ~~Three~~ Hundred Fifty ~~Sixty~~ (75~~3~~60) ERUs per month from the Property subject to all of the provisions of this section. For purposes of this section 2.6, one ERU is one half-pound BOD per day and flow of One Hundred Eighty (180) gallons per day, and "750 ERUs" means a monthly average (measured on an annual basis) of three hundred seventy-five (375) pounds Biochemical Oxygen Demand ("BOD") and monthly wastewater flow of One Hundred Thirty-Five Thousand (135,000) gallons.

2.6.2 The Tribe shall secure waste water treatment plant capacity for Seven ~~Three~~ Hundred Fifty ~~Sixty~~ (75~~3~~60) ERUs per month by payment of a Latecomer charge to the City of the sum of Three Thousand Five Hundred Twenty-nine Dollars ($3,529.00) per ERU. ~~Said amount shall be payable at the time of connection to the municipal sewer system~~. The Tribe previously paid for 360 ERUs ($1,270,440) at the time of connection to the City's municipal sewer system; the Tribe shall pay the City for an additional 390 ERUs ($1,376,310) within thirty (30) days of the effective date of this Third Amendment, *i.e.*, no later than December 31, 2016.

2.6.2.1 In addition, the Tribe shall pay the City a one-time mitigation fee in the amount of $250,000.00 within thirty (30) days of the effective date of this Third Amendment, *i.e.*, no later than December 31, 2016.

2.6.3 Effluent flow and strength shall be periodically monitored at the Tribe's sole cost at a frequency determined appropriate by the City after consultation with the Tribe. If waste water treatment demand from uses existing on the Property on the effective date of this Agreement exceeds Seven ~~Three~~ Hundred Fifty ~~Sixty~~ (75~~36~~0) ERUs per month in either BOD or flow, the Tribe shall take such steps as may be necessary to bring waste water treatment demand below or equal to Seven ~~Three~~ Hundred Fifty ~~Sixty~~ (750) ERUs per month, including but not limited to pre-treatment of wastewater effluent, installation of low flow toilets, faucet flow restrictors, composting of food waste from restaurant kitchens, diversion of fat and grease, or similar measures following consultation between the parties. By pre-treating its effluent, the Tribe may generate waste water exceeding said limit within the Project so long as the waste water effluent as measured at the point of connection to the municipal sewer system does not exceed Seven ~~Three~~ Hundred Fifty ~~Sixty~~ (75~~36~~0) ERUs per month.

2.6.4 The Tribe may request additional treatment capacity from the City for new uses or expansion of uses existing on the Property on or after the effective date of this Agreement. However, the City shall not have any obligation to honor the Tribe's request unless there is additional overall conveyance system and treatment capacity to meet the Tribe's request without impairing service to existing customers or planned new customers. The Tribe agrees not to connect any new or additional uses (*e.g.*, a hotel, expanded casino, or other wastewater effluent-generating uses) to the municipal sewer system except as mutually agreed in writing by the parties following consultation between the parties and amendment of this Agreement pursuant to Section 2.6.7 below. ~~future agreement, and may or may not be subject to a Latecomer Reimbursement agreement~~.

2.6.5 The Tribe covenants that it shall not discharge nor permit or suffer to be discharged to the City's sewer system any pollutants, greases or oils in quantities that exceed the limits of Snoqualmie Municipal Code 13.04.430. Compliance with the provisions of Snoqualmie Municipal Code 13.04.010 through 13.04.470 inclusive, which are hereby incorporated herein by this reference as contractual obligations, shall be a condition precedent to the City's obligation to accept wastewater effluent from the Project.

2.6.6 The rate for waste water treatment shall be the then-current rate at any time as established by City Council for sewer service for one residence located within the City multiplied by the number of ERUs actually flowing through the City-owned facilities based upon the most recent measure of the_sewage flow and BOD from the property, plus the Tribe's share of the then generally-applicable utility tax, until such time as the City Council adopts a revised commercial sewer service rate based on BOD, following which the Tribe will pay the then-applicable BOD-based commercial sewer service rate at any time as established by the City Council plus the Tribe's share of the then generally-applicable utility tax. The cost of BOD testing shall be paid to the City by the Tribe in addition to the rate for waste water treatment. The City shall record the measurements from said facilities and bill the Tribe at no greater frequency than monthly, and the Tribe shall duly pay the bill within thirty (30) days of receipt.

2.6.7 Except as provided ~~for the provision above~~ in Section 2.6.4 above regarding the possibility of additional City collection and treatment plant capacity allowing for additional City treatment of additional wastewater effluent from new or expanded uses on the Property, the City shall not be obligated to accept any waste water effluent in excess of 75~~36~~0 ERUs per month unless and until this Agreement is amended in writing to provide for such additional wastewater treatment.

2.6.8 The City shall not be liable for any damages of any nature whatsoever for any delay in the commencement of provision of sewer service of for interruptions in provision of sewer service, unless the City is reckless or intentional in its conduct.

2.6.9 Except in the event of suspension of service under Section 2.7 below, ~~I~~in the event of delay in the commencement of sewer service or interruption in sewer service, the City shall be responsible for providing temporary facilities for the collection of effluent at the Property and trucking the effluent from the Property to the waste water treatment plant, or for paying the cost thereof, and the City shall further accept the trucked sewage effluent at the waste water treatment plant at no charge to the Tribe.

3. Compact Impact Mitigation Fund.

Section 2.8.2 of the Services Agreement is amended to read as follows:

2.8.2 At the request of the Tribe, the City shall cast its vote relating to disbursal of the impact mitigation fund under the Compact to permit disbursals from the fund to apply to payment for ~~fire and emergency services and~~ sewer service provided by the City including fees rendered under this Agreement; provided, however, that commencing in the calendar year 2017, the Tribe agrees not to seek disbursement from the impact mitigation fund for reimbursement of more than 360 ERUs of sewer service per month, and the City is not obligated to cast its vote to permit disbursal from the fund for reimbursement of more than 360 ERUs of sewer service per month. ~~This provision shall not preclude t~~The City ~~from seeking~~ may seek disbursements from the impact mitigation fund established by the Compact for impacts not related to the Services~~. In addition, prior to the Expiration Date, and at the request of the City, the Tribe shall cast its vote relating to disbursal of the impact mitigation fund under the Compact to permit disbursals from the fund in the amount of $100,000 to be used in the City's discretion for human services purposes. The Tribe agrees that this~~

~~disbursal to the City shall be a priority and precede any disbursals from the impact mitigation fund for City-provided fire and emergency services and sewer services; provided, however, that the Tribe shall not be required to vote for or make a disbursal from the impact mitigation fund for human services so long as the Tribe has provided $100,000 to the Community Center from a source other than the impact mitigation fund prior to the annual meeting of the Impact Mitigation Committee.~~

4. Community Center Contribution.

A new section 2.8.3 is added to the Services Agreement, which new section shall read as follows:

Beginning in 2016, the Tribe will make an annual charitable contribution to the YMCA in the amount of $100,000, upon the YMCA's application for the same through the Tribe's charitable giving program.

5. Limited Waiver of Sovereign Immunity

Section 2.11 of the Services Agreement is hereby amended to read as follows:

2.11 Limited Waiver of Sovereign Immunity

The Tribe hereby consents to the limited waiver of sovereign immunity solely with respect to the interpretation and enforcement of this Agreement and its provisions. The Tribe further consents to the exercise of subject matter and personal jurisdiction by the United States District Court or the Superior Court for the State of Washington for King County, as applicable, for the interpretation and enforcement of this Agreement, and any judgment of the court rendered thereon. This waiver shall be effective only during the term of this Agreement, provided, the waiver shall remain in force for such time after termination of this Agreement as may be necessary to resolve the rights and obligations of either the City or the Tribe arising out of this Agreement. Service of process upon the Tribe shall be made on the Tribal Chairman or Tribal Secretary at the authorized address of the Tribe as set forth below. The Tribe further waives and agrees not to assert any doctrine concerning sufficiency of service of process, or requiring exhaustion of Tribal Court or administrative remedies prior to proceeding with any ~~arbitration or~~ court proceeding on this Agreement.

6. Dispute Resolution

Section 2.14 of the Services Agreement is hereby amended to read as follows:

2.14 Dispute Resolution

In the event that the parties have any disagreement regarding their respective rights or obligations concerning issues addressed by the Services under this Agreement, arising from the interpretation of any of the provisions hereof or applicable law or their application to any particular facts or circumstances, other than an action for termination for material breach, the parties' respective chief executive officers (Mayor and Tribal Council Chair) shall first meet in a good faith attempt to resolve their differences by agreement., and fFailing such agreement, the parties agree to submit such disagreement(s) question or questions to a neutral mediator mutually selected by the parties, and whose fees shall be borne equally the parties. binding arbitration administered by the American Arbitration Association under its Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator(s) may be entered and enforced Should the parties be unable to resolve their disagreement(s) through such mediation, only then may a party commence an action in the United States District Court or the Superior Court for the State of Washington for King County, as applicable.

7. Term.

Section 2.19 of the Services Agreement is deleted in its entirety, and replaced with the following:

2.19 Term.

This Agreement shall be effective and shall be in full force commencing December 1, 2016 and remain in full force and effect until November 30, 2020 ("Expiration Date"). This Agreement may be renewed, extended or otherwise modified by mutual written agreement of the Tribe and City at any time prior to the Expiration Date.

8. General Provisions

8.1 Other Provisions of Agreement Not Affected. All other provisions of the Services Agreement and the First and Second Amendments thereto not specifically amended herein shall remain in full force and effect, and are not to be affected by this Third Amendment.

8.2. Amendment. This Third Amendment may not be modified, supplemented or otherwise amended, except by written instrument duly executed by all parties and approved by the Tribal Council and the City Council.

Executed as of this 26th day of September 2016.

CITY OF SNOQUALMIE

By:______________________________
Matthew R. Larson, Mayor

SNOQUALMIE TRIBE

By:______________________________
Alisa Burley, Tribal Secretary

STATE OF Washington }
COUNTY OF King } ss.

On this day personally appeared before me Matthew R. Larson, to me known to be the Mayor of the City of Snoqualmie, the Washington municipal corporation that executed the foregoing instrument, and acknowledged such instrument to be the free and voluntary act and deed of such municipal corporation, for the uses and purposes therein mentioned, and on oath stated that he was duly authorized to execute such instrument.

GIVEN UNDER MY HAND AND OFFICIAL SEAL this 26th day of September, 2016.

Notary Public
State of Washington
E JOANN WARREN
My Appointment Expires Sep 15, 2017

E Joann Warren

Printed Name E. Joann Warren
NOTARY PUBLIC in and for the State of Washington,
residing at Maple Valley
My Commission Expires 9-15-17

STATE OF ____________ }
COUNTY OF ____________ } ss.

On this day personally appeared before me Alisa Burley, to me known to be the Secretary of the Snoqualmie Indian Tribe, the federally-recognized Indian tribe that executed the foregoing instrument, and acknowledged such instrument to be the free and voluntary act and deed of such Indian tribe, for the uses and purposes therein mentioned, and on oath stated that she was duly authorized to execute such instrument.

GIVEN UNDER MY HAND AND OFFICIAL SEAL this ____ day of ____________, 2016.

____

Printed Name ______________________
NOTARY PUBLIC in and for the State of ______________,
residing at ______________________
My Commission Expires ______________________

STATE OF Washington }
COUNTY OF King } ss.

On this day personally appeared before me Matthew R. Larson, to me known to be the Mayor of the City of Snoqualmie, the Washington municipal corporation that executed the foregoing instrument, and acknowledged such instrument to be the free and voluntary act and deed of such municipal corporation, for the uses and purposes therein mentioned, and on oath stated that he was duly authorized to execute such instrument.

GIVEN UNDER MY HAND AND OFFICIAL SEAL this 26th day of September, 2016.

Notary Public
State of Washington
E JOANN WARREN
My Appointment Expires Sep 15, 2017

E Joann Warren
Printed Name E. Joann Warren
NOTARY PUBLIC in and for the State of Washington,
residing at Maple Valley
My Commission Expires 9-15-17

STATE OF Washington }
COUNTY OF King } ss.

On this day personally appeared before me Alisa Burley, to me known to be the Secretary of the Snoqualmie Indian Tribe, the federally-recognized Indian tribe that executed the foregoing instrument, and acknowledged such instrument to be the free and voluntary act and deed of such Indian tribe, for the uses and purposes therein mentioned, and on oath stated that she was duly authorized to execute such instrument.

GIVEN UNDER MY HAND AND OFFICIAL SEAL this 26th day of September, 2016.

REBECCA D. HORST
STATE OF WASHINGTON
NOTARY PUBLIC
MY COMMISSION EXPIRES
09-13-19

[signature]
Printed Name Rebecca D. Horst
NOTARY PUBLIC in and for the State of Washington,
residing at Lake Stevens
My Commission Expires 9/13/2019

SECOND AMENDMENT TO AGREEMENT BETWEEN THE CITY OF SNOQUALMIE AND THE SNOQUALMIE TRIBE FOR THE PROVISION OF POLICE, FIRE AND EMERGENCY MEDICAL SERVICES TO THE SNOQUALMIE HILLS PROJECT AND SEWER UTILITY SERVICE TO THE TRIBE'S INITIAL RESERVATION

THIS SECOND AMENDMENT TO AGREEMENT is made this ___ day of ____, 2015, between the CITY OF SNOQUALMIE ("the City"), a Washington municipal corporation, and THE SNOQUALMIE TRIBE ("the Tribe"), a federally recognized Indian tribe.

RECITALS

1.1. The City is a municipal corporation of the State of Washington, organized under the Optional Municipal Code, title 35 RCW, located in King County, Washington.

1.2. The Tribe is a federally recognized Indian tribe, and is the developer of certain real property within the City's Snoqualmie Hills Planning Area commonly known as the Snoqualmie Hills Project, a gaming and entertainment facility ("the Project") on real property held in trust for the Tribe by the United States ("the Property").

1.3. The City and the Tribe entered a certain agreement entitled "Agreement between the City of Snoqualmie and the Snoqualmie Tribe For the Provision of Police, Fire and Emergency Medical Services to the Snoqualmie Hills Project and Sewer Utility Services to the Tribe's Initial Reservation" dated April 26, 2004 ("the Services Agreement").

1.4 The City and the Tribe entered into the First Amendment to the Services Agreement on January 28, 2008.

1.5. The Services Agreement is set to expire by its terms in November 2015. The City and the Tribe recognize that there are aspects of the Services Agreement that need to be changed. However, the City and the Tribe recognize the need to amend the Services Agreement in limited respects as set forth in this Second Amendment in order to maintain the status quo for one year to enable the Tribe and the City to explore, in good faith, a long-term mutually beneficial solution to issues identified concerning sewer utility service.

1.6. The following amendment of the Services Agreement is made upon the basis of the foregoing recitals, and in consideration of the mutual promises and covenants herein, and the mutual benefits to be derived by the parties therefrom.

AGREEMENT

2.1 TERM OF THE AGREEMENT

Section 2.19 of the Services Agreement is amended to add the following sentences to the end of the section as follows:

"Notwithstanding the foregoing, this Agreement shall be effective and shall be in full force and effect until November 30, 2016 ("Expiration Date"). The Tribe and the City agree to have their respective representatives meet, in person or by phone, at least once a month after the execution of this Second Amendment to explore, in good faith, a long-term mutually beneficial solution to issues identified concerning sewer utility service. Said meetings shall take place on the third Wednesday of every month at a time and location to be mutually agreed by the Tribe and the City. The Agreement may be renewed in writing by mutual agreement of the Tribe and the City at any time prior to the Expiration Date."

2.2 GENERAL PROVISIONS

2.2.1 Other Provisions of Agreement Not Affected. All other provisions of the Services Agreement and the First Amendment thereto not specifically amended herein shall remain in full force and effect, and are not be affected by this Second Amendment.

2.2.2 Amendment. This Second Amendment may not be modified, supplemented or otherwise amended, except by written instrument duly executed by all parties and approved by the Tribal Council and the City Council.

Executed as of this 8 day of October, 2015.

CITY OF SNOQUALMIE

____
Matthew R. Larson, Mayor

SNOQUALMIE TRIBE

Carolyn Lubenau
Carolyn Lubenau, Chairwoman

FIRST AMENDMENT TO AGREEMENT BETWEEN THE CITY OF SNOQUALMIE AND THE SNOQUALMIE TRIBE FOR THE PROVISION OF POLICE, FIRE AND EMERGENCY MEDICAL SERVICES TO THE SNOQUALMIE HILLS PROJECT AND SEWER UTILITY SERVICE TO THE TRIBE'S INITIAL RESERVATION

THIS FIRST AMENDMENT TO AGREEMENT is made this 28th day of January, 2008, between the CITY OF SNOQUALMIE ("the City"), a Washington municipal corporation, and THE SNOQUALMIE TRIBE ("the Tribe"), a federally recognized Indian tribe.

RECITALS

1.1. The City is a municipal corporation of the State of Washington, organized under the Optional Municipal Code, title 35A RCW, located in King County, Washington.

1.2. The Tribe is a federally recognized Indian tribe, and is the developer of certain real property within the City's Snoqualmie Hills Planning Area commonly known as the Snoqualmie Hills Project, a gaming and entertainment facility ("the Project"). The real property is legally described on Attachment A hereto ("the Property").

1.3. The City and the Tribe entered a certain agreement entitled "Agreement between the City of Snoqualmie and the Snoqualmie Tribe For the Provision of Police, Fire and Emergency Medical Services to the Snoqualmie Hills Project and Sewer Utility Services to the Tribe's Initial Reservation " dated April 26, 2004 ("the Services Agreement").

1.4. The City and the Tribe desire to amend the Services Agreement in certain respects as set forth in this First Amendment.

1.5. The following amendment of the Services Agreement is made upon the basis of the foregoing recitals, and in consideration of the mutual promises and covenants herein, and the mutual benefits to be derived by the parties therefrom.

AGREEMENT

2.1 POLICE SERVICES

Sections 1.9 and 2.2 and Exhibit F of the Services Agreement, relating to Police Services, are hereby deleted in their entirety. Section 1.7 of the Services Agreement is modified to eliminate "Polices Services" from the definition of "Services." The City shall have no obligation under the Services Agreement to provide Police Services to the

Project and the Tribe shall have no obligation under the Services Agreement to pay the City for such Police Services.

2.2 FIRE AND EMERGENCY MEDICAL SERVICES

2.2.1 The Tribe wishes in time to exercise a portion of its sovereign powers by providing its own Fire and Emergency Medical Services to the Project. The Tribe is not presently in a position to fully provide these Services and desires the City to provide such Services. However, the Tribe and City have obtained the agreement of East Side Fire and Rescue, a Fire and Emergency Medical Services agency composed of King County Washington Fire Districts 10 and 38, and the Cities of Issaquah, North Bend, and Sammamish ("ESFR") to dispatch ESFR's ladder truck to the Project when such a ladder truck is necessary. Consequently, the Services Agreement is amended as follows:

2.2.2 Section 2.3.4 of the Services Agreement is amended by deleting the last two sentences (relating to the ladder truck). The City shall have no obligation under the Services Agreement to acquire a ladder truck and the Tribe shall have no obligation under the Services Agreement to pay the City for such ladder truck.

2.2.3 A new Section 2.3.5 is added to the Services Agreement as follows: "The Tribe may terminate that portion of the Services Agreement relating to Fire and Emergency Medical Services upon no less than one-year's prior written notice to the City. Such termination of that portion of the Services Agreement relating to Fire and Emergency Medical Services may occur no earlier than three and one-half years following the opening of the Project (the "FEMS Termination Date"). Such termination shall affect only the City's obligation to provide such Services after the FEMS Termination Date and the Tribe's obligation to pay for such Fire and Emergency Medical Services performed after the FEMS Termination Date and shall not affect the parties' obligations relating to such Fire and Emergency Medical Services performed prior to the FEMS Termination Date or otherwise affect any other obligations arising under the Services Agreement."

2.3 OFF SITE IMPROVEMENTS

2.3.1 The City and the Tribe acknowledge that since the execution of the Services Agreement, both the scope of the Off-Site Improvements and the manner by which the City financed those Off-Site Improvements and the Tribe reimbursed the City therefore have changed from that contemplated by the Services Agreement. The City and the Tribe wish to memorialize those changes and the manner by which both parties will complete their obligations regarding those Off-Site Improvements in this First Amendment. Consequently, the Services Agreement is amended as follows:

2.3.2 Section 2.5.2(ii) of the Services Agreement is amended to read as follows:

"(ii) cause the Off-Site Improvements to be available for connection to the On-Site Improvements, at the location identified on Exhibit E on the earlier of the date that is (1) three months prior to the opening of the Project or (2) no later than the date that is three business days following the date on which a qualified inspector selected by the Tribe and approved by the City in its reasonable discretion certifies in writing that construction of the Project has been completed to the point where toilets, floor drains and sinks have been installed and are ready for inspection for compliance with applicable building codes."

2.3.3 Sections 2.5.3 and 2.5.4 are deleted in their entirety.

2.3.4 The City acknowledges that the Tribe has paid in full the cost of the Off-Site Improvements described in Exhibit E other than the Off-Site Improvements described in "Schedule C" attached hereto as Attachment B (the "Schedule C Improvements") and that the Tribe has deposited with the City the full estimated cost of the Schedule C Improvements. The Tribe agrees to reimburse the City the amount by which the actual cost of the Schedule C Improvements exceeds the amount the Tribe deposited for the Schedule C Improvements. The City agrees to refund to the Tribe the amount by which the amount the Tribe deposited for the Schedule C Improvements exceeds the actual cost of the Schedule C Improvements. The City shall provide the Tribe a full accounting of the cost of the Schedule C Improvements. The City agrees to provide the Tribe reasonable access to the site of the Schedule C Improvements and to the records of the City relating to the Schedule C Improvements so that the Tribe may assess whether the costs of the Schedule C Improvements are actual costs.

2.3.5 As an alternative to the City designing and constructing the Schedule C Improvements, the Tribe may elect to design and construct the Schedule C Improvements itself pursuant to a developer extension agreement with the City. To keep the Tribe fully informed as to the scope of the Schedule C Improvements, the City shall report to the Tribe on the first and 15th days of each month on the progress of the development of the plans for the Schedule C Improvements and shall provide the Tribe with a full, final set of plans upon which the City shall request bids for construction as soon as such are completed. If the Tribe elects to design and construct the Schedule C Improvements itself, it shall so notify the City in writing at any time before the City lets a contract for the construction of the Improvements. In such event, the City and the Tribe shall execute a developer extension agreement, the City shall refund to the Tribe the amount the Tribe has deposited with the City to cover the full estimated cost of the Schedule C Improvements, plus any interest that has accrued thereon; the City shall provide the Tribe with all plans and other design and construction documents at then current level of completion; and the Tribe shall complete the design, if necessary, and construct the Schedule C Improvements. In no event shall the construction of the Schedule C

Improvements affect the date by which the Off Site Improvements (sewer service) shall be made available as provided in this First Amendment.

2.4 LATECOMER AGREEMENT

There is hereby added to the Services Agreement a new section 2.6.10, Latecomer Reimbursement, to read as follows:

2.6.10 Reimbursement by Latecomers. In addition to all other connection charges and latecomer reimbursement charges, the City shall by ordinance provide for collection of a sum calculated by dividing the total cost of construction of the Off-Site Improvements, excluding the sewer flow monitoring station and the stub-outs provided to lots adjacent to the route by Seven Hundred Seventy (770). The amount so calculated shall be collected by the City from the owner of any property that taps into, uses, or otherwise connects, directly or indirectly, or through laterals or branches, to the wastewater collection facilities paid for by the Tribe as such owner's fair pro rata share. The City shall further by ordinance provide for collection of an additional sum equal to the cost of the stub-out from the owner of each property provided a stub-out at the Tribe's expense. The City shall remit amounts so collected to the Tribe within 60 days of receipt. The latecomer reimbursement amount shall not be affected by any subsequent re-rating of the capacity of the wastewater treatment plant. Such ordinance shall be adopted as soon as practicable after completion of the improvements, but the City shall have no liability for delay in adoption of the ordinance required to implement the reimbursement charges. These reimbursement provisions shall remain in full force and effect for a period of 15 years after the date the City determines the wastewater collection facilities improvements have been completed. The Tribe may assign its right to receive latecomer reimbursement payments, upon notification to the City. The City and the Tribe shall enter into a Latecomer Agreement in a mutually approved form.

2.5 COMPACT IMPACT MITIGATION FUND.

Section 2.8.2 of the Services Agreement is amended to read as follows:

"2.8.2 At the request of the Tribe, the City shall cast its vote relating to disbursal of the impact mitigation fund under the Compact to permit disbursals from the fund to apply to payment for fire and emergency services and sewer service provided by the City including fees rendered under this Agreement. This provision shall not preclude the City from seeking disbursements from the impact mitigation fund established by the Compact for impacts not related to the Services. In addition, during the initial term of this Agreement, at the request of the City, the Tribe shall cast its vote relating to disbursal of the impact mitigation fund under the Compact to permit disbursals from the fund in an amount not to exceed $100,000 annually to the City to be used in the City's discretion for human services purposes. In the event that the Tribe exercises its option to terminate that portion of the Services Agreement relating to Fire and Emergency Medical Services pursuant to Section 2.3.5 hereof, the City may increase this request to an amount not to exceed $300,000 annually. The Tribe agrees that this disbursal to the City shall be a priority after payment for City-provided fire and emergency services and sewer services."

2.4 GENERAL PROVISIONS

2.4.1 Other Provisions of Agreement Not Affected. All other provisions of the Services Agreement not specifically amended herein shall remain in full force and effect, and not be affected by this First Amendment.

2.4.2 Amendment. This First Amendment may not be modified, supplemented or otherwise amended, except by written instrument duly executed by all parties and approved by the Tribal Council and the City Council.

Executed as of this 28th day of January, 2008

CITY OF SNOQUALMIE

Matthew R. Larson, Mayor

Attest: ______________________
Jodi Warren, City Clerk

SNOQUALMIE TRIBE

____

STATE OF WASHINGTON } ss.

COUNTY OF KING

On this 28th day of January, 2008, before me, the undersigned, a Notary Public duly commissioned and sworn, personally appeared MATTHEW R. LARSON, to me known to be the Mayor of the City of Snoqualmie, and acknowledged the said instrument to be the free and voluntary act of said municipal corporation, for the uses and purposes therein stated, and on oath stated that he is authorized to execute the said instrument.

Witness my hand and official seal hereto affixed the day and year first above written.

Notary Public
State of Washington
E JOANN WARREN
My Appointment Expires Sep 15, 2009

E Joann Warren
Printed Name E. Joann Warren
NOTARY PUBLIC in and for the State of Washington,
residing at Maple Valley
My Commission Expires 9-15-09

STATE OF WASHINGTON } ss.

COUNTY OF KING

On this 30th day of January, 2008, before me, the undersigned, a Notary Public duly commissioned and sworn, personally appeared Jerry Enick, to me known to be the Head Chief of the Snoqualmie Tribe, and acknowledged the said instrument to be the free and voluntary act of said Tribe, for the uses and purposes therein stated, and on oath stated that he is authorized to execute the said instrument.

Witness my hand and official seal hereto affixed the day and year first above written.

Cheryl A. Mullen
Printed Name Cheryl A. Mullen
NOTARY PUBLIC in and for the State of Washington,
residing at Renton Washington
My Commission Expires 08.12.2009

STATE OF WASHINGTON NOTARY PUBLIC

EXHIBIT A

LEGAL DESCRIPTION

PARCEL A:

ALL OF GOVERNMENT LOT 3, AND THAT PORTION OF GOVERNMENT LOT 4, LYING NORTHERLY OF THE NORTH MARGIN OF SR 90 (STATE HIGHWAY NO. 2), SECTION 31, TOWNSHIP 24 NORTH, RANGE 8 EAST W.M.;

SITUATED IN THE COUNTY OF KING, STATE OF WASHINGTON.

PARCEL B:

TRACT 1 IN BLOCK 3 OF THE UNRECORDED PLAT OF SI-VIEW ACRE TRACTS, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE SOUTH LINE OF THE NORTHWEST 1/4 SECTION 31, TOWNSHIP 24 NORTH, RANGE 8 EAST W.M., 750.75 FEET SOUTH 88º51'11" WEST OF THE SOUTHEAST CORNER OF SAID NORTHWEST 1/4;
THENCE SOUTH 88º51'11" WEST, 660.36 FEET;
THENCE NORTH 03º02'25" WEST, 308.18 FEET;
THENCE NORTH 86º57'35" EAST, 660.00 FEET TO THE WEST LINE OF A 60.0-FOOT STREET;
THENCE SOUTH 03º02'25" EAST ALONG SAID STREET, 330.0 FEET TO THE POINT OF BEGINNING;

EXCEPT THAT PORTION OF LOT 1 IN BLOCK 3 OF THE UNRECORDED PLAT OF SI-VIEW ACRE TRACTS, IN SECTION 31, TOWNSHIP 24 NORTH, RANCH 8 EAST W.M., DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEAST CORNER OF THE ABOVE DESCRIBED LOT 1, SOUTH 86º57'35" WEST A DISTANCE OF 311.14 FEET ALONG THE NORTH BOUNDARY OF SAID LOT 1;
THENCE SOUTH 03º02'25" EAST A DISTANCE OF 140.00 FEET;
THENCE NORTH 86º57'35" EAST A DISTANCE OF 311.14 FEET TO THE EAST BOUNDARY LINE OF SAID LOT 1;
THENCE NORTH 03º02'25" WEST A DISTANCE OF 140.00 FEET ALONG THE EAST BOUNDARY OF SAID LOT 1 TO THE POINT OF BEGINNING;

SITUATED IN THE COUNTY OF KING, STATE OF WASHINGTON.

ATTACHMENT B

SCHEDULE C IMPROVEMENTS

Replacement of a failing sanitary sewer main located in Olmstead Alley beginning at SE River Street and terminating at SE King Street, bordered by SE Silva Avenue and SE Olmstead Avenue. The project includes abandoning in place 620 feet of existing failing sewer collector, the installation of 19 new side sewers, connection to the existing system, manholes and clean-outs, and other sewer appurtences as necessary.

ORIGINAL

SNOQUALMIE TRIBE

P.O. Box 280
4480 Tolt Ave
Carnation, WA 98014

Phone: (425) 333-6551
Toll Free: 1-888-348-3323
Fax: (425) 333-6727
E-Mail: Snoqualmie1855@aol.com

RESOLUTION # 77 – 2004

WHEREAS, the Snoqualmie Indian Tribe is the Sovereign Entity recognized as a signatory Tribe to the Point Elliott Treaty of 1855; and

WHEREAS, the Snoqualmie Tribal Council is the governing body of the Snoqualmie Indian Tribe by authority of the Constitution of the Snoqualmie Indian Tribe; and

WHEREAS, the Snoqualmie Tribal Council is the duly elected council of the General Membership and is responsible for the protection of the health, safety and general welfare of the Snoqualmie people; and

WHEREAS, the Snoqualmie Tribe has embarked on an endeavor to develop and operate an entertainment facility, commonly referred to the Snoqualmie Hills Project, that will serve as the foundation of the tribal economy and provide a path towards tribal self-sufficiency; and

WHEREAS, the Snoqualmie Tribe currently has an application pending with the Bureau of Indian Affairs to place an approximately 56-acre parcel of land, currently located within the Urban Growth Boundary of the City of Snoqualmie, into trust for gaming and concurrently establishing an Initial Reservation for the Snoqualmie Tribe; and

WHEREAS, the Snoqualmie Tribal Council desires to enter into an intergovernmental agreement with the City of Snoqualmie for Police, Fire and Emergency Medical Services and Sewer Utility Services for the Snoqualmie Hills Project and the Tribe's Initial Reservation; and

WHEREAS, Tribal Representatives, Matthew Mattson and Ray Mullen, in cooperation with the MGD Companies negotiated an intergovernmental agreement for said services in the form as presented to the Tribal Council on this date;

BE IT THEREFOR RESOLVED that the Snoqualmie Tribal Council hereby approves the Agreement between the City of Snoqualmie and the Snoqualmie Tribe for the Provision of Police, Fire and Emergency Medical Services to the Snoqualmie Hills Project and Sewer Utility Service to the Tribe's Initial Reservation.

CERTIFICATION

Voted on this 22nd of April, 2004 with a quorum present and voting for 5, Against 0.
Abstaining 0.

Joseph O. Mullen 4-22-04
Joseph O. Mullen, Tribal Chairman

Arlene Ventura 4-22-04
Arlene Ventura, Tribal Secretary

AGREEMENT BETWEEN THE CITY OF SNOQUALMIE AND THE SNOQUALMIE TRIBE FOR THE PROVISION OF POLICE, FIRE AND EMERGENCY MEDICAL SERVICES TO THE SNOQUALMIE HILLS PROJECT AND SEWER UTILITY SERVICE TO THE TRIBE'S INITIAL RESERVATION

THIS AGREEMENT is dated for reference purposes the 26th day of April, 2004.

I
RECITALS

1.1 The City of Snoqualmie ("the City") is a Washington municipal corporation organized and operating under the Optional Municipal Code, Title 35A of the Revised Code of Washington, located in eastern King County.

1.2 The Snoqualmie Tribe ("the Tribe") is a federally recognized Indian tribe, whose initial reservation ("the Property") is to be located within the City's designated Urban Growth Area. The Property is legally described on Exhibit A.

1.3 This Agreement is entered between the City and Tribe in their respective governmental capacities as sovereign entities, under authority of the Interlocal Cooperation Act, Title 39.34 RCW and the 1855 Treaty of Point Elliott.

1.4 The Tribe desires to construct and operate a commercial enterprise that will include, among other uses, entertainment, dining and gaming facilities, commonly known as the Snoqualmie Hills Project ("the Project"). The Project will be comprised of an approximately 150,000 square foot building, plus parking facilities, landscaping and other site amenities upon the Property to provide revenues to the Tribe to fund its health, education, housing, social service, governmental, economic development and other programs for its members, as well as providing employment opportunities for members of the Tribe and the surrounding community.

1.5 The City desires to support the Tribe in the construction and operation of the Project, provided that the Project is initially constructed substantially as represented to the City by the Tribe, and that there is no financial subsidy to the Project from City taxpayers or ratepayers.

1.6 Over the past several years, the Tribe has had many meetings, presentations and discussions with the City and members of the general public about the Project. These meetings and discussions have dealt with the full range of issues related to the construction and operation of a project of this size and nature, including, among other things, building appearance and quality, traffic impacts mitigation, and light and noise mitigation. The Tribe has further made a number of representations to the City about the style, materials and quality of the Project buildings and facilities, on and off site signage, traffic mitigation at Exit 25 and on North Bend Way, mitigation of impacts to adjoining residential properties through land use buffers on the Property, and the nature of operations and other aspects of the Project. The Tribe has also prepared an Environmental Assessment ("EA") under the National Environmental Policy Act, containing a description of the Project, identification of potential impacts and measures to avoid or mitigate impacts. The City respects the sovereignty of the Tribe and its sole authority to approve uses, site plans, signage, building designs, and operations upon the Tribe's reservation. The Tribe acknowledges nonetheless that the City has placed material reliance upon the conceptual plans and representations made by the Tribe and the mitigation measures identified in the EA in its decision to support the Project by entering this Agreement, and that the City would not have entered into this Agreement but for such conceptual plans and representations and proposed mitigations. The conceptual plans and general representations of the Tribe are attached hereto as Exhibits B, C and D. The EA shall be deemed an appendix to this Agreement although not physically attached.

1.7 The Project requires all services and utilities common to commercial enterprises such as this, including the following specific services and utilities: police and fire and emergency medical services and sewer utility services ("Police Services," "Fire and Emergency Medical Services" and "Utility Services" respectively, and collectively "the Services"). Due to the location of the Project within the City's Urban Growth Area, the City is the most logical jurisdiction to provide the Services to the Project. The City Fire Department and Police Department each have capacity to provide the respective Services to the Project when augmented by the consideration to be paid by the Tribe. The City has sewage treatment capacity within its combined utility to provide Utility Services to the Project while still meeting its obligations to serve the existing City and projected growth within the Urban Growth Area during the term of this Agreement. It is in the best interests of the Tribe and City to provide for provision of the Services to the Project by the City through this Agreement. Due to the large capital investment required in order to construct the Project, the Tribe desires assurances that the Services will be available to the Project prior to undertaking construction.

1.8 The Tribe and the State of Washington entered a Tribal-State Compact for Class III Gaming ("the Compact"), which was approved by the U.S. Secretary of the Interior on or about April 15, 2002. The Compact provides in Section XIV (C) for an impact mitigation fund and a committee to oversee disbursement of the impact mitigation fund. The Compact does not preclude the Tribe from entering into an agreement for services. The City would not enter into this Agreement if the impact mitigation fund were the sole source of payment for the Services. The City and the Tribe recognize that it is in their mutual interests that the impact mitigation fund be the first source available to the Tribe to pay for the Services.

1.9 The Tribe desires the City to provide Police Services for the Project. The Project will have a private security department and an internal detention facility. The Tribe's security department will be the first responders for most incidents. Certain other crimes which may occur within the Project are within the exclusive jurisdiction of the Federal Bureau of Investigation. Certain crimes by Indians within the Property are subject to the exclusive jurisdiction of the Tribe and the Tribal Court. Accordingly, the scope of City polices services anticipated by the parties is receiving the turn-over, as determined by the Tribe, of suspects detained by employees of the Tribe at a secure location with Project buildings, arrest and/or issuance of citations to persons detained by Tribal security employees as deemed appropriate, and the transport to a jail facility if required. Based on experience at comparable facilities, it is estimated that there will be approximately four calls for service per week on average, but the actual demand for services cannot be accurately forecast at the time of entering this Agreement, and the parties recognize there may be a need for future adjustment. State criminal statutes are effective as to certain crimes committed by non-Indians upon the Property pursuant to Public Law 280, 83rd Congress, 1st Session, and RCW 37.12.010.

1.10 The Tribe desires the City to provide full Fire Suppression and Emergency Medical Services for the Project, but not Fire Marshal or Fire Code Enforcement Services. The City can provide all of the required Services, provided, Advanced Life

Support Services (Medic One) are provided by King County as a tax-supported service throughout King County and provided in the City through the Bellevue Fire Department by contract with King County. Calls for service through 911 requiring Advanced Life Support Services will result in the simultaneous dispatch of City personnel and equipment and Medic One personnel and equipment stationed in North Bend. However, the costs of the dispatch of Medic One personnel and equipment stationed in North Bend shall not be the responsibility of the Tribe or the City.

1.11 In order to serve the Project with City sewer service, both on-site sewer improvements ("the On-Site Improvements") and Off-Site sewer improvements ("the Off-Site Improvements) are required. The Off-Site Improvements are set forth in Exhibit E. The preliminary estimate of the cost of the Off-Site Improvements is One Million Nine Hundred Sixteen Thousand Two Hundred Twenty-two Dollars ($1,916,222). The Off-Site Improvements are designed and sized to address certain existing City infrastructure deficits, and construction thereof will confer certain public benefits on the City beyond what is solely necessary to provide sewer service to the Project.

1.12 The Tribe has a limited capital budget for construction of the Project, and may wish to pay the costs of the Off-Site Improvement from revenues of the Project after it is open and operating. The Tribe does not have bonding or borrowing capacity for the Off-Site Improvements over and above the financing committed for its capital budget for construction of the Project, and if the Tribe is to defer payment of the cost of construction of the Off-Site Improvements, the Tribe wishes to avail itself of the City's ability to issue revenue bonds.

1.13 Notwithstanding that the Off-Site Improvements confer a certain public benefit to the City over and above what is solely necessary to provide sewer service to the Project, the City would not construct the Off-Site Improvements at this time or at any time in the foreseeable future.

1.14 The City's financing of the Off-Site Improvements to provide sewer service to the Project through the issuance of revenue bonds would not constitute a prohibited gift or lending of credit by the City because the Tribe is a federally recognized Tribe and as such it constitutes a sovereign government and its purposes constitute public purposes, as determined by the Washington State Supreme Court in Anderson v. O'Brien, 84 Wash.2d 64 (1974).

1.15 The Tribe recognizes and agrees that the ability to avail itself of the City's revenue bonding capacity for financing the Off-Site Improvements, if agreed to by the City, would relieve the Tribe of the necessity to use its capital budget for the Project to construct the Off-Site Improvements, and has significant monetary value comparable to the public benefits conferred upon the City.

1.16 The City would consider issuing revenue bonds to assist the Tribe in financing the construction of the Off-Site Improvements if, and only if, the Tribe pays the bond payments in full, including the share allocable to public benefits, in consideration of the benefits to the Tribe of making the City's revenue bonding capacity available for financing the Off-Site Improvements, and further provided that the City's rate payers are fully protected against potential rate increases in the event of a default by the Tribe through provision of a guarantee in a form acceptable to the bond underwriter and the City.

1.17 The Project's estimated wastewater treatment demand is estimated at Three Hundred Sixty (360) Equivalent Residential Units (ERUs), measured by both Biological Oxygen Demand (BOD) and flow. For purposes of this Agreement, one ERU is one half-pound BOD per day and flow of One Hundred Eighty (180) gallons per day.

1.18 The Tribe as a sovereign entity is not subject to lawsuit in the courts of the State of Washington. The jurisdiction of federal courts is limited to matters involving a federal question or diversity of citizenship and the parties cannot by agreement confer jurisdiction upon the federal courts. In the absence of a limited waiver of sovereign immunity, the City would not have a remedy for breach of any of the provisions of this Agreement by the Tribe. In order to induce the City to enter this Agreement, the Tribe is willing to agree to a limited waiver of sovereign immunity as to both subject matter and personal jurisdiction over the Tribe, strictly limited to the enforcement of this Agreement and any judgment rendered thereon, by the courts of the State of Washington.

1.19 The City was represented in the negotiation of this Agreement by City Attorney Patrick B. Anderson. The Tribe was represented in negotiation of this Agreement by its representatives, Ray Mullen, Economic Development Chairman, Mathew Mattson Esq., Tribal Administrator and Thomas LeClaire, MGU Companies President. Both parties enter this Agreement freely and voluntarily to secure its benefits Both parties believe the provisions of this Agreement are in accordance with all applicable federal and state statutory and case law, and believe that all of the provisions of this Agreement are valid and enforceable. The City Council approved this Agreement and authorized the Mayor to sign by motion adopted at a regular meeting on April 26th,

2004. The Snoqualmie Tribal Council approved this Agreement and authorized the Tribal Chairman to sign by motion adopted at a meeting on April 22, 2004.

II

AGREEMENT

2.1 Assurances

2.1.1 The Tribe will use all commercially reasonable efforts to commence and develop the Project in accordance with this Agreement.

2.1.2 The City will use its best efforts to provide the Project with the Services.

2.1.3 The Tribe and the City will each use their best efforts to timely seek and obtain the regulatory and governmental approvals necessary to construct, maintain and provide for the provision of the Services.

2.2 Police Services

2.2.1 The City shall provide Police services to the Project, provided the police services shall only be provided in response to calls for service from the Tribe. The Tribe and the City, through its Police Department, shall establish written protocols governing requests for service.

2.2.2 The scope of the police services shall include receiving the turn-over of suspects detained by employees of the Tribe at a secure location within Project buildings, arrest and/or issuance of citations to such suspects on the Property as deemed appropriate, and the transport to a jail facility if required. The Police Services shall not include routine patrol services or investigation of routine crimes on the Property or within

Project or Project buildings, provided, the Police Services shall include response to major crimes in progress on the Property or within Project Buildings at the request of the Tribe.

2.2.3 The City shall provide the Police Services to the Project according to the City's standard operating procedures for determining priority of response to calls for service from the City as a whole. The City makes no representations or warranties about response time or priority of service, other than that calls for service from the Project will be responded to on the same basis as calls for service from the City as a whole under such standard operating procedures.

2.2.4 As consideration for the provision of the Police Services, the Tribe shall pay startup costs, including vehicle and equipment, of one police officer, in the amount of Fifty-five Thousand Dollars, payable in full six months prior to the estimated opening date of the Project, and the fully loaded cost of one police officer, as detailed on Exhibit F, payable on a pro rata basis six months prior to the estimated opening date of the Project for the first year, and annually in advance by December 1 of each year for the following year for succeeding years. The initial estimate of the year 2004 fully-loaded cost of one police officer is set forth on Exhibit F, provided, such fully-loaded cost shall be subject to adjustment annually, or more frequently upon the occurrence of any event significantly affecting such fully-loaded cost, including but not limited to changes in salary or benefits for police officers.

2.2.5 All suspects apprehended on the Property either by the Tribe or by the City and turned over to the City shall be charged under Washington State statutes and not under ordinances of the City of Snoqualmie. The Tribe shall assist in the prosecution of all persons charged with offenses occurring within the Property, and all persons employed at the Project shall respond to subpoenas issued for their attendance at all such prosecutions.

2.2.6 All costs, if any, incurred by the City for persons arrested on the Property and transported by the City to any jail facility shall be paid by the Tribe within 30 (thirty) days upon being billed therefore by the City, in addition to all other consideration payable under this Agreement.

2.2.7 The parties shall meet after the first full year of operation, provided, such meeting shall occur sooner on request of either party, to assess whether actual demand for Police Services is consistent with a anticipated demand, and to equitably increase or decrease the compensation to the City if the demand for Police Services appreciably exceeds or fails to meet anticipated demand.

2.3 Fire and Emergency Medical Services

2.3.1 The City shall provide Fire Suppression and Emergency Medical Services to the Project. The Tribe and the City, through its Fire Department, shall establish written protocols governing requests for service.

2.3.2 The scope of services shall include all Fire Suppression and Emergency Medical Services on the same basis as provided within the corporate limits of the City, but shall not include Fire Marshal or Fire Code Enforcement Services, unless by special request and subject to agreement for additional compensation for such services, provided, the Tribe shall provide the Fire Department with all building plans and such other information as the Fire Department shall require prior to construction, to allow the Fire Department to evaluate and comment on any matter affecting fire prevention and suppression.

2.3.3 The Tribe shall permit access by the Fire Department for inspection as necessary to maintain current information concerning the condition of all buildings and any matters that may affect Fire Suppression and Emergency medical services within such buildings. The Tribe shall further permit access by Fire Department and Police Department personnel into all buildings at a reasonable time upon at least 24-hour prior notice prior to occupancy to determine if all emergency radios work within such buildings, and at reasonable times on prior notice thereafter whenever new radio equipment or changes in radio equipment would prudently require additional emergency radio testing. If emergency radios do not work within any building, Fire Department and/or Police Department personnel may decline to enter such building in emergencies until such time as internal antennas or other radio equipment is installed and emergency radios have been tested and proven functional within such building.

2.3.4 As consideration for the provision of the Fire and Emergency Medical Services, the Tribe shall pay startup costs of two fire fighters, in the amount of Two Thousand Nine Hundred Dollars ($2,900) each, and the fully loaded cost of two fire fighters, as detailed on Exhibit G. The start-cost of one firefighter shall be payable in full six months prior to the estimated opening date, and payment of the start-up cost of the second fire fighter shall be payable on the actual opening date of the Project. The fully loaded costs of both firefighters shall be payable in advance on a pro rata basis on the date the start-up costs are payable for each firefighter respectively for the first year, and annually in advance by December 1 of each year for the following year for succeeding years. The initial estimate of the year 2004 fully-loaded cost per fire fighter is set forth on Exhibit G, provided, such fully-loaded cost shall be subject to adjustment annually, or more frequently upon the occurrence of any event significantly affecting such fully-loaded cost, including but not limited to changes in salary or benefits for fire fighters. As additional consideration for provision of the services, the Tribe shall pay two-fifths of the cost of a ladder truck, as detailed on Exhibit H, anticipated to be obtained in 2005 and for which payments are anticipated to commence in 2006. The City may obtain the ladder truck either by lease or bond financing, and payments from the Tribe for its two-fifths share shall be made to the City sufficiently in advance of the due dates of the City's payments on its underlying obligation.

2.4 On-Site Improvements

2.4.1 All On-site Improvements shall be designed, constructed, owned operated and maintained by the Tribe.

2.4.2 City approval shall be required for the design and equipping of all connections between City owned and operated sewer systems and on-site sewer systems owned by the Tribe, which shall not be unreasonable withheld or delayed.

2.4.3 The connection of the Tribal-owned on-site sewage collection system to the City-owned sewer main shall be made at the property line of the Property, and facilities for measuring sewage flow and BOD from the Property shall be located in a City-owned manhole in the nearest suitable public right of way, or if any facilities are located above ground then as near as practicable, so long as there is assurance and protection by the City that there is no third-party hookup between the sewage flow measuring facilities and the Property line.

2.5 Off-Site Improvements

2.5.1 The entire cost of the Off-Site Improvements, as detailed in Exhibit E, required to provide sewer service to the Property shall be paid by the Tribe, notwithstanding that there is additional public benefit to the City, provided, however, that the City shall after construction at the request of the Tribe establish the reimbursement amount for the Tribe of a fair pro rata share of the cost of the construction of the sewer facilities, excluding those facilities serving only the Tribe, to be paid by any owner of real estate who did not contribute to the original cost of the sewer facilities and who subsequently connect to or use the same, pursuant to chapter 35.91 RCW.

2.5.2 Subject to the Tribe's obligation to pay the cost of the Off-Site Improvements, the City shall:

(i) construct, own, operate and maintain the Off-Site Improvements;

(ii) cause the Off-Site Improvements to be available for connection to the On-site Improvements, at the location identified in Exhibit E, no later than ____ months after the Bonds (as defined below) are issued; and

(iii) will act in good faith to diligently fulfill its responsibility to complete the Off-Site Improvements in a timely manner.

2.5.3 The City shall issue revenue bonds (the "Bonds") to finance the costs of acquiring, constructing, installing and equipping the Off-Site Improvements, upon satisfaction of the following conditions:

(i) The Tribe provides information regarding itself, the Project, the Property, the On-site Improvements, the Tribe's source of funds to make payments under this Agreement, and other information necessary for the City to prepare a Bond offering document that does not contain material misstatements or omissions (within the meaning of state and federal securities laws);

(ii) The Tribe provides the City and its bond underwriter with one or more certificates, dated the date the Bonds are issued and executed by an authorized officer of the Tribe, of the type typically provided by conduit borrowers in the context of a municipal bond offering (*e.g.* certificates regarding incumbency of tribal officials, due authorization of this Agreement and related documents, litigation matters, and the information provided pursuant to Section 2.5.3(i));

(iii) The Tribe delivers to the City a letter, executed by an authorized officer of the Tribe, stating that it is the letter required by this paragraph (iii) and that the Tribe authorizes the City to proceed with the issuance of the Bonds and commence the acquisition, construction, installation and equipping of the Off-Site Improvements;

(iv) The Tribe causes to be delivered to the City (or the City's designee) an irrevocable letter of credit from a bank (within the meaning of Section 3(a)(2) of the Securities Act of 1933) in an amount sufficient to pay the all principal of the Bonds, together with the interest on the Bonds that accrues over a period of at least 190 days, and with the ability to draw thereon on each Bond payment date (including any accelerated maturity of the Bonds due to the termination of expiration of such letter of credit), provided no costs of such letter of credit (including reimbursement for draws thereunder) shall be payable by the City; and

(v) The Tribe causes to be delivered to the City an opinion of the Tribe's counsel stating that this Agreement is duly authorized, valid, binding and enforceable with respect to the Tribe and an opinion of counsel from the letter of credit bank stating that the letter of credit is duly authorized, valid, binding and enforceable.

(vi) The Bonds are not secured by the City's full faith and credit or the assets of the City's various utilities, but are special fund obligations payable solely from amounts received by the City pursuant to Section 2.5.4 of this Agreement and amounts received under the letter of credit described in paragraph (iv) above.

In connection with the issuance of the Bonds, the City and the Tribe expect to circulate among themselves and their consultants, for review and comment, drafts of the Bond offering documents, the City's Bond ordinance, the Bond closing documents, and the letter of credit documents. The Tribe acknowledges that the interest on the Bonds may not be exempt from federal income tax due to the expected use and source of security for the Bonds. The Tribe also acknowledges that the marketability of the Bonds, and the interest cost thereof, likely will be affected by the perceived creditworthiness of the letter of credit bank.

2.5.4 The Tribe shall make the following payments with respect to the Bonds:

(i) In the event the Bonds are not issued because of the Tribe's failure to satisfy the conditions of paragraph (i), (ii), (iv) or (v) of Section 2.5.3, the Tribe shall reimburse the City for all costs incurred with respect to the Off-Site Improvements (including costs incurred with respect to issuing the Bonds (or preparing the Bonds for issuance)) after the letter described in Section 2.5.3(iii) is received by the City;

(ii) For the life of the Bonds, the Tribe shall pay the City an amount equal to the principal of and interest on the Bonds next coming due at least seven days prior to each payment date of the Bonds;

(iii) Upon execution of this Agreement, the Tribe pay to the City (or to such persons as the City designates) money necessary for the cost of designing the Off-Site Improvements (which costs are estimated to be $260,000), at such time as may be required to assure that the design and construction of the Off-Site Improvements can occur within the time specified in Section 2.5.2(ii) of this Agreement (it being understood that any sum advanced under this paragraph (iii) will be reimbursed to the Tribe from the Bond proceeds).

2.6 Provision of Sewer Service to the Project

2.6.1 The City shall accept waste water effluent not exceeding Three Hundred Sixty (360) ERUs from the Property subject to all of the provisions of this section.

2.6.2 The Tribe shall secure waste water treatment plant capacity for Three Hundred Sixty (360) ERUs by payment of a Latecomer charge to the City of the sum of Three Thousand Five Hundred Twenty-nine Dollars ($3,529.00) per ERU. Said amount shall be payable at the time of connection to the municipal sewer system.

2.6.3 Effluent flow and strength shall be periodically monitored at the Tribe's sole cost at a frequency determined appropriate by the City after consultation with the Tribe. If waste water treatment demand exceeds Three Hundred Sixty (360) ERUs in either BOD or flow, the Tribe shall take such steps as may be necessary to bring waste water treatment demand below or equal to Three Hundred Sixty (360) ERUs, including but not limited to pre-treatment. By pre-treating its effluent, the Tribe may generate waste water exceeding said limit within the Project so long as the waste water effluent as measured at the point of connection to the municipal sewer system does not exceed Three Hundred Sixty (360) ERUs.

2.6.4 The Tribe may request additional treatment capacity from the City. However, the City shall not have any obligation to honor the Tribe's request unless there is additional overall capacity to meet the Tribe's request. The cost to the Tribe of any additional ERUs shall be determined by future agreement, and may or may not be subject to a Latecomer Reimbursement agreement.

2.6.5 The Tribe covenants that it shall not discharge nor permit or suffer to be discharged to the City's sewer system any pollutants, greases or oils in quantities that exceed the limits of Snoqualmie Municipal Code 13.04.430. Compliance with the provisions of Snoqualmie Municipal Code 13.04.010 through 13.04.470 inclusive, which are hereby incorporated herein by this reference as contractual obligations, shall be a condition precedent to the City's obligation to accept wastewater effluent from the Project.

2.6.6 The rate for waste water treatment shall be the then-current rate at any time as established by City Council for sewer service for one residence multiplied by the number of ERUs actually flowing through the City-owned facilities based upon the most recent measure sewage flow and BOD from the property. The cost of BOD testing shall be paid to the City by the Tribe in addition to the rate for waste water treatment. The City shall record the measurements from said facilities and bill the Tribe at no greater frequency than monthly, and the Tribe shall duly pay the bill within thirty (30) days of receipt.

2.6.7 Except for the provision above in 2.6.4 regarding the possibility of additional City treatment plant capacity allowing for additional City treatment of waste water effluent from the Property, the City shall not be obligated to accept any waste water effluent in excess of 360 ERUs unless and until this Agreement is amended in writing to provide for such additional waste water treatment.

2.6.8 Except as provided in section 2.6.9, the City shall not be liable for any damages of any nature whatsoever for any delay in the commencement of provision of sewer service of for interruptions in provision of sewer service, unless the City is reckless or intentional in its conduct.

2.6.9 In the event of delay in the commencement of sewer service or interruption in sewer service, the City shall be responsible for providing temporary facilities for the collection of effluent at the Property and trucking the effluent from the Property to the waste water treatment plant, or for paying the cost thereof, and the City shall further accept the trucked sewage effluent at the waste water treatment plant at no charge to the Tribe.

2.7 <u>Suspension of Service for Non-Payment</u>

In the event any payment required to be made by the Tribe to the City under this Agreement is more than thirty (30) days past due after the City's written notice thereof to the Tribe, and unless the Tribe notifies the City in writing within ten (10) days of receiving said notice that the Tribe disputes the payment, the City may suspend provision of the service for which the City contends payment is due until such payment has been paid, provided, the City will give not less than forty-eight hours written notice to the Tribe stating the date and time at which the particular service will be suspended for non-payment.

2.8 Relation of Compact and This Agreement

2.8.1 The Tribe's obligation to make payments for Services under this Agreement is entirely contractual in nature and completely independent of the provisions of the Compact.

2.8.2 At the request of the Tribe, the City shall cast its vote relating to disbursal of the impact mitigation fund under the Compact to permit disbursals from the fund to apply to payment for Police, Fire and Emergency Medical Services and sewer service including bond payments and use fees rendered under this Agreement.

2.9 Construction of Project Substantially in Conformity with Representations

The Tribe in the exercise of its sovereignty shall require the Project to be initially constructed and environmentally mitigated substantially in conformity with the conceptual plans general representations in Exhibits B, C and D and the EA.

2.10 Tribal Retail Store in City and Participation in City Shuttle Project

The Tribe and the City shall cooperate in good faith for the establishment of a Tribal retail store in the Snoqualmie Downtown Historic District if commercially viable, and for the Tribe's good faith participation in a potential future City shuttle service to create a transportation link between the Project, the Downtown Historic District and other potential locations within the City and/or Snoqualmie Valley.

2.11 Limited Waiver of Sovereign Immunity

The Tribe hereby consents to the limited waiver of sovereign immunity solely with respect to the enforcement of this Agreement and its provisions. The Tribe further consents to the exercise of subject matter and personal jurisdiction by the Superior Court of the State of Washington for King County for the enforcement of this Agreement, and any judgment of the court rendered thereon. This waiver shall be effective only during the term of this Agreement, provided, the waiver shall remain in force for such time after termination of this Agreement as may be necessary to resolve the rights and obligations of either the City or the Tribe arising out of this Agreement. Service of process upon the Tribe shall be made on the Tribal Chairman or Tribal Secretary at the authorized address of the Tribe as set forth below, provided, that if the offices of Tribal Chair and Tribal Secretary are vacant, then service may be made upon any member of the Tribal Council, and further provided, if all positions on the Tribal Council are vacant, then service may be made upon any member of the Tribe. The Tribe further waives and agrees not to assert any doctrine requiring exhaustion of Tribal Court or administrative remedies prior to proceeding with any arbitration or court proceeding on this Agreement.

2.12 Indemnity and Insurance

2.12.1 The City shall indemnify, defend and hold harmless the Tribe, its agents and employees, from and against any and all liability, including attorney's fees, arising from injury or death to persons or damage to property resulting in whole or in part from negligent acts of the City, its agents or employees, regardless of whether in connection with such act or omission it is alleged or claimed that an act of the City, its agents or employees caused or contributed thereto.

2.12.2 The Tribe shall indemnify, defend and hold harmless the City, its agents and employees, from and against any and all liability, including attorney's fees, arising from injury or death to persons or damage to property resulting in whole or in part from negligent acts of the Tribe, its agents or employees, regardless of whether in connection with such act or omission it is alleged or claimed that an act of the Tribe, its agents or employees caused or contributed thereto.

2.12.3 The Tribe shall indemnify, defend and hold harmless the City, its agents and employees, from and against any and all liability, including attorney's fees, arising from any claim for false arrest or imprisonment or violation of civil rights for any detention, questioning, arrest or other similar claim or cause of action arising out of events occurring on the Property, without regard to negligence or either party, unless the conduct of the officer or employee of the City constitutes gross negligence, reckless or intentional violation of the rights of the person making such claim.

2.13 Interpretation of Agreement

The Recitals to this Agreement are intended to be consulted with respect to the interpretation of this Agreement or its application in particular circumstances. Where any provision is susceptible of two interpretations, the interpretation most consistent with the intention of the parties as determined by consulting the Recitals shall control.

2.14 Dispute Resolution

In the event that the parties have any disagreement regarding their respective rights or obligations under this Agreement arising from the interpretation of any of the provisions hereof or their application to any particular facts or circumstances, other than an action for termination for material breach, the parties shall first meet in a good faith attempt to resolve their differences by agreement, and failing such agreement, the parties agree to submit such question or questions to binding arbitration administered by the American Arbitration Association under its Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator(s) may be entered and enforced in the Superior Court for the State of Washington for King County.

2.15 Entire Agreement

This Agreement contains the entire understanding of the parties with respect to the provision of services by the City to the Property. All prior discussions or negotiations, whether oral or written, are superceded by this Agreement.

2.16 Amendment

This Agreement may only be amended in a further written document executed by the duly authorized representatives of the Tribe and City, with the prior approval of the Tribal Council and City Council respectively, provided, written protocols for the provision of Police, Fire and Emergency Medical Services shall not be deemed an amendment of this Agreement, nor shall amendments to the sewer regulations of general applicability throughout the City's service area adopted by City Council be deemed amendments to this Agreement.

2.17 Action for Termination for Material Breach or Specific Performance

2.17.1 This Agreement may only be terminated by either party prior to its expiration by material breach by the other party. Any action for termination for material breach of this Agreement shall be brought in the Superior Court of the State of Washington for King County, and all remedies whether legal or equitable as the facts may warrant shall be available to both parties. In the event of any action in Superior Court to terminate this Agreement for material breach, the prevailing party shall be entitled to an award of reasonable attorneys fees and expenses of litigation, including but not limited to expert witness expenses.

2.17.2 For purposes of this Agreement, "material breach" shall include the following:

2.17.3 By the City: Failure to perform any material obligation under this Agreement, provided written notice has been provided to the City stating the nature of the default and the actions required to cure and such default remains uncured for a period exceeding ninety (90) days, and further provided, if such default cannot be cured within ninety (90) days the City shall have additional time provided that the City has commenced actions to cure within the ninety (90) day period, and is diligently proceeding to complete such actions to cure. or substantial delay in the construction of Off-Site Improvements which, as a result thereof, delays the Project development for the opening of the commercial enterprise.

2.17.4 By the Tribe: The failure to initially construct the Project substantially in conformance with the conceptual plans and general representations in Exhibits B, C and D and the EA, provided, the representations regarding construction of signage shall be permanent; the failure to make any payment on the Bonds pursuant to subparagraph 2.5.3 when due; the failure to cure any default in payment of any other sums due the City under this Agreement for a period of thirty (30) days after receiving the City's written notice to cure such default unless the Tribe notifies the City in writing within ten (10) days of receiving said notice that the Tribe disputes the payment; and the failure to perform any material duty or obligation of the Tribe under this Agreement, provided written notice has been provided to the Tribe stating the nature of the default and the actions required to cure and such default remains uncured for a period exceeding ninety (90) days, and further provided, if such default cannot be cured within ninety (90) days the Tribe shall have additional time provided that the Tribe has commenced actions to cure within the ninety (90) day period, and is diligently proceeding to complete such actions to cure.

2.17.3 Tribe's Remedies: Both Parties agree and recognize that, due to the size and scope of the Project, including the major infrastructure improvements that must be made in the initial phases of the Project, the design and placement of various discrete uses and structures, and the functional and economic interrelationships of the various components of the Project, as a practical matter it will not be possible physically, financially and as a matter of land use planning, to restore the Project to its former state once any significant portion of the Project is developed and/or any portion of the infrastructure is constructed. For the above reasons it may not be possible to determine an amount of monetary damages which would adequately and properly compensate Tribe for this work. Therefore, the Parties agree that, except as provided in Sections 2.6.8, the Tribe's sole remedies shall be specific performance or termination of the agreement for the City's material breach in the event of the City's failure to carry out its material obligations under this Agreement.

2.17.4 City's Remedies: The City's sole remedies under this Agreement shall be the collection of any sums due it for payments on the Bonds, sums due it for the Services, subject to the provisions for Dispute Resolution, or termination of the agreement for the Tribe's material breach in the event of the Tribe's failure to carry out its material obligations under this Agreement.

2.18 <u>Force Majeure</u>

Neither Party shall be deemed to be in default where failure or delay in performance of any of its obligations under this Agreement is caused by earthquakes, other Acts of God, fires, wars, riots or similar hostilities, strikes and other labor difficulties beyond the Party's control (including the Party's employment force), government regulations, court actions (such as restraining orders or injunctions), or other causes beyond the Party's control. If any such events shall occur, the term of this Agreement and the time for performance shall be extended for the duration of each such even, provided that the term of this Agreement shall not be extended under any circumstances for more than 5 years.

2.19 Term of Agreement

This Agreement shall become effective upon execution hereof by the authorized representatives of the Tribe and the City, and shall remain in full force and effect for a period of 7 (seven) years after the opening of the Project, and shall be automatically renewed for 5 (five) successive additional periods of 7 (seven) years each unless written notice of termination is given by either the Tribe or the City at least 6 (six) months prior to the expiration of the initial term or any renewal term, and further provided, the Tribe's obligation to pay the Bonds shall survive any termination of this Agreement until the Bonds are paid in full.

2.20 Notices

2.20.1 Notice may be given by either party to the other party for any purpose under this Agreement by personal delivery, or certified mailing. Notice shall be deemed given on the date of delivery or three days after the date of mailing.

2.20.2 Notices shall be given to the parties as follows:

To the City:	With a copy to:
R. Fuzzy Fletcher, Mayor PO Box 987	Patrick B. Anderson, City Attorney PO Box 924

Snoqualmie, WA 98065

Snoqualmie, WA 98065

To the Tribe

Joseph Mullen, Chairman
PO Box 280
4480 Tolt Ave.
Carnation, WA 98014

With a copy to:

Matthew Mattson, Esq
149 NE 52nd Street
Seattle, WA 98105

2.20.3 Each party shall be responsible to notify the other of any change in the name, or address of persons to receive notice, provided, any party having actual notice of such change shall give notice to the current holder of the office at such known address.

2.21 Assignment

This Agreement shall not be assignable to either party.

2.22 No Third Party Beneficiaries

This Agreement is entered for the uses and purposes set forth above, for the sole benefit of the City and Tribe, and the provisions hereof are not intended to benefit or protect the interest of any other person or entity.

2.23 Relationship of Parties

This Agreement is intended only to create contractual obligations for the Services, and the City and the Tribe do not intend, and nothing herein shall be construed, to create a partnership or joint venture between them.

CITY OF SNOQUALMIE

R. Fuzzy Fletcher, Mayor
Dated: 4-26-2004

SNOQUALMIE TRIBE

Joseph Mullen, Chairman
Dated: 4-26-04

EXHIBIT A

LEGAL DESCRIPTION

PARCEL A:

ALL OF GOVERNMENT LOT 3, AND THAT PORTION OF GOVERNMENT LOT 4, LYING NORTHERLY OF THE NORTH MARGIN OF SR 90 (STATE HIGHWAY NO. 2), SECTION 31, TOWNSHIP 24 NORTH, RANGE 8 EAST W.M.;

SITUATED IN THE COUNTY OF KING, STATE OF WASHINGTON.

PARCEL B:

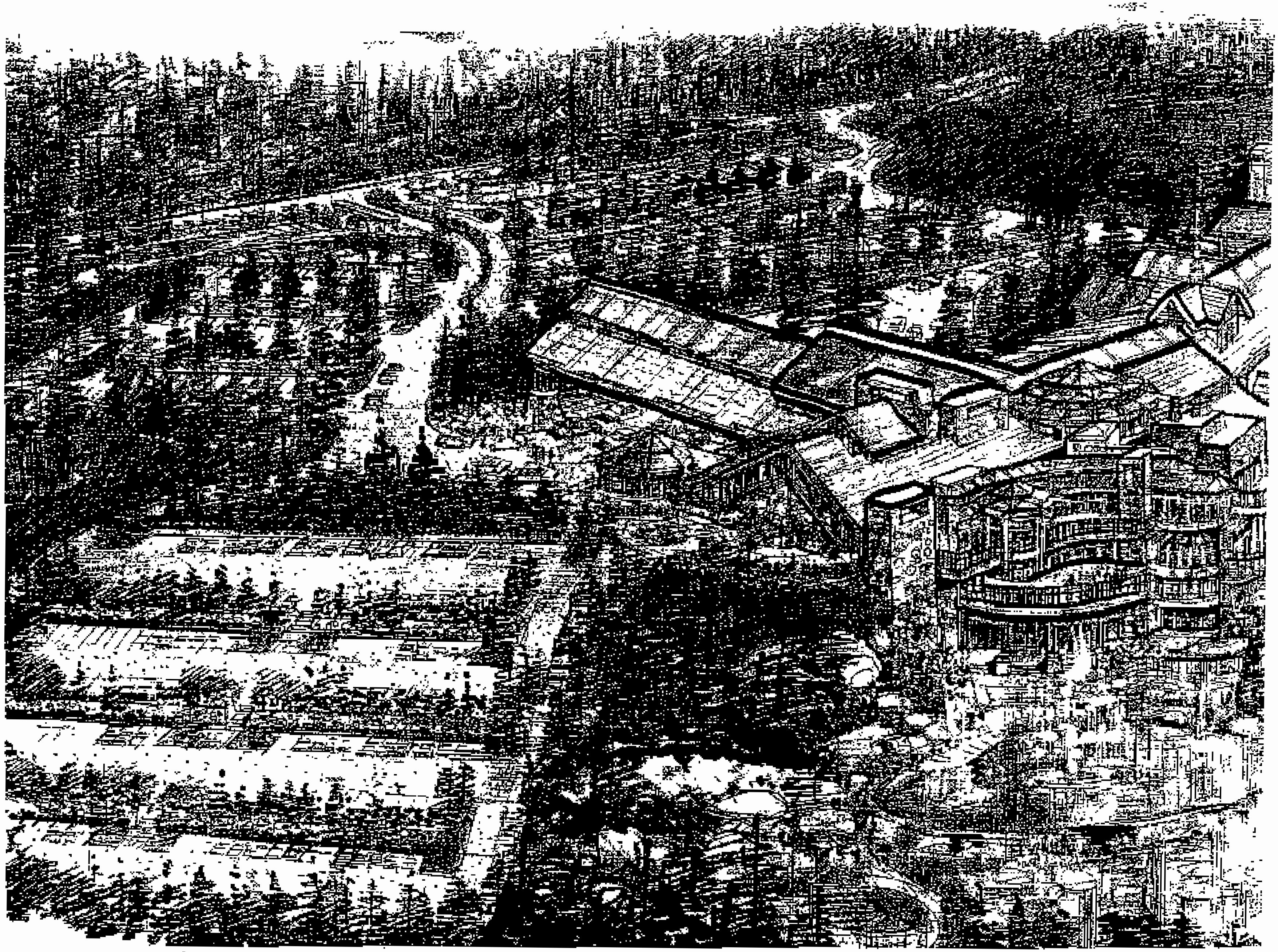
TRACT 1 IN BLOCK 3 OF THE UNRECORDED PLAT OF SI-VIEW ACRE TRACTS, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE SOUTH LINE OF THE NORTHWEST 1/4 SECTION 31, TOWNSHIP 24 NORTH, RANGE 8 EAST W.M., 750.75 FEET SOUTH 88°51'11" WEST OF THE SOUTHEAST CORNER OF SAID NORTHWEST 1/4;
THENCE SOUTH 88°51'11" WEST, 660.36 FEET;
THENCE NORTH 03°02'25" WEST, 308.18 FEET;
THENCE NORTH 86°57'35" EAST, 660.00 FEET TO THE WEST LINE OF A 60.0-FOOT STREET;
THENCE SOUTH 03°02'25" EAST ALONG SAID STREET, 330.0 FEET TO THE POINT OF BEGINNING;

EXCEPT THAT PORTION OF LOT 1 IN BLOCK 3 OF THE UNRECORDED PLAT OF SI-VIEW ACRE TRACTS, IN SECTION 31, TOWNSHIP 24 NORTH, RANCH 8 EAST W.M., DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEAST CORNER OF THE ABOVE DESCRIBED LOT 1, SOUTH 86°57'35" WEST A DISTANCE OF 311.14 FEET ALONG THE NORTH BOUNDARY OF SAID LOT 1;
THENCE SOUTH 03°02'25" EAST A DISTANCE OF 140.00 FEET;
THENCE NORTH 86°57'35" EAST A DISTANCE OF 311.14 FEET TO THE EAST BOUNDARY LINE OF SAID LOT 1;
THENCE NORTH 03°02'25" WEST A DISTANCE OF 140.00 FEET ALONG THE EAST BOUNDARY OF SAID LOT 1 TO THE POINT OF BEGINNING;

SITUATED IN THE COUNTY OF KING, STATE OF WASHINGTON.



Source: Heartland Associates 2001

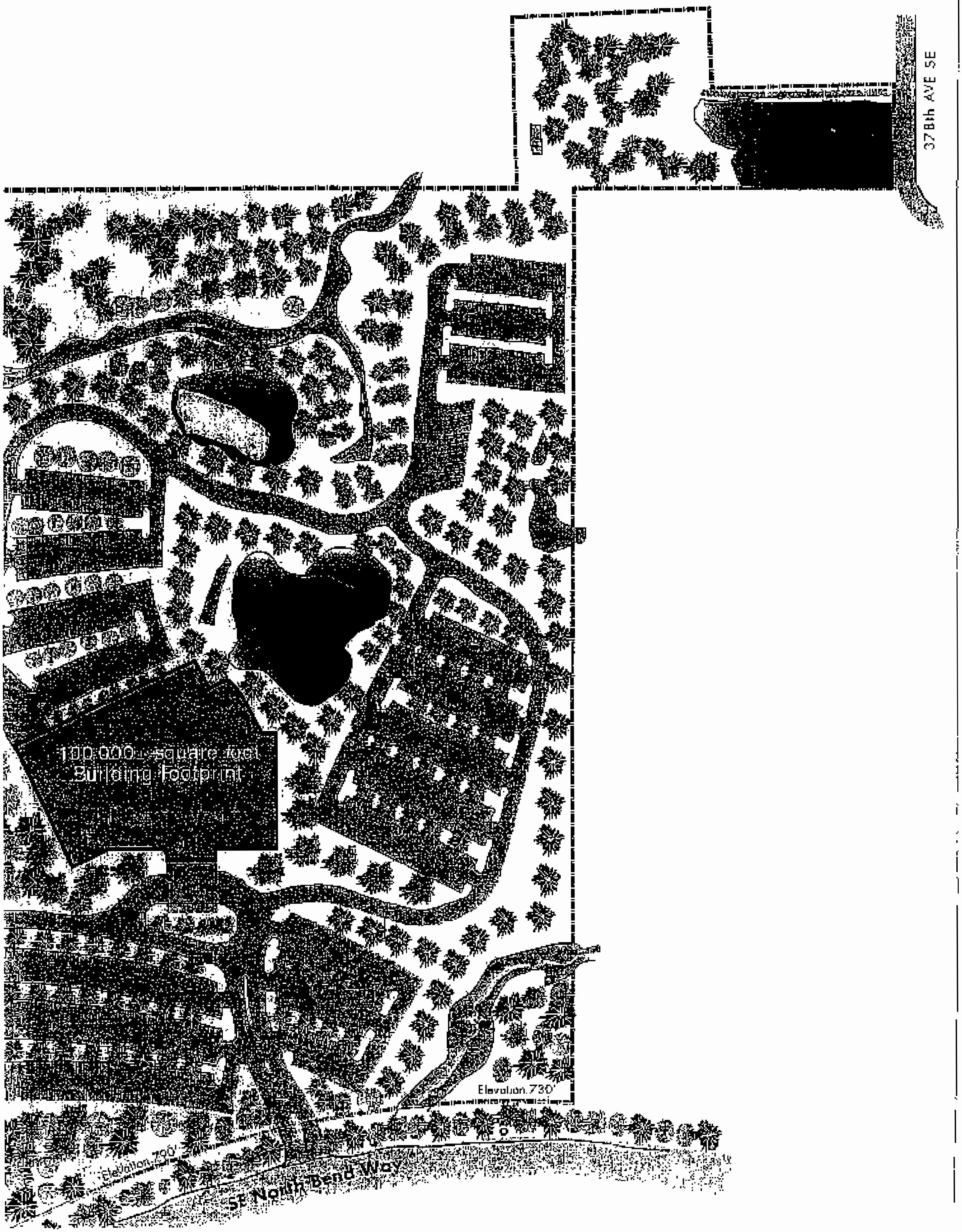

378th AVE SE
100,000± square foot
Building Footprint
Elevation 730'
Elevation 790'
SE North Bend Way

EXHIBIT D

GENERAL REPRESENTATIONS OF TRIBE

- The building will be located in the approximate middle of the site and below North Bend Way to reduce the visual impact along this roadway and to provide for a more secluded setting for the Project.
- The berm and existing vegetation on North Bend Way will remain undisturbed to the maximum extent feasible with safe and efficient site ingress and egress.
- A significant undisturbed vegetated buffer will be left on the west side of the Property along 372^{nd} Ave. S.E.
- The architectural style and materials of the building will blend elements of the "great lodge" of the West and the Pacific Northwest with the natural characteristics of the Property.
- Signage will be oriented toward North Bend Way. No signage will be erected on site intended to be visible from I-90. Signage will be oriented toward North Bend Way. No signage will be erected on site intended to be visible from I-90. Signage on I-90 will be WSDOT approved signage directing travelers to the Tribe's reservation or to travelers' services.
- Tribe will work with City and WSDOT if experience shows eastbound off-ramp of Exit 27 should be reconfigured or other traffic impact mitigation is required.

EXHIBIT E
SEWER COLLECTION SYSTEM
REQUIRED IMPROVEMENTS

The Required Improvements are based upon the South Snoqualmie Hills Sewer Plan (Tt/KCM, 2002), which should be consulted in connection with this Exhibit. The Tribe shall be responsible for actual costs incurred. Estimated costs are provided for planning purposes only

IMPROVEMENT	ESTIMATE
Construct new 10" sewer trunk from northeast corner of Tribe's property southeasterly along SE 88th Street to 384th Avenue SE and connecting to existing manhole #313.	$469,000
Improve existing collection system to eliminate Pump Station No. 5 and bypass Pump Station No. 2 with new 15-inch trunk sewer line by constructing a new trunk sewer to replace existing 10" trunk sewer from manhole 300 upstream from Pump Station No. 5 to manhole 110 at the corner of Cedar Street and Silva Avenue and continuing the sewer line north on Silva Avenue and Fir Street, connecting to the existing 15-inch trunk sewer at manhole # 8.	$568,000
Remove Pump Station 5 following construction of the new sewer.	$20,000
Increase motors from 32 to 40 horsepower at Pump Station No. 1.	$5,000
Correct point source of infiltration and inflow, including smoke reports (mostly on private property), leaking manholes, and water tight manhole lids in flood areas	$47,000
Provide a wastewater monitoring station as near as practicable to the point of connection to the municipal system to specifications and design approved by the City, to include a flow measurement manhole with a Parshal flume, level sensor, and an above grade flow indicator, totalizer and data logger and an automatic sampler for taking time-or flow-composite samples.	$20,000
Contingency	$339,000
Engineering and administration	$367.000
Sales tax	$126,000
TOTAL:	$1,961,000.00

Exhibit F

Fully Loaded Cost for One Police Officer

CITY OF SNOQUALMIE - POLICE SERVICES
(2004 Base Year Example)

Formula for projecting costs from Wages for Benefits and Overtime, Equipment and Administrative, and Total Costs for 1 Police Services personnel.

2004 Example

FF Monthly Wage	$	5,235.00	X	12	**Months**	=
FF Annual Wage	$	62,820.00				
Benefit and Overtime Projection						
Annual Wage	$	62,820.00				
Benefit & Overtime Multiplier		45.54%				
Projected Benefit and Overtime Cost	$	28,609.00				
Equipment and Administrative Projection						
Annual Wage	$	62,820.00				
Equipment and Administrative Multiplier		31.60%				
Projected Equipment and Administrative Cost	$	19,852.00				
Total Cost Per Employee						
Annual Wage	$	62,820.00				
Benefit and Overtime	$	28,609.00				
Equipment and Administrative	$	19,852.00				
	$	111,281.00				
Total Costs for One Employee	$	111,281.00				

Actual fully loaded cost will be calculated annually

CITY OF SNOQUALMIE - POLICE SERVICES
(2004 Base Year)

SALARIES & WAGES	ESTIMATE $ 62,820.00	Wage
OVERTIME	ESTIMATE $5,333.00	Wage
PERSONNEL BENEFITS	ESTIMATE $23,276.00	Wage
OPERATIONAL COSTS	ESTIMATE $12,791.00	Equipment
ADMINISTRATIVE COSTS	ESTIMATE $7,061.00	Administrative
TOTAL	$111,281.00	

Wages	Equipment	Administrative
$91,429.00	$12,791.00	$7,061.00
82%	11%	6%

CITY OF SNOQUALMIE - POLICE SERVICES
BENEFIT AND OVERTIME MULTIPLIER

Schedule identifies multiplier to annual wage to determine estimate for Benefit and Overtime costs.

Total Wages, Benefits & Overtime Costs	$ 91,429.00
Benefit Costs	$ 23,276.00
Overtime Costs	$ 5,333.00
Total Benefit & Overtime	$ 28,609.00
Annual Wages	$ 62,820.00
Ratio Benefits & Overtime to Wages	45.54% **Benefit and Overtime Multiplier**

Test

Multiplier X Wages = $ 28,609.00

Should equal Total Benefits & Overtime Costs above

Exhibit G

Fully Loaded Cost of Two Fire Fighters

CITY OF SNOQUALMIE- FIRE AND EMERGENCY SERVICES
(2004 Base Year Example)

FORMULA

2004 Example

FF Monthly Wage	$	4,619.00	X	12	**Months =**
FF Annual Wage	$	55,428.00			
Benefit and Overtime Projection					
Annual Wage	$	55,428.00			
Benefit & Overtime Multiplier		42.94%			
Projected Benefit and Overtime Cost	$	23,800.00			
Equipment and Administrative Projection					
Annual Wage	$	55,428.00			
Equipment and Administrative Multiplier		27.64%			
Projected Equipment and Administrative Cost	$	15,321.20			
Total Cost Per Employee					
Annual Wage	$	55,428.00			
Benefit and Overtime	$	23,800.00			
Equipment and Administrative	$	15,321.20			
	$	94,549.20			
Total Costs for Two Employees	$	189,098.40			

BREAKDOWN OF ESTIMATED COSTS

CITY OF SNOQUALMIE- FIRE AND EMERGENCY SERVICES
(2004 Base Year Example)

ESTIMATIONS Based on 2 Employees

522.20.10 SALARIES & WAGES	ESTIMATE $ 55,428.00	Wage		
522.20.11 UNIFORMS	ESTIMATE $920.00	Equipment		
522.20.12 OVERTIME	ESTIMATE $2,400.00	Wage		
522.20.20 PERSONNEL BENEFITS	ESTIMATE $21,400.00	Wage		
522.20.31 OPERATING SUPPLIES	ESTIMATE $2,040.00	Equipment		
522.20.42 COMMUNICATION	ESTIMATE $1,280.00	Equipment		
522.20.46 INSURANCE	ESTIMATE $3,500 00	Administrative		
522.20.47 PUBLIC UTILITIES	ESTIMATE $1,050.00	Administrative		
522.20.48 REPAIRS & MAINTENANCE	ESTIMATE $1,000.00	Equipment		
522.20.49 LAUNDRY	ESTIMATE $120.00	Equipment		
522.20.64 EQUIPMENT	ESTIMATE $2,720.00	Equipment		
522.40.00 TRAINING	ESTIMATE $1,400.00	Administrative		
522.40.49 MEMBERSHIPS	ESTIMATE $171 20	Administrative		
522.92.40 CIVIL SERVICE	ESTIMATE $1,120.00	Administrative		
TOTAL PER EMPLOYEE	$94,549.20	Wages, Overtime & Benefits	Equipment	Administrative
		$79,228.00	$8,080 00	$7,241.20
		84%	9%	8%
TIMES 2 EMPLOYEES	$189,098.40	$158,456.00	$16,160.00	$14,482.40

CITY OF SNOQUALMIE- FIRE AND EMERGENCY SERVICES
BENEFIT AND OVERTIME MULTIPLIER

Schedule identifies multiplier to annual wage to determine estimate for Benefit and Overtime costs.

Total Wages, Benefits & Overtime Costs	$ 79,228.00	
Benefit Costs	$ 21,400.00	
Overtime Costs	$ 2,400.00	
Total Benefit & Overtime	$ 23,800.00	
Annual Wages	$ 55,428.00	
Ratio Benefits & Overtime to Wages	42.94%	**Benefit and Overtime Multiplier**

Test

Multiplier X Wages = $ 23,800.00

Should equal Total Benefits & Overtime Costs above

Exhibit H

LADDER TRUCK EXAMPLE

Specification:	New 110' aerial ladder truck – "quint" style.
Estimated cost (2004 dollars):	$810,000
Estimated annual payment (5 year term, 5.5% lease rate, one annual payment)	$189,893.67
Tribe's share:	$75,957.47

The Tribe's actual payment will depend upon final purchase cost and nature and terms of financing.

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Appendix G

Hydraulic Analyses Results

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Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
CO-28	MH-GIS-MH-36	749.5	PSEWW	736.5	15.4	0.847	8	PVC	0.01	83	29.5	-0.5	
CO-30	MH-GIS-MH-77	756.31	PSEWW	736.5	8.8	2.263	8	PVC	0.01	56	24.1	-0.5	
GM-GIS-AC_ssGM_1255	MH-GIS-AC_ssMH_2569	987.01	MH-GIS-RI_ssMH_2320	987.3	60	-0.005	8	PVC	0.01	3	77.7	-0.1	
GM-GIS-AC_ssGM_1266	MH-GIS-AC_ssMH_2570	966.73	MH-GIS-CR_ssMH_2321	968.83	100.7	-0.021	8	PVC	0.01	47	100	1.7	
GM-GIS-AC_ssGM_1419	MH-GIS-AC_ssMH_2543	957.94	MH-GIS-AC_ssMH_2522	961.45	68	0.052	8	PVC	0.01	4	58.3	3.2	
GM-GIS-AC_ssGM_1420	MH-GIS-AC_ssMH_2522	961.45	MH-GIS-AC_ssMH_2530	980.95	400	0.049	8	PVC	0.01	3	5.1	18.9	
GM-GIS-AC_ssGM_1421	MH-GIS-AC_ssMH_2533	955.84	MH-GIS-AC_ssMH_2521	970.9	260	0.058	8	PVC	0.01	4	6.2	14.4	
GM-GIS-AC_ssGM_1422	MH-GIS-AC_ssMH_2521	970.9	MH-GIS-AC_ssMH_2529	986.8	240	0.066	8	PVC	0.01	3	5.1	15.3	
GM-GIS-AC_ssGM_1423	MH-GIS-AC_ssMH_2537	990.52	MH-GIS-AC_ssMH_2529	986.8	137.1	0.027	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1424	MH-GIS-AC_ssMH_2539	981.15	MH-GIS-AC_ssMH_2527	977.75	175.8	0.019	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1425	MH-GIS-AC_ssMH_2540	975.33	MH-GIS-AC_ssMH_2544	973.78	90.9	0.017	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1426	MH-GIS-AC_ssMH_2518	963.48	MH-GIS-AC_ssMH_2514	975.79	158.5	0.078	8	PVC	0.01	9	9.5	11.7	
GM-GIS-AC_ssGM_1427	MH-GIS-AC_ssMH_2514	975.79	MH-GIS-AC_ssMH_2534	992.06	244.7	0.066	8	PVC	0.01	4	6.2	15.6	
GM-GIS-AC_ssGM_1428	MH-GIS-AC_ssMH_2569	987.01	MH-GIS-AC_ssMH_2517	987.35	74.8	0.005	8	PVC	0.01	1	26.7	-0.1	
GM-GIS-AC_ssGM_1429	MH-GIS-AC_ssMH_2523	960.92	MH-GIS-AC_ssMH_2524	964.82	121.6	-0.032	8	PVC	0.01	43	100	7.5	
GM-GIS-AC_ssGM_1430	MH-GIS-AC_ssMH_2525	957.38	MH-GIS-AC_ssMH_2535	965.08	175.4	0.044	8	PVC	0.01	15	12.5	7.1	
GM-GIS-AC_ssGM_1431	MH-GIS-AC_ssMH_2535	965.08	MH-GIS-AC_ssMH_2527	977.75	300.5	0.042	8	PVC	0.01	4	6.2	12	
GM-GIS-AC_ssGM_1432	MH-GIS-AC_ssMH_2524	964.82	MH-GIS-AC_ssMH_2526	966.2	72.7	-0.019	8	PVC	0.01	44	100	3.6	
GM-GIS-AC_ssGM_1433	MH-GIS-AC_ssMH_2526	966.2	MH-GIS-AC_ssMH_2570	966.73	37.3	-0.014	8	PVC	0.01	46	100	2.3	
GM-GIS-AC_ssGM_1434	MH-GIS-AC_ssMH_2531	960.07	MH-GIS-AC_ssMH_2546	971.34	240.5	0.047	8	PVC	0.01	9	9.5	10.7	
GM-GIS-AC_ssGM_1435	MH-GIS-AC_ssMH_2528	957.15	MH-GIS-AC_ssMH_2525	957.38	35.4	0.006	8	PVC	0.01	17	100	4	
GM-GIS-AC_ssGM_1436	MH-GIS-AC_ssMH_2523	960.92	MH-GIS-AC_ssMH_2532	960.88	126.7	-3E-04	8	PVC	0.01	42	100	5.3	
GM-GIS-AC_ssGM_1437	MH-GIS-AC_ssMH_2532	960.88	MH-GIS-AC_ssMH_2519	957.9	120.4	-0.025	8	PVC	0.01	30	100	5.3	
GM-GIS-AC_ssGM_1438	MH-GIS-AC_ssMH_2519	957.9	MH-GIS-AC_ssMH_2533	955.84	123.8	-0.017	8	PVC	0.01	29	100	5.3	
GM-GIS-AC_ssGM_1439	MH-GIS-AC_ssMH_2520	956.8	MH-GIS-AC_ssMH_2533	955.84	270	0.004	8	PVC	0.01	24	100	4.4	
GM-GIS-AC_ssGM_1440	MH-GIS-AC_ssMH_2515	981.51	MH-GIS-AC_ssMH_2516	977.36	84.2	0.049	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-AC_ssGM_1441	MH-GIS-AC_ssMH_2518	963.48	MH-GIS-AC_ssMH_2532	960.88	90.8	0.029	8	PVC	0.01	10	100	2.7	
GM-GIS-AC_ssGM_1442	MH-GIS-AC_ssMH_2528	957.15	MH-GIS-AC_ssMH_2520	956.8	244.1	0.001	8	PVC	0.01	18	100	4	
GM-GIS-AC_ssGM_1443	MH-GIS-AC_ssMH_2515	981.51	MH-GIS-AC_ssMH_2536	986.72	122.9	0.042	8	PVC	0.01	1	3.6	4.6	
GM-GIS-AC_ssGM_1444	MH-GIS-AC_ssMH_2538	982.94	MH-GIS-AC_ssMH_2530	980.95	159.3	0.012	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1445	MH-GIS-AC_ssMH_2535	965.08	MH-GIS-AC_ssMH_2531	960.07	276	-0.018	8	PVC	0.01	10	100	-0.5	
GM-GIS-AC_ssGM_1446	MH-GIS-AC_ssMH_2542	992.86	MH-GIS-AC_ssMH_2534	992.06	87.2	0.009	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1447	MH-GIS-AC_ssMH_2516	977.36	MH-GIS-AC_ssMH_2514	975.79	71.6	0.022	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-AC_ssGM_1448	MH-GIS-MH-86	993.66	MH-GIS-AC_ssMH_2534	992.06	54	0.03	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1449	MH-GIS-MH-55	976.71	MH-GIS-AC_ssMH_2527	977.75	37.6	-0.028	8	PVC	0.01	1	100	0.4	
GM-GIS-AC_ssGM_1450	MH-GIS-AC_ssMH_2520	956.8	MH-GIS-AC_ssMH_2543	957.94	32	0.036	8	PVC	0.01	5	100	4.4	
GM-GIS-AC_ssGM_1451	MH-GIS-AC_ssMH_2544	973.78	MH-GIS-AC_ssMH_2545	972.76	41.9	0.024	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-AC_ssGM_1452	MH-GIS-AC_ssMH_2546	971.34	MH-GIS-AC_ssMH_2545	972.76	53.2	0.027	8	PVC	0.01	8	8.8	0.8	
GM-GIS-AC_ssGM_1453	MH-GIS-AC_ssMH_2547	974.61	MH-GIS-AC_ssMH_2545	972.76	39.9	0.046	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-AC_ssGM_1454	MH-GIS-AC_ssMH_2541	978.1	MH-GIS-AC_ssMH_2547	974.61	162	0.022	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-AC_ssGM_1455	MH-GIS-MH-46	977.43	MH-GIS-AC_ssMH_2541	978.1	30	-0.022	8	PVC	0.01	1	100	0	
GM-GIS-AR_ssGM_751	MH-GIS-AR_ssMH_2012	534.92	MH-GIS-AR_ssMH_2015	531.19	92.4	0.04	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AR_ssGM_753	MH-GIS-AR_ssMH_2015	531.19	MH-GIS-AR_ssMH_2017	517.96	169.4	0.078	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-AR_ssGM_754	MH-GIS-AR_ssMH_2014	539.39	MH-GIS-AR_ssMH_2015	531.19	249.8	0.033	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AR_ssGM_755	MH-GIS-AR_ssMH_2013	551.42	MH-GIS-AR_ssMH_2015	531.19	287.7	0.07	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AU_ssGM_218	MH-GIS-AU_ssMH_1599	866.04	MH-GIS-AU_ssMH_1600	851.08	203.6	0.073	8	PVC	0.01	4	6.6	-0.6	
GM-GIS-AU_ssGM_219	MH-GIS-FW_ssMH_1596	871.76	MH-GIS-AU_ssMH_1599	866.04	192.1	0.03	8	PVC	0.01	4	6	-0.6	
GM-GIS-AU_ssGM_220	MH-GIS-AU_ssMH_1600	851.08	MH-GIS-DH_ssMH_1601	841.46	194.5	0.049	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-AU_ssGM_367	MH-GIS-AU_ssMH_1767	885.96	MH-GIS-FW_ssMH_1608	884.67	106.1	0.012	8	PVC	0.01	6	7.6	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-AU_ssGM_368	MH-GIS-AU_ssMH_1765	892.62	MH-GIS-AU_ssMH_1766	889	127.1	0.028	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-AU_ssGM_369	MH-GIS-AU_ssMH_1764	894	MH-GIS-AU_ssMH_1765	892.62	263.7	0.005	8	PVC	0.01	2	5	-0.6	
GM-GIS-AU_ssGM_370	MH-GIS-AU_ssMH_1768	892.9	MH-GIS-AU_ssMH_1764	894	127	-0.009	8	PVC	0.01	1	100	0.5	
GM-GIS-AU_ssGM_371	MH-GIS-MH-166	894	MH-GIS-AU_ssMH_1764	894	139.4	0	8	PVC	0.01	1	8.4	-0.6	
GM-GIS-AU_ssGM_372	MH-GIS-MH-191	894	MH-GIS-AU_ssMH_1765	892.62	162.7	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AU_ssGM_373	MH-GIS-AU_ssMH_1766	889	MH-GIS-AU_ssMH_1767	885.96	213.5	0.014	8	PVC	0.01	5	7	-0.6	
GM-GIS-AU_ssGM_374	MH-GIS-AU_ssMH_1761	877.23	MH-GIS-AU_ssMH_1760	876.04	130.6	0.009	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-AU_ssGM_375	MH-GIS-AU_ssMH_1762	882.91	MH-GIS-AU_ssMH_1761	877.23	279.6	0.02	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AU_ssGM_376	MH-GIS-AU_ssMH_1760	876.04	MH-GIS-AU_ssMH_1600	851.08	129.2	0.193	8	PVC	0.01	4	6	-0.6	
GM-GIS-AU_ssGM_377	MH-GIS-AU_ssMH_1769	889.03	MH-GIS-AU_ssMH_1763	885.95	170	0.018	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-AU_ssGM_378	MH-GIS-AU_ssMH_1763	885.95	MH-GIS-AU_ssMH_1762	882.91	118.2	0.026	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-AU_ssGM_379	MH-GIS-AU_ssMH_1770	856.12	MH-GIS-AU_ssMH_1771	842.97	132.6	0.099	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-AU_ssGM_380	MH-GIS-AU_ssMH_1771	842.97	MH-GIS-DH_ssMH_1773	832.79	221.5	0.046	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AU_ssGM_382	MH-GIS-MH-85	861.23	MH-GIS-AU_ssMH_1770	856.12	52.7	0.097	6	PVC	0.01	1	3.8	-0.5	
GM-GIS-AZ_ssGM_1106	MH-GIS-AZ_ssMH_2479	751.27	MH-GIS-AZ_ssMH_2495	736.45	117	0.127	8	PVC	0.01	14	11.9	-0.6	
GM-GIS-AZ_ssGM_1107	MH-GIS-AZ_ssMH_2472	826.5	MH-GIS-AZ_ssMH_2471	823.93	56.8	0.045	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-AZ_ssGM_1108	MH-GIS-AZ_ssMH_2474	822.64	MH-GIS-AZ_ssMH_2475	825.15	283.1	-0.009	8	PVC	0.01	11	100	2	
GM-GIS-AZ_ssGM_1109	MH-GIS-AZ_ssMH_2473	822.85	MH-GIS-AZ_ssMH_2474	822.64	39.4	0.005	8	PVC	0.01	9	100	1.8	
GM-GIS-AZ_ssGM_1110	MH-GIS-AZ_ssMH_2475	825.15	MH-GIS-AZ_ssMH_2485	809.69	332.1	0.047	8	PVC	0.01	15	12.6	-0.6	
GM-GIS-AZ_ssGM_1111	MH-GIS-AZ_ssMH_2483	790.7	MH-GIS-AZ_ssMH_2477	788.86	75.8	0.024	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-AZ_ssGM_1112	MH-GIS-AZ_ssMH_2478	770.13	MH-GIS-AZ_ssMH_2479	751.27	144.5	0.13	8	PVC	0.01	10	9.9	-0.6	
GM-GIS-AZ_ssGM_1113	MH-GIS-AZ_ssMH_2480	725.46	MH-GIS-AZ_ssMH_2481	722.02	56.6	0.061	8	PVC	0.01	16	12.8	-0.6	
GM-GIS-AZ_ssGM_1114	MH-GIS-AZ_ssMH_2505	771.4	MH-GIS-AZ_ssMH_2504	770.86	66.9	0.008	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-AZ_ssGM_1115	MH-GIS-AZ_ssMH_2476	814.59	MH-GIS-AZ_ssMH_2477	788.86	314.7	0.082	8	PVC	0.01	2	4.6	-0.6	
GM-GIS-AZ_ssGM_1116	MH-GIS-AZ_ssMH_2498	814.65	MH-GIS-AZ_ssMH_2482	806.69	220.5	0.036	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-AZ_ssGM_1117	MH-GIS-AZ_ssMH_2503	748.41	MH-GIS-AZ_ssMH_2488	733.3	174	0.087	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-AZ_ssGM_1118	MH-GIS-AZ_ssMH_2488	733.3	MH-GIS-AZ_ssMH_2486	724.31	122	0.074	8	PVC	0.01	6	8	-0.6	
GM-GIS-AZ_ssGM_1119	MH-GIS-AZ_ssMH_2506	777.34	MH-GIS-AZ_ssMH_2505	771.4	145.7	0.041	8	PVC	0.01	2	4.6	-0.6	
GM-GIS-AZ_ssGM_1120	MH-GIS-AZ_ssMH_2482	806.69	MH-GIS-AZ_ssMH_2484	799.77	225.1	0.031	8	PVC	0.01	2	4.6	-0.6	
GM-GIS-AZ_ssGM_1121	MH-GIS-AZ_ssMH_2492	802.29	MH-GIS-AZ_ssMH_2483	790.7	192.3	0.06	8	PVC	0.01	4	6.6	-0.6	
GM-GIS-AZ_ssGM_1122	MH-GIS-AZ_ssMH_2489	806.65	MH-IS-18	799.57	257.4	0.028	8	PVC	0.01	50	22.8	-0.5	
GM-GIS-AZ_ssGM_1123	MH-GIS-AZ_ssMH_2471	823.93	MH-GIS-AZ_ssMH_2473	822.85	148	0.007	8	PVC	0.01	7	100	0.7	
GM-GIS-AZ_ssGM_1124	MH-GIS-AZ_ssMH_2477	788.86	MH-GIS-AZ_ssMH_2478	770.13	151.6	0.124	8	PVC	0.01	9	9.3	-0.6	
GM-GIS-AZ_ssGM_1125	MH-GIS-AZ_ssMH_2485	809.69	MH-GIS-AZ_ssMH_2491	807.92	226.7	0.008	8	PVC	0.01	45	21.7	-0.5	
GM-GIS-AZ_ssGM_1126	MH-GIS-AZ_ssMH_2491	807.92	MH-GIS-AZ_ssMH_2489	806.65	193.7	0.007	8	PVC	0.01	48	22.3	-0.5	
GM-GIS-AZ_ssGM_1127	MH-GIS-AZ_ssMH_2481	722.02	MH-GIS-AZ_ssMH_2486	724.31	231.9	-0.01	8	PVC	0.01	17	100	1.8	
GM-GIS-AZ_ssGM_1128	MH-GIS-AZ_ssMH_2507	793.93	MH-GIS-AZ_ssMH_2506	777.34	311.8	0.053	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-AZ_ssGM_1129	MH-GIS-AZ_ssMH_2484	799.77	MH-GIS-AZ_ssMH_2492	802.29	112.1	-0.022	8	PVC	0.01	3	100	1.9	
GM-GIS-AZ_ssGM_1130	MH-GIS-AZ_ssMH_2504	770.86	MH-GIS-AZ_ssMH_2503	748.41	196.1	0.114	8	PVC	0.01	4	6.6	-0.6	
GM-GIS-AZ_ssGM_1131	MH-GIS-AZ_ssMH_2493	760.45	MH-GIS-AZ_ssMH_2479	751.27	163.2	0.056	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-AZ_ssGM_1132	MH-GIS-AZ_ssMH_2494	777.45	MH-GIS-AZ_ssMH_2493	760.45	193.7	0.088	8	PVC	0.01	2	4.6	-0.6	
GM-GIS-AZ_ssGM_1133	MH-GIS-AZ_ssMH_2495	736.45	MH-GIS-AZ_ssMH_2480	725.46	123.1	0.089	8	PVC	0.01	15	12.3	-0.6	
GM-GIS-AZ_ssGM_1134	MH-GIS-AZ_ssMH_2496	827.6	MH-GIS-AZ_ssMH_2475	825.15	82	0.03	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1135	MH-GIS-AZ_ssMH_2497	817.01	MH-GIS-AZ_ssMH_2476	814.59	110.9	0.022	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-AZ_ssGM_1136	MH-GIS-AZ_ssMH_2499	783.08	MH-GIS-AZ_ssMH_2494	777.45	94.7	0.059	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-AZ_ssGM_1137	MH-GIS-AZ_ssMH_2486	724.31	MH-GIS-AZ_ssMH_2500	713.38	121.3	0.09	8	PVC	0.01	24	15.9	-0.6	
GM-GIS-AZ_ssGM_1138	MH-GIS-AZ_ssMH_2500	713.38	MH-GIS-AZ_ssMH_2487	707.6	37.2	0.155	8	PVC	0.01	26	16.2	-0.6	
GM-GIS-AZ_ssGM_1139	MH-GIS-AZ_ssMH_2487	707.6	MH-GIS-AZ_ssMH_2502	691.99	195.9	0.08	8	PVC	0.01	27	16.5	-0.6	
GM-GIS-AZ_ssGM_1140	MH-GIS-AZ_ssMH_2502	691.99	ump Station K2 (Burke St) Wetw	688.45	7.8	0.453	8	PVC	0.01	28	16.9	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-AZ_ssGM_1417	MH-GIS-AZ_ssMH_2501	832.13	MH-GIS-AZ_ssMH_2472	826.5	177.9	0.032	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-BA_ssGM_622	MH-GIS-BR_ssMH_1261	547.04	MH-GIS-BR_ssMH_1256	547.29	34.7	-0.007	8	Glass	0.013	28	63.7	-0.2	
GM-GIS-BA_ssGM_623	MH-GIS-BR_ssMH_1258	534.86	MH-GIS-BR_ssMH_1257	532.52	21.3	0.11	8	Glass	0.013	31	18	-0.5	
GM-GIS-BA_ssGM_624	MH-GIS-BR_ssMH_1257	532.52	Pump Station Z (Gala) Wetwell	527.95	6.8	0.676	8	Glass	0.013	33	18.5	-0.5	
GM-GIS-BA_ssGM_625	MH-GIS-BR_ssMH_1262	543.07	MH-GIS-BR_ssMH_1261	547.04	112.7	-0.035	8	Glass	0.013	26	100	3.7	
GM-GIS-BA_ssGM_626	MH-GIS-BR_ssMH_1258	534.86	MH-GIS-BR_ssMH_1256	547.29	123.7	0.1	8	Glass	0.013	30	17.5	11.9	
GM-GIS-BA_ssGM_627	MH-GIS-BR_ssMH_1275	560.87	MH-GIS-BR_ssMH_1274	553.5	109.5	0.067	8	Glass	0.013	3	5.8	-0.6	
GM-GIS-BA_ssGM_628	MH-GIS-BR_ssMH_1260	564	MH-GIS-BR_ssMH_1275	560.87	106.8	0.029	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-BA_ssGM_629	MH-GIS-BR_ssMH_1259	564	MH-GIS-BR_ssMH_1263	564	153.3	0	8	Glass	0.013	2	12.8	-0.6	
GM-GIS-BA_ssGM_630	MH-GIS-BR_ssMH_1269	551.44	MH-GIS-BR_ssMH_1265	548.23	68.3	0.047	8	Glass	0.013	8	100	1.1	
GM-GIS-BA_ssGM_631	MH-GIS-BR_ssMH_1265	548.23	MH-GIS-BR_ssMH_1264	547.25	116.7	0.008	8	Glass	0.013	10	100	4.4	
GM-GIS-BA_ssGM_632	MH-GIS-BR_ssMH_1264	547.25	MH-GIS-BR_ssMH_1266	552.11	140.5	-0.035	8	Glass	0.013	12	100	10.2	
GM-GIS-BA_ssGM_633	MH-GIS-BR_ssMH_1266	552.11	MH-GIS-BR_ssMH_1267	559.23	115.6	-0.062	8	Glass	0.013	13	100	7.7	
GM-GIS-BA_ssGM_634	MH-GIS-BR_ssMH_1267	559.23	MH-GIS-BR_ssMH_1268	560.34	122.1	-0.009	8	Glass	0.013	15	100	0.6	
GM-GIS-BA_ssGM_635	MH-GIS-BR_ssMH_1268	560.34	MH-GIS-BR_ssMH_1272	557.8	102.3	0.025	8	Glass	0.013	17	13	-0.6	
GM-GIS-BA_ssGM_636	MH-GIS-BR_ssMH_1270	552.27	MH-GIS-BR_ssMH_1269	551.44	328	0.003	8	Glass	0.013	7	100	0.3	
GM-GIS-BA_ssGM_637	MH-GIS-BR_ssMH_1263	564	MH-GIS-BR_ssMH_1271	563.3	116.1	0.006	8	Glass	0.013	3	6.3	-0.6	
GM-GIS-BA_ssGM_638	MH-GIS-BR_ssMH_1271	563.3	MH-GIS-BR_ssMH_1272	557.8	111.4	0.049	8	Glass	0.013	5	7.1	-0.6	
GM-GIS-BA_ssGM_639	MH-GIS-BR_ssMH_1272	557.8	MH-GIS-BR_ssMH_1273	544	227.8	0.061	8	Glass	0.013	23	15.4	-0.6	
GM-GIS-BA_ssGM_640	MH-GIS-BR_ssMH_1273	544	MH-GIS-BR_ssMH_1262	543.07	92.4	0.01	8	Glass	0.013	25	100	2.8	
GM-GIS-BA_ssGM_641	MH-GIS-BR_ssMH_1274	553.5	MH-GIS-BR_ssMH_1270	552.27	52.5	0.023	8	Glass	0.013	5	7.1	-0.6	
GM-GIS-BA_ssGM_646	MH-GIS-BA_ssMH_1930	789.51	MH-GIS-BA_ssMH_1942	788.17	202.8	0.007	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_647	MH-GIS-BA_ssMH_1919	830.9	MH-GIS-BA_ssMH_1923	831.44	93.5	-0.006	8	PVC	0.01	1	88.3	-0.1	
GM-GIS-BA_ssGM_648	MH-GIS-BA_ssMH_1925	830.88	MH-GIS-BA_ssMH_1924	830.07	46.9	0.017	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-BA_ssGM_649	MH-GIS-BA_ssMH_1926	768.21	MH-GIS-BA_ssMH_1927	766.81	90.4	0.015	8	PVC	0.01	53	23.4	-0.5	
GM-GIS-BA_ssGM_650	MH-GIS-BA_ssMH_1924	830.07	MH-GIS-BA_ssMH_1933	829.47	40.8	0.015	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-BA_ssGM_651	MH-GIS-BA_ssMH_1936	844	MH-GIS-BA_ssMH_1929	839.27	124	0.038	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-BA_ssGM_652	MH-GIS-BA_ssMH_1928	769.11	MH-GIS-BA_ssMH_1926	768.21	59.2	0.015	8	PVC	0.01	51	23.2	-0.5	
GM-GIS-BA_ssGM_653	MH-GIS-BA_ssMH_1931	809	MH-GIS-BA_ssMH_1940	804.21	206.8	0.023	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_654	MH-GIS-BA_ssMH_1941	821.69	MH-GIS-BA_ssMH_1939	818.4	207.3	0.016	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_655	MH-GIS-BA_ssMH_1932	824.81	MH-GIS-BA_ssMH_1939	818.4	116.8	0.055	8	PVC	0.01	21	14.5	-0.6	
GM-GIS-BA_ssGM_656	MH-GIS-BA_ssMH_1938	828.53	MH-GIS-BA_ssMH_1932	824.81	83.3	0.045	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-BA_ssGM_657	MH-GIS-BA_ssMH_1921	829	MH-GIS-BA_ssMH_1933	829.47	61.7	-0.008	8	PVC	0.01	1	80.2	-0.1	
GM-GIS-BA_ssGM_658	MH-GIS-BA_ssMH_1933	829.47	MH-GIS-BA_ssMH_1934	829	90.8	0.005	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-BA_ssGM_659	MH-GIS-BA_ssMH_1920	830.84	MH-GIS-BA_ssMH_1925	830.88	59.2	-7E-04	8	PVC	0.01	1	14.1	-0.6	
GM-GIS-BA_ssGM_660	MH-GIS-BA_ssMH_1918	843.65	MH-GIS-BA_ssMH_1922	842.94	39.7	0.018	8	PVC	0.01	1	65.2	-0.2	
GM-GIS-BA_ssGM_661	MH-GIS-BA_ssMH_1922	842.94	MH-GIS-BA_ssMH_1935	843.62	53.1	-0.013	8	PVC	0.01	3	100	0.5	
GM-GIS-BA_ssGM_662	MH-GIS-BA_ssMH_1940	804.21	MH-GIS-BA_ssMH_1942	788.17	247.1	0.065	8	PVC	0.01	26	16.3	-0.6	
GM-GIS-BA_ssGM_663	MH-GIS-BA_ssMH_1939	818.4	MH-GIS-BA_ssMH_1940	804.21	255.2	0.056	8	PVC	0.01	23	15.5	-0.6	
GM-GIS-BA_ssGM_664	MH-GIS-BA_ssMH_1937	832.81	MH-GIS-BA_ssMH_1938	828.53	82.4	0.052	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-BA_ssGM_665	MH-GIS-BA_ssMH_1934	829	MH-GIS-BA_ssMH_1938	828.53	113.6	0.004	8	PVC	0.01	10	10.4	-0.6	
GM-GIS-BA_ssGM_666	MH-GIS-BA_ssMH_1935	843.62	MH-GIS-BA_ssMH_1936	844	104.4	-0.004	8	PVC	0.01	4	69.7	-0.2	
GM-GIS-BA_ssGM_667	MH-GIS-BA_ssMH_1929	839.27	MH-GIS-BA_ssMH_1937	832.81	135.3	0.048	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-BA_ssGM_668	MH-GIS-BA_ssMH_1923	831.44	MH-GIS-BA_ssMH_1925	830.88	44.1	0.013	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BA_ssGM_669	MH-GIS-BA_ssMH_1942	788.17	MH-GIS-BA_ssMH_1943	785.61	60.7	0.042	8	PVC	0.01	28	17.1	-0.6	
GM-GIS-BA_ssGM_670	MH-GIS-BA_ssMH_1943	785.61	MH-GIS-BA_ssMH_1944	781.15	85.3	0.052	8	PVC	0.01	30	17.5	-0.5	
GM-GIS-BA_ssGM_671	MH-GIS-BA_ssMH_1944	781.15	MH-GIS-BA_ssMH_1945	769.62	120.7	0.096	8	PVC	0.01	31	17.9	-0.5	
GM-GIS-BA_ssGM_672	MH-GIS-BA_ssMH_1927	766.81	MH-GIS-BA_ssMH_1284	764.62	108.8	0.02	8	PVC	0.01	54	23.7	-0.5	
GM-GIS-BA_ssGM_673	MH-GIS-BA_ssMH_1945	769.62	MH-GIS-BA_ssMH_1928	769.11	70.6	0.007	8	PVC	0.01	50	22.9	-0.5	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-BP_ssGM_2	MH-GIS-BP_ssMH_1535	839.22	MH-GIS-BP_ssMH_1536	840.96	86.2	-0.02	8	PVC	0.01	3	100	1.1	
GM-GIS-BP_ssGM_3	MH-GIS-BP_ssMH_1536	840.96	MH-IS-53	830.15	89	0.122	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-BP_ssGM_4	MH-GIS-BP_ssMH_1534	855.03	MH-GIS-BP_ssMH_1535	839.22	259.3	0.061	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_5	MH-GIS-BP_ssMH_1537	828.7	MH-GIS-BP_ssMH_1538	830.07	85	-0.016	8	PVC	0.01	1	100	0.8	
GM-GIS-BP_ssGM_6	MH-GIS-BP_ssMH_1539	828.73	MH-GIS-BP_ssMH_1540	825.06	130.9	0.028	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_7	MH-GIS-BP_ssMH_1540	825.06	MH-IS-49	804.65	232	0.088	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_340	MH-GIS-BP_ssMH_1753	780.94	MH-IS-198	779.52	38.9	0.037	8	Ductile Iron	0.013	514	76.1	-0.2	
GM-GIS-BP_ssGM_341	MH-GIS-BP_ssMH_1538	830.07	MH-IS-58	819.51	38	0.278	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_342	MH-GIS-BP_ssMH_1737	845.7	MH-GIS-BP_ssMH_1738	838.64	302.4	0.023	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_345	MH-GIS-BP_ssMH_1741	809	MH-IS-50	797.44	95.4	0.121	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_347	MH-GIS-MH-44	791.82	MH-IS-MH-210	778.16	30	0.456	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_357(1)	MH-GIS-BP_ssMH_1738	838.64	MH-GIS-MH-90	835.24	264	0.013	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-BP_ssGM_357(2)	MH-GIS-MH-90	835.24	MH-IS-MH-5	825.27	73.1	0.136	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-BP_ssGM_359	MH-GIS-BP_ssMH_1755	801.95	MH-GIS-BP_ssMH_1758	796.09	160.6	0.036	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_360	MH-GIS-BP_ssMH_1754	788.61	MH-GIS-BP_ssMH_1753	780.94	210	0.037	8	Ductile Iron	0.013	513	76	-0.2	
GM-GIS-BP_ssGM_361	MH-GIS-BP_ssMH_1756	807.02	MH-GIS-BP_ssMH_1755	801.95	251.4	0.02	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_362	MH-GIS-BP_ssMH_1757	792.54	MH-GIS-BP_ssMH_1754	788.61	107.5	0.037	8	PVC	0.01	511	75.9	-0.2	
GM-GIS-BP_ssGM_363	MH-GIS-BP_ssMH_1758	796.09	MH-GIS-BP_ssMH_1757	792.54	146.8	0.024	8	PVC	0.01	510	75.8	-0.2	
GM-GIS-BP_ssGM_571	MH-GIS-MH-113	877.1	MH-IS-123	863.89	73.8	0.179	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_572	MH-GIS-MH-171	870.05	MH-IS-123	863.89	147.4	0.042	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_1083	MH-GIS-MH-89	836.77	MH-GIS-MH-90	835.24	56.1	0.027	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-BP_ssGM_1084	MH-GIS-BP_ssMH_2211	840.99	MH-GIS-MH-162	839	182.5	0.011	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_1085	MH-GIS-MH-162	839	MH-GIS-BP_ssMH_2210	838.36	135.2	0.005	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-BP_ssGM_1086	MH-GIS-BP_ssMH_2210	838.36	MH-GIS-BP_ssMH_2209	838.39	119.5	-3E-04	8	PVC	0.01	2	15.7	-0.6	
GM-GIS-BP_ssGM_1087	MH-GIS-BP_ssMH_2209	838.39	MH-GIS-MH-89	836.77	47.3	0.034	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-BP_ssGM_1283	MH-GIS-BP_ssMH_2352	835.22	MH-GIS-BP_ssMH_2354	825.07	150.8	0.067	8	PVC	0.01	206	47.5	-0.3	
GM-GIS-BP_ssGM_1284	MH-GIS-BP_ssMH_2354	825.07	MH-GIS-BP_ssMH_2353	824.9	43.2	0.004	8	PVC	0.01	440	80.1	-0.1	
GM-GIS-BP_ssGM_1298	MH-GIS-BP_ssMH_2362	814.43	MH-GIS-BP_ssMH_2361	808.69	309	0.019	8	PVC	0.01	504	75.4	-0.2	
GM-GIS-BP_ssGM_1299	MH-GIS-BP_ssMH_2353	824.9	MH-GIS-BP_ssMH_2362	814.43	168	0.062	8	PVC	0.01	503	75.3	-0.2	
GM-GIS-BP_ssGM_1300	MH-GIS-BP_ssMH_2361	808.69	MH-GIS-BP_ssMH_2363	800.67	342.5	0.023	8	PVC	0.01	505	75.5	-0.2	
GM-GIS-BP_ssGM_1301	MH-GIS-BP_ssMH_2363	800.67	MH-GIS-BP_ssMH_1758	796.09	385.8	0.012	8	PVC	0.01	506	75.6	-0.2	
GM-GIS-BP_ssGM_1458	MH-GIS-MH-70	809.18	MH-GIS-BP_ssMH_1741	809	44.2	0.004	8	PVC	0.01	1	3.9	-0.6	
GM-GIS-CO-22	MH-GIS-DY_ssMH_2561	721.57	Pump Station N6 Wetwell	717.14	10.7	0.415	8	Glass	0.013	18	13.5	-0.6	
GM-GIS-CO-126	MH-IS-GS_ssMH_1480	408.77	MH-IS-193	407.54	235	0.005	10	Concrete	0.013	245	40.5	-0.5	SM4
GM-GIS-CO_ssGM_109	MH-GIS-CO_ssMH_1372	904.88	MH-GIS-CO_ssMH_1428	902.68	138.3	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_110	MH-GIS-CO_ssMH_1428	902.68	MH-GIS-CO_ssMH_1427	902.11	85.1	0.007	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_111	MH-GIS-CO_ssMH_1371	905.28	MH-GIS-CO_ssMH_1427	902.11	193.4	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_113	MH-GIS-CO_ssMH_1426	899	MH-GIS-CO_ssMH_1419	896.39	127.3	0.021	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_114	MH-GIS-CO_ssMH_1425	904.06	MH-GIS-CO_ssMH_1426	899	134.1	0.038	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_115	MH-GIS-CO_ssMH_1423	887.13	MH-GIS-CO_ssMH_1424	884.92	121.8	0.018	8	PVC	0.01	33	18.5	-0.5	
GM-GIS-CO_ssGM_116	MH-GIS-CO_ssMH_1422	891.5	MH-GIS-CO_ssMH_1423	887.13	123.9	0.035	8	PVC	0.01	31	17.9	-0.5	
GM-GIS-CO_ssGM_117	MH-GIS-CO_ssMH_1429	894	MH-GIS-CO_ssMH_1422	891.5	153	0.016	8	PVC	0.01	29	17.2	-0.6	
GM-GIS-CO_ssGM_118	MH-GIS-CO_ssMH_1421	894	MH-GIS-CO_ssMH_1429	894	82.7	0	8	PVC	0.01	18	25.8	-0.5	
GM-GIS-CO_ssGM_119	MH-GIS-CO_ssMH_1420	896.71	MH-GIS-CO_ssMH_1421	894	96.8	0.028	8	PVC	0.01	15	12.6	-0.6	
GM-GIS-CO_ssGM_120	MH-GIS-CO_ssMH_1419	896.39	MH-GIS-CO_ssMH_1420	896.71	68.2	-0.005	8	PVC	0.01	13	66.8	-0.2	
GM-GIS-CO_ssGM_121	MH-GIS-CO_ssMH_1418	899.03	MH-GIS-CO_ssMH_1419	896.39	177	0.015	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-CO_ssGM_122	MH-GIS-CO_ssMH_1417	899.91	MH-GIS-CO_ssMH_1418	899.03	45.7	0.019	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_123	MH-GIS-CO_ssMH_1416	902.07	MH-GIS-CO_ssMH_1417	899.91	129.1	0.017	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_157	MH-GIS-CO_ssMH_1395	851.41	MH-GIS-SC_ssMH_1409	837.73	140.2	0.098	8	PVC	0.01	38	19.7	-0.5	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CO_ssGM_161	MH-GIS-CO_ssMH_1427	902.11	MH-GIS-CO_ssMH_1429	894	234.2	0.035	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-CO_ssGM_170	MH-GIS-CO_ssMH_1424	884.92	MH-GIS-CO_ssMH_1395	851.41	229.8	0.146	8	PVC	0.01	35	19.1	-0.5	
GM-GIS-CO_ssGM_453	MH-GIS-CO_ssMH_1820	903.4	MH-GIS-CO_ssMH_1831	899	138.2	0.032	8	Ductile Iron	0.013	6	8.1	-0.6	
GM-GIS-CO_ssGM_454	MH-GIS-CO_ssMH_1821	909	MH-GIS-CO_ssMH_1820	903.4	227.7	0.025	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-CO_ssGM_455	MH-GIS-CO_ssMH_1822	900.21	MH-GIS-CO_ssMH_1831	899	115.9	0.01	8	Ductile Iron	0.013	12	11.1	-0.6	
GM-GIS-CO_ssGM_456	MH-GIS-CO_ssMH_1830	902.92	MH-GIS-CO_ssMH_1822	900.21	132	0.021	8	PVC	0.01	11	10.7	-0.6	
GM-GIS-CO_ssGM_457	MH-GIS-CO_ssMH_1823	899	MH-GIS-CO_ssMH_1829	901.61	169.9	-0.015	8	PVC	0.01	1	100	3.4	
GM-GIS-CO_ssGM_458	MH-GIS-CO_ssMH_1824	905.92	MH-GIS-CO_ssMH_1832	907.32	89	-0.016	8	PVC	0.01	2	100	0.8	
GM-GIS-CO_ssGM_459	MH-GIS-CO_ssMH_1825	905.89	MH-GIS-CO_ssMH_1830	902.92	282	0.011	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-CO_ssGM_460	MH-GIS-CO_ssMH_1832	907.32	MH-GIS-CO_ssMH_1825	905.89	145.1	0.01	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-CO_ssGM_461	MH-GIS-CO_ssMH_1826	901.33	MH-GIS-CO_ssMH_1827	901.05	166.8	0.002	8	PVC	0.01	1	100	1	
GM-GIS-CO_ssGM_462	MH-GIS-CO_ssMH_1836	902.92	MH-GIS-CO_ssMH_1828	901.53	175.2	0.008	8	PVC	0.01	3	16.1	-0.6	
GM-GIS-CO_ssGM_463	MH-GIS-MH-163	905.76	MH-GIS-CO_ssMH_1827	901.05	138	0.034	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-CO_ssGM_464	MH-GIS-CO_ssMH_1828	901.53	MH-GIS-CO_ssMH_1829	901.61	126.4	-6E-04	8	PVC	0.01	5	100	0.8	
GM-GIS-CO_ssGM_465	MH-GIS-MH-169	904.03	MH-GIS-CO_ssMH_1828	901.53	147	0.017	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-CO_ssGM_466	MH-GIS-CO_ssMH_1829	901.61	MH-GIS-CO_ssMH_1830	902.92	210.1	-0.006	8	PVC	0.01	6	100	0.8	
GM-GIS-CO_ssGM_467	MH-GIS-CO_ssMH_1831	899	MH-IS-69	876.77	261.2	0.085	8	Ductile Iron	0.013	19	14.1	-0.6	
GM-GIS-CO_ssGM_468	MH-GIS-MH-182	905.23	MH-GIS-CO_ssMH_1833	907.18	156.4	-0.012	8	PVC	0.01	1	100	1.5	
GM-GIS-CO_ssGM_469	MH-GIS-CO_ssMH_1835	909	MH-GIS-CO_ssMH_1821	909	149.3	0	8	PVC	0.01	1	9.1	-0.6	
GM-GIS-CO_ssGM_470	MH-GIS-CO_ssMH_1834	908.47	MH-GIS-CO_ssMH_1818	908.92	68.1	-0.007	8	PVC	0.01	2	95.3	0	
GM-GIS-CO_ssGM_471	MH-GIS-MH-192	905.9	MH-GIS-CO_ssMH_1834	908.47	163.1	-0.016	8	PVC	0.01	1	100	2.5	
GM-GIS-CO_ssGM_472	MH-GIS-CO_ssMH_1833	907.18	MH-GIS-CO_ssMH_1824	905.92	93.4	0.013	8	PVC	0.01	2	31.4	-0.5	
GM-GIS-CO_ssGM_473	MH-GIS-CO_ssMH_1827	901.05	MH-GIS-CO_ssMH_1836	902.92	42	-0.045	8	PVC	0.01	2	100	1.3	
GM-GIS-CO_ssGM_1050	MH-GIS-CO_ssMH_1819	909	MH-GIS-CO_ssMH_1821	909	93.9	0	8	PVC	0.01	4	15	-0.6	
GM-GIS-CO_ssGM_1051	MH-GIS-CO_ssMH_1818	908.92	MH-GIS-CO_ssMH_1819	909	146.6	-6E-04	8	PVC	0.01	3	27.8	-0.5	
GM-GIS-CO_ssGM_1052	MH-GIS-CO_ssMH_1817	909	MH-GIS-CO_ssMH_1818	908.92	112.5	7E-04	8	PVC	0.01	1	15.8	-0.6	
GM-GIS-CR_ssGM_1194	MH-GIS-DP_ssMH_2281	901.58	MH-GIS-DP_ssMH_2302	898.53	183.1	0.017	8	PVC	0.01	221	49.3	-0.3	
GM-GIS-CR_ssGM_1250	MH-GIS-CR_ssMH_2568	970.75	MH-GIS-CR_ssMH_2321	968.83	67	0.029	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-CR_ssGM_1251	MH-GIS-MH-167	916.76	MH-GIS-DP_ssMH_2281	901.58	141.9	0.107	8	PVC	0.01	220	49.1	-0.3	
GM-GIS-CR_ssGM_1252	MH-GIS-DP_ssMH_2328	919	MH-GIS-MH-167	916.76	57.8	0.039	8	PVC	0.01	219	49	-0.3	
GM-GIS-CR_ssGM_1254	MH-GIS-CR_ssMH_2323	955.99	MH-GIS-CR_ssMH_2330	955.7	161.5	0.002	8	PVC	0.01	168	53.6	-0.3	
GM-GIS-CR_ssGM_1256	MH-GIS-CR_ssMH_2331	979.07	MH-GIS-CR_ssMH_2321	968.83	146.8	0.07	8	PVC	0.01	111	34.4	-0.4	
GM-GIS-CR_ssGM_1258	MH-GIS-CR_ssMH_2321	968.83	MH-GIS-CR_ssMH_2332	960.9	145.9	0.054	8	PVC	0.01	164	42.2	-0.4	
GM-GIS-CR_ssGM_1259	MH-GIS-CR_ssMH_2332	960.9	MH-GIS-CR_ssMH_2333	955.94	143.9	0.034	8	PVC	0.01	165	42.3	-0.4	
GM-GIS-CR_ssGM_1260	MH-GIS-CR_ssMH_2333	955.94	MH-GIS-CR_ssMH_2323	955.99	126.1	-4E-04	8	PVC	0.01	167	82.8	-0.1	
GM-GIS-CR_ssGM_1261	MH-GIS-DP_ssMH_2335	934.79	MH-GIS-DP_ssMH_2336	925.87	60.5	0.147	8	PVC	0.01	216	48.7	-0.3	
GM-GIS-CR_ssGM_1262	MH-GIS-DP_ssMH_2336	925.87	MH-GIS-DP_ssMH_2328	919	152.7	0.045	8	PVC	0.01	217	48.8	-0.3	
GM-GIS-CR_ssGM_1263	MH-GIS-CR_ssMH_2334	943.18	MH-GIS-DP_ssMH_2335	934.79	90.3	0.093	8	PVC	0.01	215	48.5	-0.3	
GM-GIS-CR_ssGM_1267	MH-GIS-CR_ssMH_2337	958.27	MH-GIS-CR_ssMH_2338	941.9	203	0.081	8	PVC	0.01	41	20.5	-0.5	
GM-GIS-CR_ssGM_1268	MH-GIS-CR_ssMH_2379	970.91	MH-GIS-CR_ssMH_2337	958.27	101.6	0.124	8	PVC	0.01	33	18.5	-0.5	
GM-GIS-CR_ssGM_1269	MH-GIS-CR_ssMH_2338	941.9	MH-GIS-CR_ssMH_2339	940.05	67.1	0.028	8	PVC	0.01	42	100	1	
GM-GIS-CR_ssGM_1270	MH-GIS-CR_ssMH_2339	940.05	MH-GIS-CR_ssMH_2334	943.18	174.8	-0.018	8	PVC	0.01	43	100	2.8	
GM-GIS-CR_ssGM_1271	MH-GIS-CR_ssMH_2330	955.7	MH-GIS-CR_ssMH_2340	948.55	204.8	0.035	8	PVC	0.01	169	42.8	-0.4	
GM-GIS-CR_ssGM_1272	MH-GIS-CR_ssMH_2340	948.55	MH-GIS-CR_ssMH_2334	943.18	94.8	0.057	8	PVC	0.01	170	43	-0.4	
GM-GIS-CR_ssGM_1877	MH-GIS-CR_ssMH_2978	979.6	MH-GIS-CR_ssMH_2568	970.75	77	0.115	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-CR_ssGM_1878	MH-GIS-CR_ssMH_2979	986.08	MH-GIS-CR_ssMH_2978	979.6	75.6	0.086	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-CR_ssGM_1879	MH-GIS-CR_ssMH_2980	990.89	MH-GIS-CR_ssMH_2979	986.08	75.7	0.064	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CR_ssGM_1880	MH-GIS-CR_ssMH_2990	959.4	MH-GIS-CR_ssMH_2337	958.27	55.5	0.02	8	PVC	0.01	6	8	-0.6	
GM-GIS-CR_ssGM_1881	MH-GIS-CR_ssMH_2981	978.58	MH-GIS-CR_ssMH_2990	959.4	249.3	0.077	8	PVC	0.01	5	7.2	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CR_ssGM_1882	MH-GIS-CR_ssMH_2984	988.74	MH-GIS-CR_ssMH_2982	983.25	226.8	0.024	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-CR_ssGM_1883	MH-GIS-CR_ssMH_2982	983.25	MH-GIS-CR_ssMH_2981	978.58	126.4	0.037	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-CR_ssGM_1884	MH-GIS-CR_ssMH_2983	991.74	MH-GIS-CR_ssMH_2984	988.74	86.3	0.035	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_8	MH-GIS-CT_ssMH_1278	749.62	MH-GIS-MH-36	749.5	23.3	0.005	8	PVC	0.01	81	29.3	-0.5	
GM-GIS-CT_ssGM_9	MH-GIS-MH-93	762.41	MH-GIS-CT_ssMH_1293	750.54	60.1	0.198	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_10	MH-GIS-CT_ssMH_1293	750.54	MH-GIS-CT_ssMH_1277	750.19	56	0.006	8	PVC	0.01	79	28.8	-0.5	
GM-GIS-CT_ssGM_11	MH-GIS-CT_ssMH_1277	750.19	MH-GIS-CT_ssMH_1278	749.62	46.1	0.012	8	PVC	0.01	80	29	-0.5	
GM-GIS-CT_ssGM_12	MH-GIS-CT_ssMH_1291	754.92	MH-GIS-CT_ssMH_1276	754.24	87.6	0.008	8	PVC	0.01	66	26.2	-0.5	
GM-GIS-CT_ssGM_13	MH-GIS-CT_ssMH_1276	754.24	MH-GIS-CT_ssMH_1294	752.33	82.1	0.023	8	PVC	0.01	67	26.5	-0.5	
GM-GIS-CT_ssGM_14	MH-GIS-CT_ssMH_1286	762.24	MH-GIS-CT_ssMH_1287	761.05	151.9	0.008	8	PVC	0.01	58	24.6	-0.5	
GM-GIS-CT_ssGM_15	MH-GIS-MH-116	765.96	MH-GIS-CT_ssMH_1290	756.86	76.6	0.119	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_16	MH-GIS-CT_ssMH_1280	764	MH-GIS-CT_ssMH_1279	763.04	73.8	0.013	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-CT_ssGM_17	MH-GIS-CT_ssMH_1283	769	MH-GIS-CT_ssMH_1282	767.57	230.3	0.006	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_18	MH-GIS-BA_ssMH_1284	764.62	MH-GIS-CT_ssMH_1285	762.94	157.8	0.011	8	PVC	0.01	55	24	-0.5	
GM-GIS-CT_ssGM_19	MH-GIS-CT_ssMH_1290	756.86	MH-GIS-CT_ssMH_1291	754.92	253.1	0.008	8	PVC	0.01	64	26	-0.5	
GM-GIS-CT_ssGM_20	MH-GIS-CT_ssMH_1292	751.73	MH-GIS-CT_ssMH_1293	750.54	197.8	0.006	8	PVC	0.01	76	28.3	-0.5	
GM-GIS-CT_ssGM_21	MH-GIS-CT_ssMH_1294	752.33	MH-GIS-CT_ssMH_1292	751.73	108.9	0.006	8	PVC	0.01	75	28	-0.5	
GM-GIS-CT_ssGM_22	MH-GIS-CT_ssMH_1289	758.1	MH-GIS-CT_ssMH_1290	756.86	167.8	0.007	8	PVC	0.01	62	25.5	-0.5	
GM-GIS-CT_ssGM_23	MH-GIS-CT_ssMH_1288	760.29	MH-GIS-CT_ssMH_1289	758.1	295.1	0.007	8	PVC	0.01	61	25.2	-0.5	
GM-GIS-CT_ssGM_24	MH-GIS-CT_ssMH_1287	761.05	MH-GIS-CT_ssMH_1288	760.29	80	0.01	8	PVC	0.01	59	24.9	-0.5	
GM-GIS-CT_ssGM_25	MH-GIS-CT_ssMH_1285	762.94	MH-GIS-CT_ssMH_1286	762.24	72.1	0.01	8	PVC	0.01	57	24.3	-0.5	
GM-GIS-CT_ssGM_26	MH-GIS-CT_ssMH_1282	767.57	MH-GIS-CT_ssMH_1281	766.46	218.9	0.005	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-CT_ssGM_27	MH-GIS-CT_ssMH_1279	763.04	MH-GIS-CT_ssMH_1294	752.33	59.9	0.179	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-CT_ssGM_28	MH-GIS-CT_ssMH_1281	766.46	MH-GIS-CT_ssMH_1280	764	307.2	0.008	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-CT_ssGM_246	MH-GIS-CT_ssMH_1692	756.63	MH-GIS-MH-77	756.31	49.4	0.006	8	PVC	0.01	54	23.8	-0.5	
GM-GIS-CT_ssGM_247	MH-GIS-CT_ssMH_1693	768.42	MH-GIS-CT_ssMH_1692	756.63	202.7	0.058	8	PVC	0.01	53	23.5	-0.5	
GM-GIS-CT_ssGM_248	MH-GIS-GC_ssMH_1622	773.42	MH-GIS-CT_ssMH_1693	768.42	112.9	0.044	8	Ductile Iron	0.013	52	23.3	-0.5	
GM-GIS-CV_ssGM_201	MH-GIS-CV_ssMH_1587	788.2	MH-GIS-CV_ssMH_1586	779.6	113.2	0.076	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-CV_ssGM_202	MH-GIS-CV_ssMH_1586	779.6	MH-GIS-CV_ssMH_1585	771.51	125.8	0.064	8	PVC	0.01	26	16.3	-0.6	
GM-GIS-CV_ssGM_203	MH-GIS-CV_ssMH_1585	771.51	MH-GIS-CV_ssMH_1584	767.13	180.4	0.024	8	PVC	0.01	27	100	1	
GM-GIS-CV_ssGM_204	MH-GIS-CV_ssMH_1584	767.13	MH-GIS-GC_ssMH_1590	769.6	299	-0.008	8	PVC	0.01	28	100	5.8	
GM-GIS-CV_ssGM_211	MH-GIS-GC_ssMH_1588	794	MH-GIS-CV_ssMH_1587	788.2	176.7	0.033	8	PVC	0.01	23	15.5	-0.6	
GM-GIS-CV_ssGM_212	MH-GIS-CV_ssMH_1598	859.22	MH-GIS-CV_ssMH_1597	850.39	107.1	0.082	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_242	MH-GIS-CV_ssMH_1625	716.37	PSFWW	704	24.3	0.509	8	PVC	0.01	47	22.1	-0.5	
GM-GIS-CV_ssGM_495	MH-GIS-MH-100	732.8	MH-GIS-CV_ssMH_1698	728.76	63.2	0.064	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_496	MH-GIS-CV_ssMH_1699	725.63	MH-GIS-CV_ssMH_1698	728.76	107.6	-0.029	8	PVC	0.01	42	100	2.7	
GM-GIS-CV_ssGM_497	MH-GIS-CV_ssMH_1700	727.16	MH-GIS-CV_ssMH_1699	725.63	103.1	0.015	8	PVC	0.01	40	100	1.2	
GM-GIS-CV_ssGM_498	MH-GIS-CV_ssMH_1701	730.39	MH-GIS-CV_ssMH_1700	727.16	103.7	0.031	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-CV_ssGM_499	MH-GIS-CV_ssMH_1703	742.7	MH-GIS-CV_ssMH_1701	730.39	195.6	0.063	8	PVC	0.01	38	19.8	-0.5	
GM-GIS-CV_ssGM_500	MH-GIS-CV_ssMH_1702	749	MH-GIS-CV_ssMH_1703	742.7	156.5	0.04	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-CV_ssGM_501	MH-GIS-MH-121	752.94	MH-GIS-CV_ssMH_1702	749	81.1	0.049	6	PVC	0.01	1	5.2	-0.5	
GM-GIS-CV_ssGM_502	MH-GIS-CV_ssMH_1705	756.4	MH-GIS-CV_ssMH_1703	742.7	194.6	0.07	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-CV_ssGM_503	MH-GIS-CV_ssMH_1706	767.27	MH-GIS-CV_ssMH_1705	756.4	173.7	0.063	8	Ductile Iron	0.013	33	18.3	-0.5	
GM-GIS-CV_ssGM_504	MH-GIS-CV_ssMH_1707	771.95	MH-GIS-CV_ssMH_1706	767.27	87.8	0.053	8	Ductile Iron	0.013	31	18	-0.5	
GM-GIS-CV_ssGM_505	MH-GIS-CV_ssMH_1704	775.43	MH-GIS-CV_ssMH_1707	771.95	104.4	0.033	8	Ductile Iron	0.013	22	15.1	-0.6	
GM-GIS-CV_ssGM_506	MH-GIS-CV_ssMH_1708	782.07	MH-GIS-CV_ssMH_1704	775.43	102.6	0.065	8	PVC	0.01	21	14.6	-0.6	
GM-GIS-CV_ssGM_507	MH-GIS-CV_ssMH_1711	787.91	MH-GIS-CV_ssMH_1708	782.07	102.2	0.057	8	PVC	0.01	20	14.2	-0.6	
GM-GIS-CV_ssGM_508	MH-GIS-CV_ssMH_1712	795.98	MH-GIS-CV_ssMH_1711	787.91	120.3	0.067	8	Ductile Iron	0.013	18	13.7	-0.6	
GM-GIS-CV_ssGM_509	MH-GIS-CV_ssMH_1715	794	MH-GIS-CV_ssMH_1712	795.98	101.7	-0.019	8	PVC	0.01	4	100	1.4	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CV_ssGM_510	MH-GIS-CV_ssMH_1717	794	MH-GIS-CV_ssMH_1715	794	54.3	0	8	PVC	0.01	3	100	1.4	
GM-GIS-CV_ssGM_511	MH-GIS-CV_ssMH_1718	803.09	MH-GIS-CV_ssMH_1717	794	134.8	0.067	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_512	MH-GIS-CV_ssMH_1721	804.66	MH-GIS-CV_ssMH_1720	794.25	68.3	0.152	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-CV_ssGM_513	MH-GIS-CV_ssMH_1709	772.62	MH-GIS-CV_ssMH_1707	771.95	70.4	0.01	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_514	MH-GIS-CV_ssMH_1720	794.25	MH-GIS-CV_ssMH_1719	779	182.9	0.083	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-CV_ssGM_515	MH-GIS-CV_ssMH_1719	779	MH-GIS-CV_ssMH_1710	774	207.8	0.024	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CV_ssGM_516	MH-GIS-CV_ssMH_1710	774	MH-GIS-CV_ssMH_1709	772.62	179.2	0.008	8	PVC	0.01	7	8.1	-0.6	
GM-GIS-CV_ssGM_517	MH-GIS-CV_ssMH_1731	826.6	MH-GIS-CV_ssMH_1729	831.01	260.2	-0.017	8	Ductile Iron	0.013	4	100	3.9	
GM-GIS-CV_ssGM_518	MH-GIS-MH-128	831.4	MH-GIS-CV_ssMH_1732	827.91	86.2	0.04	8	Ductile Iron	0.013	1	3.6	-0.6	
GM-GIS-CV_ssGM_519	MH-GIS-CV_ssMH_1728	825.39	MH-GIS-GC_ssMH_1591	822.34	141.2	0.022	8	Ductile Iron	0.013	9	9.5	-0.6	
GM-GIS-CV_ssGM_520	MH-GIS-CV_ssMH_1727	827.49	MH-GIS-CV_ssMH_1728	825.39	235.2	0.009	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_521	MH-GIS-CV_ssMH_1726	828.67	MH-GIS-CV_ssMH_1727	827.49	192.3	0.006	8	Ductile Iron	0.013	6	8.6	-0.6	
GM-GIS-CV_ssGM_522	MH-GIS-CV_ssMH_1725	824	MH-GIS-CV_ssMH_1726	828.67	189.6	-0.025	8	Ductile Iron	0.013	5	100	4.1	
GM-GIS-CV_ssGM_523	MH-GIS-CV_ssMH_1724	830.43	MH-GIS-CV_ssMH_1725	824	159.8	0.04	8	Ductile Iron	0.013	4	6.3	-0.6	
GM-GIS-CV_ssGM_524	MH-GIS-CV_ssMH_1723	837.84	MH-GIS-CV_ssMH_1724	830.43	357.5	0.021	8	Ductile Iron	0.013	3	5.1	-0.6	
GM-GIS-CV_ssGM_525	MH-GIS-CV_ssMH_1730	842.76	MH-GIS-CV_ssMH_1723	837.84	248.5	0.02	8	Ductile Iron	0.013	1	3.6	-0.6	
GM-GIS-CV_ssGM_526	MH-GIS-CV_ssMH_1732	827.91	MH-GIS-CV_ssMH_1731	826.6	95.1	0.014	8	Ductile Iron	0.013	3	100	2.5	
GM-GIS-CV_ssGM_527	MH-GIS-MH-139	808.6	MH-GIS-CV_ssMH_1721	804.66	100.2	0.039	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_528	MH-GIS-CV_ssMH_1597	850.39	MH-GIS-CV_ssMH_1729	831.01	193.6	0.1	8	Ductile Iron	0.013	3	5.1	-0.6	
GM-GIS-CV_ssGM_529	MH-GIS-CV_ssMH_1697	722.01	MH-GIS-CV_ssMH_1625	716.37	75.2	0.075	8	PVC	0.01	46	21.8	-0.5	
GM-GIS-CV_ssGM_530	MH-GIS-CV_ssMH_1698	728.76	MH-GIS-CV_ssMH_1697	722.01	216.6	0.031	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-CV_ssGM_1043	MH-GIS-CV_ssMH_1722	826.36	MH-GIS-CV_ssMH_1716	812.89	206.2	0.065	8	Ductile Iron	0.013	9	9.6	-0.6	
GM-GIS-CV_ssGM_1044	MH-GIS-CV_ssMH_1729	831.01	MH-GIS-CV_ssMH_1722	826.36	250.8	0.019	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_1045	MH-GIS-CV_ssMH_1714	807.44	MH-GIS-CV_ssMH_1713	802.34	86.6	0.059	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-CV_ssGM_1046	MH-GIS-CV_ssMH_1713	802.34	MH-GIS-CV_ssMH_1712	795.98	110.1	0.058	8	PVC	0.01	13	11.5	-0.6	
GM-GIS-CV_ssGM_1047	MH-GIS-CV_ssMH_1716	812.89	MH-GIS-CV_ssMH_1714	807.44	87.8	0.062	8	PVC	0.01	10	10.3	-0.6	
GM-GIS-CV_ssGM_1053	MH-GIS-GC_ssMH_1590	769.6	MH-GIS-GC_ssMH_1622	773.42	80	-0.048	8	PVC	0.01	30	100	3.3	
GM-GIS-DH_ssGM_199	MH-GIS-DH_ssMH_1602	809.49	MH-GIS-DH_ssMH_1627	802	228.7	0.033	8	PVC	0.01	19	13.9	-0.6	
GM-GIS-DH_ssGM_200	MH-GIS-MU_ssMH_1805	809.96	MH-GIS-DH_ssMH_1602	809.49	80.7	0.006	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-DH_ssGM_213	MH-GIS-MH-30	818.72	MH-GIS-DH_ssMH_1621	814.69	19.2	0.21	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_214	MH-GIS-DH_ssMH_1601	841.46	MH-GIS-DH_ssMH_1772	828	136.4	0.099	8	PVC	0.01	27	16.8	-0.6	
GM-GIS-DH_ssGM_221	MH-GIS-DH_ssMH_1855	841	MH-GIS-DH_ssMH_1601	841.46	130.8	-0.004	8	PVC	0.01	18	91.8	-0.1	
GM-GIS-DH_ssGM_243	MH-GIS-DH_ssMH_1627	801.7	PSK3-WW	801.5	54.7	0.004	10	PVC	0.01	67	19.9	-0.7	
GM-GIS-DH_ssGM_244	MH-GIS-DH_ssMH_1772	828	MH-GIS-DH_ssMH_1621	814.69	112.1	0.119	8	PVC	0.01	31	17.9	-0.5	
GM-GIS-DH_ssGM_245	MH-GIS-DH_ssMH_1621	814.69	PSK3-WW	793	133.3	0.163	8	PVC	0.01	32	18.3	-0.5	
GM-GIS-DH_ssGM_264	MH-GIS-DH_ssMH_1643	907.41	MH-GIS-DH_ssMH_1642	904	206	0.017	8	PVC	0.01	11	10.7	-0.6	
GM-GIS-DH_ssGM_265	MH-GIS-DH_ssMH_1631	907.59	MH-GIS-DH_ssMH_1633	902.33	166.9	0.032	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-DH_ssGM_266	MH-GIS-DH_ssMH_1630	907.74	MH-GIS-DH_ssMH_1631	907.59	187.5	8E-04	8	PVC	0.01	2	7.8	-0.6	
GM-GIS-DH_ssGM_267	MH-GIS-DH_ssMH_1629	909	MH-GIS-DH_ssMH_1630	907.74	107.7	0.012	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_268	MH-GIS-MH-149	912.36	MH-GIS-DH_ssMH_1640	911.41	115.9	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_269	MH-GIS-DH_ssMH_1640	911.41	MH-GIS-DH_ssMH_1641	907.27	320.9	0.013	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_270	MH-GIS-DH_ssMH_1650	912.29	MH-GIS-DH_ssMH_1644	908.13	203.6	0.02	8	PVC	0.01	7	8.6	-0.6	
GM-GIS-DH_ssGM_271	MH-GIS-DH_ssMH_1633	902.33	MH-GIS-DH_ssMH_1634	900.81	32.8	0.046	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-DH_ssGM_272	MH-GIS-MH-193	912.64	MH-GIS-DH_ssMH_1632	903.43	164.7	0.056	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_273	MH-GIS-DH_ssMH_1645	916.73	MH-GIS-DH_ssMH_1646	917.3	159.3	-0.004	8	PVC	0.01	1	100	0.5	
GM-GIS-DH_ssGM_274	MH-GIS-DH_ssMH_1646	917.3	MH-GIS-DH_ssMH_1647	917.68	140.8	-0.003	8	PVC	0.01	2	86.9	-0.1	
GM-GIS-DH_ssGM_275	MH-GIS-DH_ssMH_1647	917.68	MH-GIS-DH_ssMH_1648	917.81	84.7	-0.002	8	PVC	0.01	2	29.9	-0.5	
GM-GIS-DH_ssGM_276	MH-GIS-DH_ssMH_1648	917.81	MH-GIS-DH_ssMH_1649	914	274.8	0.014	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-DH_ssGM_277	MH-GIS-DH_ssMH_1651	917.06	MH-GIS-DH_ssMH_1650	912.29	201.9	0.024	8	PVC	0.01	2	4.9	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DH_ssGM_278	MH-GIS-DH_ssMH_1652	919	MH-GIS-DH_ssMH_1651	917.06	205.7	0.009	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_279	MH-GIS-DH_ssMH_1653	919	MH-GIS-DH_ssMH_1652	919	268.8	0	8	PVC	0.01	1	9.6	-0.6	
GM-GIS-DH_ssGM_280	MH-GIS-DH_ssMH_1635	884.99	MH-GIS-DH_ssMH_1636	887.23	38.1	-0.059	8	PVC	0.01	7	100	7	
GM-GIS-DH_ssGM_281	MH-GIS-DH_ssMH_1634	900.81	MH-GIS-DH_ssMH_1635	884.99	141.7	0.112	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-DH_ssGM_282	MH-GIS-DH_ssMH_1636	887.23	MH-GIS-DH_ssMH_1637	888.71	122.6	-0.012	8	PVC	0.01	8	100	4.8	
GM-GIS-DH_ssGM_283	MH-GIS-DH_ssMH_1637	888.71	MH-GIS-DH_ssMH_1638	888.98	222	-0.001	8	PVC	0.01	9	100	3.3	
GM-GIS-DH_ssGM_284	MH-GIS-DH_ssMH_1638	888.98	MH-GIS-DH_ssMH_1639	892.53	204.7	-0.017	8	PVC	0.01	10	100	3	
GM-GIS-DH_ssGM_285	MH-GIS-DH_ssMH_1639	892.53	MH-GIS-DH_ssMH_1310	888.97	106.7	0.033	8	PVC	0.01	11	10.3	-0.6	
GM-GIS-DH_ssGM_286	MH-GIS-DH_ssMH_1633	902.33	MH-GIS-DH_ssMH_1632	903.43	21.1	0.052	8	PVC	0.01	2	4.1	0.5	
GM-GIS-DH_ssGM_287	MH-GIS-MH-148	911.26	MH-GIS-DH_ssMH_1629	909	114.6	0.02	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_288	MH-GIS-DH_ssMH_1641	907.27	MH-GIS-DH_ssMH_1643	907.41	221.6	-6E-04	8	PVC	0.01	2	33	-0.4	
GM-GIS-DH_ssGM_289	MH-GIS-DH_ssMH_1649	914	MH-GIS-DH_ssMH_1650	912.29	85.4	0.02	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-DH_ssGM_290	MH-GIS-DH_ssMH_1644	908.13	MH-GIS-DH_ssMH_1643	907.41	104.9	0.007	8	PVC	0.01	8	9	-0.6	
GM-GIS-DH_ssGM_381	MH-GIS-DH_ssMH_1773	832.79	MH-GIS-DH_ssMH_1772	828	28.2	0.17	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-DH_ssGM_383	MH-GIS-DH_ssMH_1796	867.52	MH-GIS-DH_ssMH_1775	858.76	181.9	0.048	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_384	MH-GIS-DH_ssMH_1775	858.76	MH-GIS-DH_ssMH_1795	855.63	126.9	0.025	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_385	MH-GIS-DH_ssMH_1795	855.63	MH-GIS-DH_ssMH_1777	854	91.2	0.018	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_386	MH-GIS-DH_ssMH_1777	854	MH-GIS-DH_ssMH_1776	854	98.8	0	8	PVC	0.01	3	23.4	-0.5	
GM-GIS-DH_ssGM_387	MH-GIS-DH_ssMH_1776	854	MH-GIS-DH_ssMH_1774	854	94.5	0	8	PVC	0.01	4	23.2	-0.5	
GM-GIS-DH_ssGM_388	MH-GIS-DH_ssMH_1774	854	MH-GIS-DH_ssMH_1794	854.06	44.9	-0.001	8	PVC	0.01	4	22.9	-0.5	
GM-GIS-DH_ssGM_389	MH-GIS-DH_ssMH_1778	857.96	MH-GIS-DH_ssMH_1794	854.06	158.5	0.025	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_390	MH-GIS-DH_ssMH_1782	858.36	MH-GIS-DH_ssMH_1778	857.96	122.3	0.003	8	PVC	0.01	1	4.3	-0.6	
GM-GIS-DH_ssGM_391	MH-GIS-DH_ssMH_1780	878.22	MH-GIS-DH_ssMH_1779	874.82	183.8	0.018	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-DH_ssGM_392	MH-GIS-DH_ssMH_1784	879	MH-GIS-DH_ssMH_1780	878.22	103.4	0.008	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-DH_ssGM_393	MH-GIS-DH_ssMH_1781	875.18	MH-GIS-DH_ssMH_1780	878.22	126	-0.024	8	PVC	0.01	2	100	2.4	
GM-GIS-DH_ssGM_394	MH-GIS-DH_ssMH_1788	874	MH-GIS-DH_ssMH_1781	875.18	101.8	-0.012	8	PVC	0.01	1	100	3.6	
GM-GIS-DH_ssGM_395	MH-GIS-DH_ssMH_1779	874.82	MH-GIS-DH_ssMH_1783	862.01	106.7	0.12	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-DH_ssGM_396	MH-GIS-DH_ssMH_1783	862.01	MH-GIS-DH_ssMH_1794	854.06	159.3	0.05	8	PVC	0.01	9	9.7	-0.6	
GM-GIS-DH_ssGM_397	MH-GIS-DH_ssMH_1786	902.52	MH-GIS-DH_ssMH_1785	896.55	131	0.046	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_398	MH-GIS-DH_ssMH_1785	896.55	MH-GIS-DH_ssMH_1784	879	213.2	0.082	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_399	MH-GIS-DH_ssMH_1787	912.62	MH-GIS-DH_ssMH_1786	902.52	116.9	0.086	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_400	MH-GIS-DH_ssMH_1790	872.4	MH-GIS-DH_ssMH_1788	874	77.4	-0.021	8	PVC	0.01	1	100	5.2	
GM-GIS-DH_ssGM_401	MH-GIS-DH_ssMH_1789	879	MH-GIS-DH_ssMH_1780	878.22	160.3	0.005	8	PVC	0.01	2	4.8	-0.6	
GM-GIS-DH_ssGM_402	MH-GIS-DH_ssMH_1791	880.21	MH-GIS-DH_ssMH_1789	879	193.5	0.006	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_403	MH-GIS-DH_ssMH_1792	888.54	MH-GIS-DH_ssMH_1791	880.21	144.5	0.058	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_404	MH-GIS-DH_ssMH_1793	860.37	MH-GIS-DH_ssMH_1782	858.36	108.8	0.018	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_405	MH-GIS-DH_ssMH_1794	854.06	MH-GIS-DH_ssMH_1854	847.07	184	0.038	8	PVC	0.01	17	13	-0.6	
GM-GIS-DH_ssGM_478	MH-GIS-DH_ssMH_1840	904.51	MH-GIS-DH_ssMH_1841	902.08	121.4	0.02	8	PVC	0.01	16	12.9	-0.6	
GM-GIS-DH_ssGM_479	MH-GIS-DH_ssMH_1642	904	MH-GIS-DH_ssMH_1840	904.51	90.7	-0.006	8	PVC	0.01	12	94.8	0	
GM-GIS-DH_ssGM_482	MH-GIS-DH_ssMH_1845	914	MH-GIS-DH_ssMH_1844	908.63	274.7	0.02	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_483	MH-GIS-DH_ssMH_1844	908.63	MH-GIS-DH_ssMH_1843	905.71	251.5	0.012	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-DH_ssGM_484	MH-GIS-DH_ssMH_1843	905.71	MH-GIS-DH_ssMH_1840	904.51	277.1	0.004	8	PVC	0.01	3	6	-0.6	
GM-GIS-DH_ssGM_485	MH-GIS-DH_ssMH_1846	915.61	MH-GIS-DH_ssMH_1845	914	277.6	0.006	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_494	MH-GIS-DH_ssMH_1854	847.07	MH-GIS-DH_ssMH_1855	841	218.6	0.028	8	PVC	0.01	17	13.3	-0.6	
GM-GIS-DP_ssGM_1141	MH-GIS-DP_ssMH_2226	886.37	MH-GIS-DP_ssMH_2225	875.46	339.3	0.032	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1142	MH-GIS-DP_ssMH_2232	854.82	MH-GIS-DP_ssMH_2231	852.15	45.5	0.059	8	PVC	0.01	30	17.7	-0.5	
GM-GIS-DP_ssGM_1143	MH-GIS-DP_ssMH_2235	900.74	MH-GIS-DP_ssMH_2234	891.07	142.3	0.068	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1144	MH-GIS-DP_ssMH_2234	891.07	MH-GIS-MH-81	886.96	62.1	0.066	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1145	MH-GIS-DP_ssMH_2236	854	MH-GIS-DP_ssMH_2227	854	78.9	0	8	PVC	0.01	6	100	5.3	

City of Snoqualmie
General Sewer Plan
SewerGEMS Results

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1146	MH-GIS-DP_ssMH_2237	884.29	MH-GIS-DP_ssMH_2271	886.47	90.5	-0.024	8	PVC	0.01	1	100	1.6	
GM-GIS-DP_ssGM_1147	MH-GIS-DP_ssMH_2271	886.47	MH-GIS-DP_ssMH_2226	886.37	51.9	0.002	8	PVC	0.01	3	6.5	-0.6	
GM-GIS-DP_ssGM_1148	MH-GIS-DP_ssMH_2267	857.19	MH-GIS-DP_ssMH_2262	860.27	79.6	-0.039	8	PVC	0.01	10	100	8.4	
GM-GIS-DP_ssGM_1149	MH-GIS-DP_ssMH_2238	873.56	MH-GIS-DP_ssMH_2263	872.16	41.6	0.034	8	PVC	0.01	3	39.5	-0.4	
GM-GIS-DP_ssGM_1150	MH-GIS-DP_ssMH_2231	852.15	MH-GIS-MH-32	848.68	70.2	0.049	8	PVC	0.01	32	18.1	-0.5	
GM-GIS-DP_ssGM_1151	MH-GIS-DP_ssMH_2265	857.32	MH-GIS-DP_ssMH_2230	832.03	264.5	0.096	8	PVC	0.01	230	50.3	-0.3	
GM-GIS-DP_ssGM_1152	MH-GIS-DP_ssMH_2270	872.05	MH-GIS-DP_ssMH_2228	859.78	247.7	0.05	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1153(1)	MH-GIS-DP_ssMH_2239	840	MH-GIS-DP_ssMH_2572	839	113.7	0.009	8	PVC	0.01	14	11.9	-0.6	
GM-GIS-DP_ssGM_1153(2)	MH-GIS-DP_ssMH_2572	839	MH-GIS-DP_ssMH_2351	839	25.5	0	8	PVC	0.01	15	70.5	-0.2	
GM-GIS-DP_ssGM_1154	MH-GIS-DP_ssMH_2230	832.03	MH-GIS-DP_ssMH_2573	826.42	113.2	0.05	8	PVC	0.01	231	50.5	-0.3	
GM-GIS-DP_ssGM_1154(1)	MH-GIS-DP_ssMH_2573	826.42	MH-GIS-BP_ssMH_2354	825.07	25	0.054	8	PVC	0.01	233	50.6	-0.3	
GM-GIS-DP_ssGM_1155	MH-GIS-DP_ssMH_2240	826.56	MH-GIS-DP_ssMH_2574	824.46	144.6	0.015	8	PVC	0.01	19	14	-0.6	
GM-GIS-DP_ssGM_1156	MH-GIS-DP_ssMH_2243	857.36	MH-GIS-DP_ssMH_2239	840	212.3	0.082	8	PVC	0.01	13	11.3	-0.6	
GM-GIS-DP_ssGM_1157	MH-GIS-DP_ssMH_2241	896.36	MH-GIS-DP_ssMH_2242	889.46	115.1	0.06	8	PVC	0.01	224	49.6	-0.3	
GM-GIS-DP_ssGM_1158	MH-GIS-MH-48	881.7	MH-GIS-DP_ssMH_2244	879.62	32.6	0.064	8	PVC	0.01	8	8.8	-0.6	
GM-GIS-DP_ssGM_1159	MH-GIS-DP_ssMH_2244	879.62	MH-GIS-DP_ssMH_2246	862.14	195.4	0.089	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-DP_ssGM_1160	MH-GIS-DP_ssMH_2251	866.38	MH-GIS-DP_ssMH_2250	853.91	149.5	0.083	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-DP_ssGM_1161	MH-GIS-DP_ssMH_2250	853.91	MH-GIS-DP_ssMH_2249	853.17	59.9	0.012	8	PVC	0.01	19	100	4.6	
GM-GIS-DP_ssGM_1162	MH-GIS-MH-26	894.4	MH-GIS-DP_ssMH_2253	893.86	15	0.036	8	PVC	0.01	14	11.9	-0.6	
GM-GIS-DP_ssGM_1163	MH-GIS-DP_ssMH_2253	893.86	MH-GIS-DP_ssMH_2252	878.79	161.1	0.094	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-DP_ssGM_1164	MH-GIS-DP_ssMH_2252	878.79	MH-GIS-DP_ssMH_2251	866.38	138.5	0.09	8	PVC	0.01	17	13	-0.6	
GM-GIS-DP_ssGM_1165	MH-GIS-DP_ssMH_2248	853.14	MH-GIS-DP_ssMH_2247	853.34	85	-0.002	8	PVC	0.01	22	100	5.5	
GM-GIS-DP_ssGM_1166	MH-GIS-DP_ssMH_2249	853.17	MH-GIS-DP_ssMH_2248	853.14	63.8	5E-04	8	PVC	0.01	20	100	5.3	
GM-GIS-DP_ssGM_1167	MH-GIS-DP_ssMH_2233	901.08	MH-GIS-MH-132	897.42	98	0.037	8	PVC	0.01	11	10.8	-0.6	
GM-GIS-DP_ssGM_1168	MH-GIS-DP_ssMH_2257	903.51	MH-GIS-DP_ssMH_2233	901.08	84.4	0.029	8	PVC	0.01	6	8	-0.6	
GM-GIS-DP_ssGM_1169	MH-GIS-DP_ssMH_2256	906.73	MH-GIS-DP_ssMH_2257	903.51	96	0.034	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-DP_ssGM_1170	MH-GIS-DP_ssMH_2255	908.98	MH-GIS-DP_ssMH_2256	906.73	136.8	0.016	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1171	MH-GIS-DP_ssMH_2254	912.48	MH-GIS-DP_ssMH_2255	908.98	48.2	0.073	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1172	MH-GIS-DP_ssMH_2258	869	MH-GIS-DP_ssMH_2243	857.36	200.7	0.058	8	PVC	0.01	11	10.8	-0.6	
GM-GIS-DP_ssGM_1173	MH-GIS-DP_ssMH_2259	874.02	MH-GIS-DP_ssMH_2258	869	123.1	0.041	8	PVC	0.01	10	10.2	-0.6	
GM-GIS-DP_ssGM_1174	MH-GIS-DP_ssMH_2261	899.74	MH-GIS-DP_ssMH_2260	879.52	245.2	0.082	8	PVC	0.01	8	8.8	-0.6	
GM-GIS-DP_ssGM_1175	MH-GIS-DP_ssMH_2260	879.52	MH-GIS-DP_ssMH_2259	874.02	56.4	0.098	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-DP_ssGM_1176	MH-GIS-MH-27	900.33	MH-GIS-DP_ssMH_2261	899.74	17.1	0.035	8	PVC	0.01	6	8	-0.6	
GM-GIS-DP_ssGM_1177	MH-GIS-DP_ssMH_2266	855.35	MH-GIS-DP_ssMH_2267	857.19	83.1	-0.022	8	PVC	0.01	9	100	7.2	
GM-GIS-DP_ssGM_1179	MH-GIS-DP_ssMH_2227	854	MH-GIS-DP_ssMH_2266	855.35	130	-0.01	8	PVC	0.01	8	100	6.7	
GM-GIS-DP_ssGM_1180	MH-GIS-DP_ssMH_2268	875.98	MH-GIS-DP_ssMH_2269	875.13	92.9	0.009	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1181	MH-GIS-DP_ssMH_2269	875.13	MH-GIS-DP_ssMH_2270	872.05	54.9	0.056	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1182	MH-GIS-DP_ssMH_2273	871.91	MH-GIS-DP_ssMH_2272	870.72	84.4	0.014	8	PVC	0.01	8	8.8	-0.6	
GM-GIS-DP_ssGM_1183	MH-GIS-DP_ssMH_2274	877.11	MH-GIS-DP_ssMH_2273	871.91	233.8	0.022	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1184	MH-GIS-DP_ssMH_2298	866.27	MH-GIS-DP_ssMH_2232	854.82	205	0.056	8	PVC	0.01	29	17.4	-0.6	
GM-GIS-DP_ssGM_1185	MH-GIS-DP_ssMH_2272	870.72	MH-GIS-DP_ssMH_2298	866.27	77.7	0.057	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-DP_ssGM_1186	MH-GIS-DP_ssMH_2225	875.46	MH-GIS-DP_ssMH_2273	871.91	126.2	0.028	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-DP_ssGM_1187	MH-GIS-DP_ssMH_2275	877.45	MH-GIS-DP_ssMH_2238	873.56	59.9	0.065	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1188	MH-GIS-DP_ssMH_2228	859.78	MH-GIS-DP_ssMH_2236	854	256.6	0.023	8	PVC	0.01	5	33	-0.4	
GM-GIS-DP_ssGM_1189	MH-GIS-DP_ssMH_2277	852.62	MH-GIS-DP_ssMH_2276	849.27	106.1	0.032	8	PVC	0.01	14	11.9	-0.6	
GM-GIS-DP_ssGM_1190	MH-GIS-DP_ssMH_2290	828.38	MH-GIS-DP_ssMH_2240	826.56	70.6	0.026	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-DP_ssGM_1191	MH-GIS-MH-106	902.27	MH-GIS-DP_ssMH_2233	901.08	71.4	0.017	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1192	MH-GIS-MH-135	906.59	MH-GIS-MH-106	902.27	117.5	0.037	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1193	MH-GIS-DP_ssMH_2280	909.09	MH-GIS-MH-135	906.59	99.1	0.025	8	PVC	0.01	1	3.6	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1195	MH-GIS-DP_ssMH_2284	857.2	MH-GIS-DP_ssMH_2282	857.41	123.6	-0.002	8	PVC	0.01	37	64	-0.2	
GM-GIS-DP_ssGM_1196	MH-GIS-DP_ssMH_2283	843.58	MH-GIS-MH-38	840.28	35.7	0.093	8	PVC	0.01	39	20.2	-0.5	
GM-GIS-DP_ssGM_1197	MH-GIS-DP_ssMH_2247	853.34	MH-GIS-DP_ssMH_2245	856.11	77.7	-0.036	8	PVC	0.01	23	100	8.1	
GM-GIS-DP_ssGM_1197(1)	MH-GIS-DP_ssMH_2245	856.11	MH-GIS-DP_ssMH_2246	862.14	69.1	-0.087	8	PVC	0.01	24	100	5.5	
GM-GIS-DP_ssGM_1198	MH-GIS-DP_ssMH_2246	862.14	MH-GIS-DP_ssMH_2285	857.88	117.2	0.036	8	PVC	0.01	34	18.9	-0.5	
GM-GIS-DP_ssGM_1199	MH-GIS-DP_ssMH_2285	857.88	MH-GIS-DP_ssMH_2284	857.2	42.8	0.016	8	PVC	0.01	36	19.2	-0.5	
GM-GIS-DP_ssGM_1200	MH-GIS-DP_ssMH_2282	857.41	MH-GIS-DP_ssMH_2283	843.58	131.9	0.105	8	PVC	0.01	38	19.9	-0.5	
GM-GIS-DP_ssGM_1201	MH-GIS-DP_ssMH_2278	868.39	MH-GIS-DP_ssMH_2289	854	258.7	0.056	8	PVC	0.01	11	10.8	-0.6	
GM-GIS-DP_ssGM_1202	MH-GIS-DP_ssMH_2289	854	MH-GIS-DP_ssMH_2277	852.62	88.6	0.016	8	PVC	0.01	13	11.3	-0.6	
GM-GIS-DP_ssGM_1203	MH-GIS-MH-104	874.4	MH-GIS-DP_ssMH_2278	868.39	66.6	0.09	8	PVC	0.01	10	10.2	-0.6	
GM-GIS-DP_ssGM_1204	MH-GIS-DP_ssMH_2276	849.27	MH-GIS-DP_ssMH_2291	826.74	92.4	0.244	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-DP_ssGM_1205	MH-GIS-DP_ssMH_2291	826.74	MH-GIS-DP_ssMH_2290	828.38	66.6	-0.025	8	PVC	0.01	17	100	1.1	
GM-GIS-DP_ssGM_1206	MH-GIS-DP_ssMH_2294	876.38	MH-GIS-DP_ssMH_2293	847.37	200.4	0.145	8	PVC	0.01	125	36.6	-0.4	
GM-GIS-DP_ssGM_1207	MH-GIS-MH-34	843.8	MH-GIS-DP_ssMH_2292	844.23	23	0.019	8	PVC	0.01	130	37.4	0	
GM-GIS-DP_ssGM_1208	MH-GIS-MH-19	877.92	MH-GIS-DP_ssMH_2294	876.38	10	0.154	8	PVC	0.01	124	36.4	-0.4	
GM-GIS-DP_ssGM_1209	MH-GIS-DP_ssMH_2295	904.7	MH-GIS-MH-52	902.93	37	0.048	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1210	MH-GIS-DP_ssMH_2279	927.21	MH-GIS-DP_ssMH_2254	912.48	208.3	0.071	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1211	MH-GIS-DP_ssMH_2296	867.82	MH-GIS-DP_ssMH_2297	872.58	109.2	-0.044	8	PVC	0.01	17	100	6	
GM-GIS-DP_ssGM_1212	MH-GIS-DP_ssMH_2263	872.16	MH-GIS-DP_ssMH_2296	867.82	94.4	0.046	8	PVC	0.01	4	100	1	
GM-GIS-DP_ssGM_1213	MH-GIS-DP_ssMH_2262	860.27	MH-GIS-DP_ssMH_2296	867.82	155.3	-0.049	8	PVC	0.01	11	100	12.9	
GM-GIS-DP_ssGM_1214	MH-GIS-DP_ssMH_2299	874.3	MH-GIS-DP_ssMH_2298	866.27	247.5	0.032	8	PVC	0.01	19	14	-0.6	
GM-GIS-DP_ssGM_1215	MH-GIS-DP_ssMH_2297	872.58	MH-GIS-DP_ssMH_2299	874.3	94.5	-0.018	8	PVC	0.01	18	100	1.2	
GM-GIS-DP_ssGM_1216	MH-GIS-DP_ssMH_2293	847.37	MH-GIS-DP_ssMH_2292	844.23	200	0.016	8	PVC	0.01	129	37.2	-0.4	
GM-GIS-DP_ssGM_1217	MH-GIS-DP_ssMH_2300	849.15	MH-GIS-DP_ssMH_2293	847.37	69.5	0.026	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1218	MH-GIS-DP_ssMH_2300	849.15	MH-GIS-MH-33	853.18	20	0.202	8	PVC	0.01	1	3.6	3.4	
GM-GIS-DP_ssGM_1219	MH-GIS-DP_ssMH_2242	889.46	MH-GIS-DP_ssMH_2301	875.07	181.8	0.079	8	PVC	0.01	225	49.7	-0.3	
GM-GIS-DP_ssGM_1220	MH-GIS-DP_ssMH_2264	864	MH-GIS-DP_ssMH_2265	857.32	144.6	0.046	8	PVC	0.01	229	50.2	-0.3	
GM-GIS-DP_ssGM_1221	MH-GIS-DP_ssMH_2301	875.07	MH-GIS-DP_ssMH_2229	867.69	99.1	0.074	8	PVC	0.01	226	49.9	-0.3	
GM-GIS-DP_ssGM_1222	MH-GIS-DP_ssMH_2229	867.69	MH-GIS-DP_ssMH_2264	864	111.8	0.033	8	PVC	0.01	228	50	-0.3	
GM-GIS-DP_ssGM_1223	MH-GIS-MH-81	886.96	MH-GIS-DP_ssMH_2303	886.09	50	0.017	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1225	MH-GIS-DP_ssMH_2304	893.01	MH-GIS-DP_ssMH_2303	886.09	200.5	0.035	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1226	MH-GIS-DP_ssMH_2308	901.14	MH-GIS-DP_ssMH_2309	902.8	137	-0.012	8	PVC	0.01	4	100	1.1	
GM-GIS-DP_ssGM_1227	MH-GIS-MH-52	902.93	MH-GIS-DP_ssMH_2308	901.14	50	0.036	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1228	MH-GIS-DP_ssMH_2306	886.34	MH-GIS-DP_ssMH_2307	876.14	271.1	0.038	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-DP_ssGM_1229	MH-GIS-DP_ssMH_2303	886.09	MH-GIS-MH-48	881.7	78	0.056	8	PVC	0.01	6	8	-0.6	
GM-GIS-DP_ssGM_1230	MH-GIS-MH-132	897.42	MH-GIS-MH-26	894.4	110	0.027	8	PVC	0.01	13	11.3	-0.6	
GM-GIS-DP_ssGM_1231	MH-GIS-DP_ssMH_2309	902.8	MH-GIS-MH-27	900.33	70	0.035	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-DP_ssGM_1232	MH-GIS-DP_ssMH_2302	898.53	MH-GIS-DP_ssMH_2241	896.36	79.8	0.027	8	PVC	0.01	222	49.4	-0.3	
GM-GIS-DP_ssGM_1233	MH-GIS-DP_ssMH_2310	880.97	MH-GIS-MH-50	882.1	35	0.032	8	PVC	0.01	1	3.6	0.5	
GM-GIS-DP_ssGM_1234	MH-GIS-DP_ssMH_2313	874	MH-GIS-DP_ssMH_2312	876.61	124.7	-0.021	8	PVC	0.01	8	100	2.1	
GM-GIS-DP_ssGM_1235	MH-GIS-DP_ssMH_2307	876.14	MH-GIS-DP_ssMH_2313	874	151.3	0.014	8	PVC	0.01	6	88	-0.1	
GM-GIS-DP_ssGM_1236	MH-GIS-DP_ssMH_2312	876.61	MH-GIS-MH-104	874.4	75	0.029	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-DP_ssGM_1237	MH-GIS-DP_ssMH_2310	880.97	MH-GIS-MH-19	877.92	46.6	0.065	8	PVC	0.01	123	36.2	-0.4	
GM-GIS-DP_ssGM_1238	MH-GIS-DP_ssMH_2305	891.12	MH-GIS-DP_ssMH_2314	887.98	54.9	0.057	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1239	MH-GIS-DP_ssMH_2314	887.98	MH-GIS-DP_ssMH_2306	886.34	59.5	0.028	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1240	MH-GIS-DP_ssMH_2311	896.03	MH-GIS-DP_ssMH_2305	891.12	123.7	0.04	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1241	MH-GIS-DP_ssMH_2315	882.04	MH-GIS-DP_ssMH_2310	880.97	126.6	0.008	8	PVC	0.01	120	35.8	-0.4	
GM-GIS-DP_ssGM_1242	MH-GIS-DP_ssMH_2316	889	MH-GIS-DP_ssMH_2315	882.04	400	0.017	8	PVC	0.01	119	35.6	-0.4	
GM-GIS-DP_ssGM_1243	MH-GIS-NJ_ssMH_2565	895.08	MH-GIS-DP_ssMH_2316	889	211	0.029	8	PVC	0.01	117	35.4	-0.4	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1274	MH-GIS-DP_ssMH_2360	836.89	MH-GIS-DP_ssMH_2347	827.82	148.1	0.061	8	PVC	0.01	36	19.2	-0.5	
GM-GIS-DP_ssGM_1275	MH-GIS-MH-173	852.82	MH-GIS-DP_ssMH_2341	849.09	64.9	0.057	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1276	MH-GIS-DP_ssMH_2341	849.09	MH-GIS-DP_ssMH_2348	849	251	4E-04	8	Glass	0.013	5	15.1	-0.6	
GM-GIS-DP_ssGM_1277	MH-GIS-DP_ssMH_2355	840.68	MH-GIS-DP_ssMH_2343	837.64	115	0.026	8	PVC	0.01	140	38.9	-0.4	
GM-GIS-DP_ssGM_1278	MH-GIS-DP_ssMH_2351	839	MH-GIS-DP_ssMH_2344	838.9	112.8	9E-04	8	PVC	0.01	204	70.5	-0.2	
GM-GIS-DP_ssGM_1279	MH-GIS-DP_ssMH_2348	849	MH-GIS-DP_ssMH_2342	844	400	0.013	8	Glass	0.013	6	8	-0.6	
GM-GIS-DP_ssGM_1280	MH-GIS-DP_ssMH_2358	834	MH-GIS-DP_ssMH_2349	839	260	-0.019	8	PVC	0.01	186	100	5.2	
GM-GIS-DP_ssGM_1281	MH-GIS-DP_ssMH_2349	839	MH-GIS-DP_ssMH_2351	839	291.8	0	8	PVC	0.01	187	100	0	
GM-GIS-DP_ssGM_1282	MH-GIS-DP_ssMH_2344	838.9	MH-GIS-BP_ssMH_2352	835.22	94.5	0.039	8	PVC	0.01	205	47.4	-0.4	
GM-GIS-DP_ssGM_1285	MH-GIS-DP_ssMH_2350	824	MH-GIS-BP_ssMH_2353	824.9	116.1	-0.008	8	PVC	0.01	61	100	0.7	
GM-GIS-DP_ssGM_1286	MH-GIS-DP_ssMH_2345	824	MH-GIS-DP_ssMH_2350	824	119.4	0	8	PVC	0.01	39	100	0.7	
GM-GIS-DP_ssGM_1287	MH-GIS-DP_ssMH_2346	824	MH-GIS-DP_ssMH_2345	824	79.5	0	8	PVC	0.01	38	100	0.8	
GM-GIS-DP_ssGM_1288	MH-GIS-DP_ssMH_2347	827.82	MH-GIS-DP_ssMH_2346	824	139.4	0.027	8	PVC	0.01	37	19.5	-0.5	
GM-GIS-DP_ssGM_1289	MH-GIS-MH-34	843.8	MH-GIS-DP_ssMH_2355	840.68	25	0.125	8	PVC	0.01	131	37.5	-0.4	
GM-GIS-DP_ssGM_1290	MH-GIS-DP_ssMH_2342	844	MH-GIS-DP_ssMH_2355	840.68	71.3	0.047	8	Glass	0.013	8	8.8	-0.6	
GM-GIS-DP_ssGM_1291	MH-GIS-DP_ssMH_2574	824.46	MH-GIS-DP_ssMH_2350	824	25	0.018	8	PVC	0.01	20	100	0.3	
GM-GIS-DP_ssGM_1292	MH-GIS-MH-38	840.28	MH-GIS-DP_ssMH_2343	837.64	25	0.106	8	PVC	0.01	41	20.5	-0.5	
GM-GIS-DP_ssGM_1293	MH-GIS-DP_ssMH_2357	834	MH-GIS-DP_ssMH_2358	834	111.1	0	8	PVC	0.01	185	100	5.3	
GM-GIS-DP_ssGM_1294	MH-GIS-DP_ssMH_2356	834	MH-GIS-DP_ssMH_2357	834	140.9	0	8	PVC	0.01	183	100	5.4	
GM-GIS-DP_ssGM_1295	MH-GIS-DP_ssMH_2343	837.64	MH-GIS-DP_ssMH_2356	834	99.5	0.037	8	PVC	0.01	182	100	1.8	
GM-GIS-DP_ssGM_1296	MH-GIS-MH-32	848.68	MH-GIS-DP_ssMH_2359	847.39	20	0.065	8	PVC	0.01	33	18.5	-0.5	
GM-GIS-DP_ssGM_1297	MH-GIS-DP_ssMH_2359	847.39	MH-GIS-DP_ssMH_2360	836.89	187.4	0.056	8	PVC	0.01	34	18.9	-0.5	
GM-GIS-DT_ssGM_760	MH-GIS-MH-196	418.86	MH-GIS-RW_ssMH_1506	417.71	175	0.007	8	Concrete	0.013	9	9.8	-0.6	SM4
GM-GIS-DT_ssGM_761	MH-GIS-MH-186	419.33	MH-GIS-RW_ssMH_1506	417.71	404.2	0.004	8	Concrete	0.013	17	15.3	-0.6	
GM-GIS-DT_ssGM_762	MH-GIS-MH-185	419.96	MH-GIS-MH-186	419.33	158	0.004	8	Concrete	0.013	9	11	-0.6	
GM-GIS-DT_ssGM_763	MH-IS-277	413.81	MH-IS-96	412.74	166.6	0.006	10	Concrete	0.013	35	14.4	-0.7	
GM-GIS-DT_ssGM_770	MH-GIS-DT_ssMH_2022	415.16	MH-GIS-DT_ssMH_2021	414	290.8	0.004	8	Concrete	0.013	9	11	-0.6	
GM-GIS-DT_ssGM_771	MH-GIS-DT_ssMH_2021	414	MH-IS-271	410.4	323.6	0.011	8	Concrete	0.013	17	13.4	-0.6	
GM-GIS-DT_ssGM_782	MH-GIS-DT_ssMH_1492	416.47	MH-GIS-DT_ssMH_2026	415.29	296.2	0.004	8	Concrete	0.013	3	6.8	-0.6	
GM-GIS-DT_ssGM_783	MH-GIS-DT_ssMH_2026	415.29	MH-IS-136	409.7	368.5	0.015	8	Concrete	0.013	6	8	-0.6	
GM-GIS-DT_ssGM_788	MH-GIS-DT_ssMH_1483	415.09	MH-IS-138	409.59	399.9	0.014	8	Concrete	0.013	3	5.6	-0.6	SM4
GM-GIS-DT_ssGM_791	MH-GIS-RW_ssMH_1485	415.75	MH-IS-139	410.69	189.6	0.027	8	Concrete	0.013	60	25	-0.5	
GM-GIS-DT_ssGM_802	MH-GIS-RW_ssMH_1498	414	MH-IS-277	413.81	297	7E-04	8	Glass	0.013	17	23.9	-0.5	
GM-GIS-DT_ssGM_804	MH-GIS-MH-198	414.78	MH-GIS-MH-15	414.08	182.5	0.004	8	Concrete	0.013	3	100	1.9	
GM-GIS-DT_ssGM_805	MH-GIS-DT_ssMH_2029	415.39	MH-IS-139	410.69	316.4	0.015	8	Concrete	0.013	6	8	-0.6	
GM-GIS-DT_ssGM_806	MH-GIS-MH-168	416.02	MH-GIS-DT_ssMH_2029	415.39	144	0.004	8	Glass	0.013	3	6.7	-0.6	
GM-GIS-DT_ssGM_807	MH-GIS-MH-179	416.76	MH-GIS-DT_ssMH_1472	416.37	150.1	0.003	8	Concrete	0.013	3	45.3	-0.4	
GM-GIS-DT_ssGM_808	MH-GIS-DT_ssMH_2031	412.24	MH-IS-139	410.69	171.5	0.009	8	Concrete	0.013	41	20.6	-0.5	
GM-GIS-DT_ssGM_809	MH-GIS-DT_ssMH_1472	416.37	MH-GIS-DT_ssMH_2030	416.92	184.3	-0.003	8	Concrete	0.013	9	100	0	
GM-GIS-DT_ssGM_810	MH-GIS-DT_ssMH_2030	416.92	MH-GIS-DT_ssMH_2031	412.24	297	0.016	8	Concrete	0.013	13	11.3	-0.6	
GM-GIS-DT_ssGM_813	MH-GIS-RW_ssMH_2034	414	MH-GIS-DT_ssMH_2031	412.24	228.8	0.008	8	Concrete	0.013	25	16.1	-0.6	
GM-GIS-DT_ssGM_920	MH-GIS-DT_ssMH_2107	418.03	MH-GIS-DT_ssMH_1472	416.37	433.8	0.004	8	Concrete	0.013	3	6.9	-0.6	
GM-GIS-DT_ssGM_972	MH-GIS-GS_ssMH_2154	416.74	MH-IS-137	411.83	318.3	0.015	8	Concrete	0.013	6	8	-0.6	
GM-GIS-DT_ssGM_1011	MH-GIS-RW_ssMH_2095	415.61	MH-IS-140	409.52	115.2	0.053	8	Concrete	0.013	26	16.4	-0.6	
GM-GIS-DT_ssGM_1013	MH-GIS-MH-160	418.62	MH-GIS-RW_ssMH_2094	417.87	130.7	0.006	8	Concrete	0.013	9	10.1	-0.6	
GM-GIS-DT_ssGM_1456	MH-GIS-MH-53	414	MH-IS-192	405.19	64	0.138	15	Concrete	0.013	17	6	-1.2	
GM-GIS-DT_ssGM_1457	MH-GIS-MH-54	414	MH-GIS-MH-53	414	37.2	0	15	Concrete	0.013	9	8.6	-1.1	
GM-GIS-DY_ssGM_1459	MH-GIS-DY_ssMH_2562	754	MH-GIS-DY_ssMH_2548	754.07	240.5	-3E-04	8	Glass	0.013	1	20.6	-0.5	
GM-GIS-DY_ssGM_1460	MH-GIS-DY_ssMH_2551	737.26	MH-GIS-DY_ssMH_2549	743.29	74.9	0.081	8	Glass	0.013	9	9.8	5.4	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DY_ssGM_1461	MH-GIS-DY_ssMH_2548	754.07	MH-GIS-DY_ssMH_2550	745.64	122.1	0.069	8	Glass	0.013	2	4.8	-0.6	
GM-GIS-DY_ssGM_1462	MH-GIS-DY_ssMH_2550	745.64	MH-GIS-DY_ssMH_2549	743.29	37.9	0.062	8	Glass	0.013	4	6	-0.6	
GM-GIS-DY_ssGM_1463	MH-GIS-DY_ssMH_2561	721.57	MH-GIS-DY_ssMH_2551	737.26	171.8	0.091	8	Glass	0.013	11	10.4	15.1	
GM-GIS-DY_ssGM_1464	MH-GIS-DY_ssMH_2555	717.93	MH-GIS-DY_ssMH_2556	716.86	51.1	-0.021	8	Glass	0.013	4	100	3.1	
GM-GIS-DY_ssGM_1465	MH-GIS-DY_ssMH_2555	717.93	MH-GIS-DY_ssMH_2552	718.95	69.9	-0.015	8	Glass	0.013	5	100	3.1	
GM-GIS-DY_ssGM_1466	MH-GIS-DY_ssMH_2561	721.57	MH-GIS-DY_ssMH_2552	718.95	43.5	-0.06	8	Glass	0.013	6	100	-0.6	
GM-GIS-DY_ssGM_1467	MH-GIS-DY_ssMH_2557	739	MH-GIS-DY_ssMH_2558	739	68.4	0	8	Glass	0.013	4	100	3.7	
GM-GIS-DY_ssGM_1468	MH-GIS-DY_ssMH_2560	734	MH-GIS-DY_ssMH_2559	734	83.1	0	8	Glass	0.013	1	100	5.3	
GM-GIS-DY_ssGM_1469	MH-GIS-DY_ssMH_2549	743.29	MH-GIS-DY_ssMH_2557	739	79.3	-0.054	8	Glass	0.013	5	100	-0.6	
GM-GIS-DY_ssGM_1470	MH-GIS-DY_ssMH_2559	734	MH-GIS-DY_ssMH_2558	739	296.5	-0.017	8	Glass	0.013	2	100	8.7	
GM-GIS-DY_ssGM_1471	MH-GIS-DY_ssMH_2553	711.51	MH-GIS-DY_ssMH_2554	713.53	58.5	-0.035	8	Glass	0.013	1	100	7.4	
GM-GIS-DY_ssGM_1472	MH-GIS-DY_ssMH_2556	716.86	MH-GIS-DY_ssMH_2554	713.53	106.5	-0.031	8	Glass	0.013	2	100	4.1	
GM-GIS-EL_ssGM_1	MH-GIS-GC_ssMH_2036	775.66	MH-GIS-GC_ssMH_1622	773.42	52.2	0.043	8	PVC	0.01	21	14.5	-0.6	
GM-GIS-EL_ssGM_825	MH-GIS-EL_ssMH_2037	786.68	MH-GIS-GC_ssMH_2036	775.66	133	0.083	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-EL_ssGM_826	MH-GIS-EL_ssMH_2045	822.1	MH-GIS-EL_ssMH_2039	813.97	63.2	0.129	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-EL_ssGM_827	MH-GIS-EL_ssMH_2052	807.93	MH-GIS-EL_ssMH_2040	802.37	48.4	0.115	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-EL_ssGM_828	MH-GIS-EL_ssMH_2053	820.51	MH-GIS-EL_ssMH_2052	807.93	272.9	0.046	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-EL_ssGM_829	MH-GIS-EL_ssMH_2040	802.37	MH-GIS-EL_ssMH_2051	797.05	55.5	0.096	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-EL_ssGM_830	MH-GIS-EL_ssMH_2050	793.43	MH-GIS-EL_ssMH_2051	797.05	53.2	-0.068	8	PVC	0.01	8	100	3.1	
GM-GIS-EL_ssGM_831	MH-GIS-EL_ssMH_2044	793.41	MH-GIS-EL_ssMH_2050	793.43	66.5	-3E-04	8	PVC	0.01	6	100	3.1	
GM-GIS-EL_ssGM_832	MH-GIS-EL_ssMH_2043	804.53	MH-GIS-EL_ssMH_2057	797.97	68	0.096	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-EL_ssGM_833	MH-GIS-EL_ssMH_2057	797.97	MH-GIS-EL_ssMH_2044	793.41	211.4	0.022	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-EL_ssGM_834	MH-GIS-EL_ssMH_2039	813.97	MH-GIS-EL_ssMH_2043	804.53	69.3	0.136	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-EL_ssGM_835	MH-GIS-EL_ssMH_2051	797.05	MH-GIS-EL_ssMH_2049	793.26	67.6	0.056	8	PVC	0.01	16	12.6	-0.6	
GM-GIS-EL_ssGM_836	MH-GIS-EL_ssMH_2049	793.26	MH-GIS-EL_ssMH_2058	788.67	54.5	0.084	8	PVC	0.01	17	13.1	-0.6	
GM-GIS-EL_ssGM_837	MH-GIS-EL_ssMH_2055	834.28	MH-GIS-EL_ssMH_2054	829.37	73.6	0.067	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-EL_ssGM_838	MH-GIS-EL_ssMH_2058	788.67	MH-GIS-EL_ssMH_2037	786.68	129.2	0.015	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-EL_ssGM_839	MH-GIS-EL_ssMH_2054	829.37	MH-GIS-EL_ssMH_2053	820.51	150.8	0.059	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-EN_ssGM_329	MH-GIS-EN_ssMH_1694	700	MH-GIS-IR_ssMH_1695	661.78	331	0.115	8	PVC	0.01	26	16.3	-0.6	
GM-GIS-EN_ssGM_330	MH-GIS-EN_ssMH_1366	703.34	MH-GIS-EN_ssMH_1694	700	29.9	0.112	8	PVC	0.01	25	16.1	-0.6	
GM-GIS-EN_ssGM_588	MH-GIS-EN_ssMH_1350	786.65	MH-GIS-EN_ssMH_1351	786.96	97.8	-0.003	8	Glass	0.013	2	100	0.4	
GM-GIS-EN_ssGM_589	MH-GIS-EN_ssMH_1351	786.96	MH-GIS-EN_ssMH_1352	787.67	99.2	-0.007	8	Glass	0.013	3	100	0.1	
GM-GIS-EN_ssGM_590	MH-GIS-EN_ssMH_1354	762.16	MH-GIS-EN_ssMH_1353	762.07	120.2	8E-04	8	Glass	0.013	2	8.9	-0.6	
GM-GIS-EN_ssGM_591	MH-GIS-EN_ssMH_1355	763	MH-GIS-EN_ssMH_1354	762.16	101.1	0.008	8	Glass	0.013	2	4.2	-0.6	
GM-GIS-EN_ssGM_592	MH-GIS-EN_ssMH_1353	762.07	MH-GIS-EN_ssMH_1365	751.94	130.6	0.078	8	Glass	0.013	20	14.4	-0.6	
GM-GIS-EN_ssGM_593	MH-GIS-EN_ssMH_1365	751.94	MH-GIS-EN_ssMH_1356	739.92	120.6	0.1	8	Glass	0.013	21	14.7	-0.6	
GM-GIS-EN_ssGM_594	MH-GIS-EN_ssMH_1356	739.92	MH-GIS-EN_ssMH_1357	727.9	120.8	0.1	8	Glass	0.013	22	15	-0.6	
GM-GIS-EN_ssGM_595	MH-GIS-EN_ssMH_1357	727.9	MH-GIS-EN_ssMH_1358	723.94	90	0.044	8	Glass	0.013	23	15.3	-0.6	
GM-GIS-EN_ssGM_596	MH-GIS-EN_ssMH_1358	723.94	MH-GIS-EN_ssMH_1359	703.73	187.4	0.108	8	Glass	0.013	24	15.6	-0.6	
GM-GIS-EN_ssGM_597	MH-GIS-EN_ssMH_1352	787.67	MH-GIS-EN_ssMH_1370	777.86	233.3	0.042	8	Glass	0.013	4	6.4	-0.6	
GM-GIS-EN_ssGM_598	MH-GIS-EN_ssMH_1370	777.86	MH-GIS-EN_ssMH_1369	774.89	78.7	0.038	8	Glass	0.013	5	7	-0.6	
GM-GIS-EN_ssGM_599	MH-GIS-EN_ssMH_1369	774.89	MH-GIS-EN_ssMH_1360	769.1	95.6	0.061	8	Glass	0.013	6	7.6	-0.6	
GM-GIS-EN_ssGM_600	MH-GIS-EN_ssMH_1360	769.1	MH-GIS-EN_ssMH_1361	762.16	107.5	0.065	8	Glass	0.013	16	12.9	-0.6	
GM-GIS-EN_ssGM_601	MH-GIS-EN_ssMH_1361	762.16	MH-GIS-EN_ssMH_1353	762.07	98.2	9E-04	8	Glass	0.013	17	21.8	-0.5	
GM-GIS-EN_ssGM_602	MH-GIS-EN_ssMH_1362	770.19	MH-GIS-EN_ssMH_1360	769.1	41.2	0.026	8	Glass	0.013	10	9.9	-0.6	
GM-GIS-EN_ssGM_603	MH-GIS-EN_ssMH_1364	779.77	MH-GIS-EN_ssMH_1362	770.19	104	0.092	8	Glass	0.013	9	9.5	-0.6	
GM-GIS-EN_ssGM_604	MH-GIS-EN_ssMH_1363	787.35	MH-GIS-EN_ssMH_1364	779.77	74.3	0.102	8	Glass	0.013	8	9	-0.6	
GM-GIS-EN_ssGM_605	MH-GIS-MH-97	794	MH-GIS-EN_ssMH_1363	787.35	61	0.109	8	Glass	0.013	7	8.6	-0.6	
GM-GIS-EN_ssGM_606	MH-GIS-EN_ssMH_1359	703.73	MH-GIS-EN_ssMH_1366	703.34	41.7	0.009	8	Glass	0.013	24	15.8	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-EN_ssGM_607	MH-GIS-MH-101	784	MH-GIS-EN_ssMH_1367	784	63.2	0	8	Glass	0.013	1	100	3.1	
GM-GIS-EN_ssGM_608	MH-GIS-EN_ssMH_1367	784	MH-GIS-EN_ssMH_1350	786.65	124.1	-0.021	8	Glass	0.013	2	100	3.1	
GM-GIS-EN_ssGM_609	MH-GIS-EN_ssMH_1368	763.36	MH-GIS-EN_ssMH_1355	763	42.8	0.008	8	Glass	0.013	1	3	-0.6	
GM-GIS-EP_ssGM_1253	MH-GIS-EP_ssMH_2571	1,044.00	MH-GIS-EP_ssMH_2317	1,044.00	20	0	8	PVC	0.01	78	100	0.5	
GM-GIS-EP_ssGM_1477	MH-GIS-EP_ssMH_2579	1,063.97	MH-GIS-EP_ssMH_2590	1,059.65	112.1	0.039	8	Glass	0.013	13	11.3	-0.6	
GM-GIS-EP_ssGM_1478	MH-GIS-EP_ssMH_2585	1,067.19	MH-GIS-EP_ssMH_2584	1,074.61	115.1	0.064	8	Glass	0.013	11	10.8	6.8	
GM-GIS-EP_ssGM_1479	MH-GIS-EP_ssMH_2587	1,053.88	MH-GIS-EP_ssMH_2585	1,067.19	204.1	0.065	8	Glass	0.013	13	11.3	12.7	
GM-GIS-EP_ssGM_1480	MH-GIS-EP_ssMH_2600	1,085.09	MH-GIS-EP_ssMH_2583	1,079.32	59.4	0.097	8	Glass	0.013	10	10.2	-0.6	
GM-GIS-EP_ssGM_1481	MH-GIS-EP_ssMH_2590	1,059.65	MH-GIS-EP_ssMH_2594	1,058.00	129.4	0.013	8	Glass	0.013	41	100	2.9	
GM-GIS-EP_ssGM_1482	MH-GIS-EP_ssMH_2578	1,064.51	MH-GIS-EP_ssMH_2601	1,069.76	160.9	0.033	8	Glass	0.013	1	3.6	4.6	
GM-GIS-EP_ssGM_1483	MH-GIS-EP_ssMH_2592	1,062.35	MH-GIS-EP_ssMH_2594	1,058.00	186	0.023	8	Glass	0.013	3	100	0.2	
GM-GIS-EP_ssGM_1484	MH-GIS-EP_ssMH_2581	1,107.73	MH-GIS-EP_ssMH_2604	1,097.53	171.2	0.06	8	Glass	0.013	6	8	-0.6	
GM-GIS-EP_ssGM_1485	MH-GIS-EP_ssMH_2607	1,058.36	MH-GIS-EP_ssMH_2606	1,061.67	281.4	-0.012	8	Glass	0.013	48	100	4.9	
GM-GIS-EP_ssGM_1486	MH-GIS-EP_ssMH_2591	1,057.24	MH-GIS-EP_ssMH_2608	1,057.37	48	-0.003	8	Glass	0.013	46	100	5.5	
GM-GIS-EP_ssGM_1487	MH-GIS-EP_ssMH_2603	1,063.73	MH-GIS-EP_ssMH_2589	1,057.65	176.2	0.035	8	Glass	0.013	18	13.5	-0.6	
GM-GIS-EP_ssGM_1488	MH-GIS-EP_ssMH_2602	1,070.56	MH-GIS-EP_ssMH_2603	1,063.73	63.7	0.107	8	Glass	0.013	17	13	-0.6	
GM-GIS-EP_ssGM_1489	MH-GIS-EP_ssMH_2595	1,086.22	MH-GIS-EP_ssMH_2596	1,082.11	177.6	0.023	8	Glass	0.013	14	11.9	-0.6	
GM-GIS-EP_ssGM_1490	MH-GIS-MH-197	1,071.22	MH-GIS-EP_ssMH_2578	1,064.51	216.3	0.031	8	Glass	0.013	6	8	-0.6	
GM-GIS-EP_ssGM_1491	MH-GIS-EP_ssMH_2608	1,057.37	MH-GIS-EP_ssMH_2607	1,058.36	169.8	-0.006	8	Glass	0.013	47	100	5.9	
GM-GIS-EP_ssGM_1492	MH-GIS-EP_ssMH_2582	1,062.05	MH-GIS-EP_ssMH_2606	1,061.67	40.7	-0.009	8	Glass	0.013	50	100	1.2	
GM-GIS-EP_ssGM_1493	MH-GIS-EP_ssMH_2605	1,063.65	MH-GIS-EP_ssMH_2587	1,053.88	263.1	0.037	8	Glass	0.013	61	25.3	-0.5	
GM-GIS-EP_ssGM_1494	MH-GIS-EP_ssMH_2605	1,063.65	MH-GIS-EP_ssMH_2582	1,062.05	56	-0.029	8	Glass	0.013	60	100	-0.4	
GM-GIS-EP_ssGM_1495	MH-GIS-EP_ssMH_2586	1,087.41	MH-GIS-EP_ssMH_2597	1,087.13	50.8	0.005	8	Glass	0.013	10	11	-0.6	
GM-GIS-EP_ssGM_1496	MH-GIS-EP_ssMH_2604	1,097.53	MH-GIS-EP_ssMH_2588	1,087.69	169.8	0.058	8	Glass	0.013	8	8.8	-0.6	
GM-GIS-EP_ssGM_1497	MH-GIS-EP_ssMH_2596	1,082.11	MH-GIS-EP_ssMH_2602	1,070.56	268	0.043	8	Glass	0.013	15	12.5	-0.6	
GM-GIS-EP_ssGM_1498	MH-GIS-EP_ssMH_2580	1,092.25	MH-GIS-EP_ssMH_2600	1,085.09	109.6	0.065	8	Glass	0.013	9	9.5	-0.6	
GM-GIS-EP_ssGM_1499	MH-GIS-EP_ssMH_2599	1,091.67	MH-GIS-EP_ssMH_2595	1,086.22	202.2	0.027	8	Glass	0.013	1	3.6	-0.6	
GM-GIS-EP_ssGM_1500	MH-GIS-MH-99	1,100.90	MH-GIS-EP_ssMH_2598	1,099.00	153.2	0.012	8	Glass	0.013	6	8	-0.6	
GM-GIS-EP_ssGM_1501	MH-GIS-EP_ssMH_2597	1,087.13	MH-GIS-EP_ssMH_2595	1,086.22	167.4	0.005	8	Glass	0.013	11	11.6	-0.6	
GM-GIS-EP_ssGM_1502	MH-GIS-EP_ssMH_2588	1,087.69	MH-GIS-EP_ssMH_2586	1,087.41	51.6	0.005	8	Glass	0.013	9	10.3	-0.6	
GM-GIS-EP_ssGM_1503	MH-GIS-EP_ssMH_2581	1,107.73	MH-GIS-MH-75	1,110.99	48.3	0.067	8	Glass	0.013	5	7.2	2.6	
GM-GIS-EP_ssGM_1504	MH-GIS-EP_ssMH_2594	1,058.00	MH-GIS-EP_ssMH_2591	1,057.24	96.7	0.008	8	Glass	0.013	45	100	4.6	
GM-GIS-EP_ssGM_1505	MH-GIS-EP_ssMH_2593	1,066.04	MH-GIS-EP_ssMH_2592	1,062.35	170.6	0.022	8	Glass	0.013	1	3.6	-0.6	
GM-GIS-EP_ssGM_1506	MH-GIS-EP_ssMH_2589	1,057.65	MH-GIS-EP_ssMH_2590	1,059.65	134	-0.015	8	Glass	0.013	27	100	4.9	
GM-GIS-EP_ssGM_1507	MH-GIS-EP_ssMH_2598	1,099.00	MH-GIS-EP_ssMH_2580	1,092.25	300	0.023	8	Glass	0.013	8	8.8	-0.6	
GM-GIS-EP_ssGM_1508	MH-GIS-EP_ssMH_2578	1,064.51	MH-GIS-EP_ssMH_2582	1,062.05	102.8	0.024	8	Glass	0.013	9	9.5	-0.6	
GM-GIS-EP_ssGM_1509	MH-GIS-EP_ssMH_2583	1,079.32	MH-GIS-EP_ssMH_2579	1,063.97	155	0.099	8	Glass	0.013	11	10.8	-0.6	
GM-GIS-EP_ssGM_1510	MH-GIS-EP_ssMH_2609	1,046.79	MH-GIS-EP_ssMH_2587	1,053.88	157	0.045	8	Glass	0.013	75	28.1	6.6	
GM-GIS-EP_ssGM_1511	MH-GIS-EP_ssMH_2571	1,044.00	MH-GIS-EP_ssMH_2609	1,046.79	131.3	0.021	8	Glass	0.013	76	28.4	2.3	
GM-GIS-FW_ssGM_189	MH-GIS-FW_ssMH_1607	894	MH-GIS-FW_ssMH_1606	891.15	175.4	0.016	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_208	MH-GIS-FW_ssMH_1603	862.78	MH-GIS-NE_ssMH_1604	868.35	299.1	0.019	8	PVC	0.01	10	9.9	5	
GM-GIS-FW_ssGM_209	MH-IS-39	847.91	MH-GIS-FW_ssMH_1603	862.78	345.5	0.043	8	PVC	0.01	11	10.3	14.3	
GM-GIS-FW_ssGM_215	MH-GIS-FW_ssMH_1595	881.15	MH-GIS-FW_ssMH_1596	871.76	240.9	0.039	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-FW_ssGM_216	MH-GIS-FW_ssMH_1593	890.23	MH-GIS-FW_ssMH_1594	885.7	170.8	0.027	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-FW_ssGM_217	MH-GIS-FW_ssMH_1594	885.7	MH-GIS-FW_ssMH_1595	881.15	150.1	0.03	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-FW_ssGM_223	MH-GIS-FW_ssMH_1606	891.15	MH-GIS-FW_ssMH_1608	884.67	299.5	0.022	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_228	MH-GIS-FW_ssMH_1592	894	MH-GIS-FW_ssMH_1593	890.23	150.8	0.025	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-FW_ssGM_291	MH-GIS-FW_ssMH_1664	844	MH-GIS-FW_ssMH_1661	843.39	111.7	0.005	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-FW_ssGM_292	MH-GIS-FW_ssMH_1661	843.39	MH-GIS-FW_ssMH_1660	841.89	222.3	0.007	8	PVC	0.01	5	7	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-FW_ssGM_293	MH-GIS-FW_ssMH_1663	844.21	MH-GIS-FW_ssMH_1664	844	48.7	0.004	8	PVC	0.01	2	5.2	-0.6	
GM-GIS-FW_ssGM_294	MH-GIS-FW_ssMH_1662	848.3	MH-GIS-FW_ssMH_1664	844	201.1	0.021	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_295	MH-GIS-FW_ssMH_1908	837.79	MH-GIS-FW_ssMH_1659	831.2	153	0.043	8	PVC	0.01	7	8.6	-0.6	
GM-GIS-FW_ssGM_296	MH-GIS-FW_ssMH_1658	813.49	MH-GIS-GC_ssMH_1612	813.35	165.1	9E-04	8	PVC	0.01	13	17	-0.6	
GM-GIS-FW_ssGM_297	MH-GIS-FW_ssMH_1659	831.2	MH-GIS-FW_ssMH_1658	813.49	343.4	0.052	8	PVC	0.01	8	9	-0.6	
GM-GIS-FW_ssGM_298	MH-GIS-FW_ssMH_1660	841.89	MH-GIS-FW_ssMH_1908	837.79	155.5	0.026	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-FW_ssGM_299	MH-GIS-FW_ssMH_1666	864.43	MH-GIS-FW_ssMH_1665	860.56	113.6	0.034	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_300	MH-GIS-FW_ssMH_1656	827.21	MH-GIS-FW_ssMH_1657	815.87	190.5	0.06	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-FW_ssGM_301	MH-GIS-MH-145	834.18	MH-GIS-FW_ssMH_1656	827.21	106.8	0.065	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_302	MH-GIS-FW_ssMH_1655	846.35	MH-GIS-FW_ssMH_1656	827.21	365	0.052	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_303	MH-GIS-FW_ssMH_1654	855.98	MH-GIS-FW_ssMH_1655	846.35	162.5	0.059	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_304	MH-GIS-FW_ssMH_1657	815.87	MH-GIS-FW_ssMH_1658	813.49	143.4	0.017	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-FW_ssGM_305	MH-GIS-FW_ssMH_1665	860.56	MH-GIS-FW_ssMH_1663	844.21	222	0.074	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_306	MH-GIS-MH-147	842.69	MH-GIS-FW_ssMH_1908	837.79	114.4	0.043	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_307	MH-GIS-FW_ssMH_1676	876.82	MH-GIS-FW_ssMH_1675	875	235.7	0.008	8	PVC	0.01	455	71.7	-0.2	
GM-GIS-FW_ssGM_308	MH-GIS-FW_ssMH_1675	875	MH-IS-MH-4	873	401.1	0.005	8	PVC	0.01	456	75.3	-0.2	
GM-GIS-FW_ssGM_309	MH-GIS-FW_ssMH_1667	887.28	MH-GIS-FW_ssMH_1668	884	391	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_313	MH-GIS-FW_ssMH_1669	875.37	MH-GIS-FW_ssMH_1670	872.88	75.7	0.033	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-FW_ssGM_314	MH-GIS-FW_ssMH_1670	872.88	MH-IS-43	861.48	302.9	0.038	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-FW_ssGM_315	MH-GIS-MH-187	877.48	MH-GIS-FW_ssMH_1670	872.88	158.3	0.029	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_316	MH-GIS-FW_ssMH_1668	884	MH-GIS-FW_ssMH_1669	875.37	351.6	0.025	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-GC_ssGM_192	MH-GIS-MH-29	797.76	MH-GIS-GC_ssMH_1578	798	18.4	-0.013	8	Glass	0.013	1	100	5.4	
GM-GIS-GC_ssGM_193	MH-GIS-MH-65	798.64	MH-GIS-GC_ssMH_1578	798	43.3	0.015	8	Glass	0.013	1	100	4.5	
GM-GIS-GC_ssGM_194	MH-GIS-GC_ssMH_1578	798	MH-GIS-GC_ssMH_1579	799.91	132.6	-0.014	8	PVC	0.01	4	100	5.2	
GM-GIS-GC_ssGM_195	MH-GIS-GC_ssMH_1579	799.91	MH-GIS-GC_ssMH_1580	803.06	194.9	-0.016	8	PVC	0.01	5	100	3.3	
GM-GIS-GC_ssGM_196	MH-GIS-GC_ssMH_1580	803.06	MH-GIS-GC_ssMH_1581	803.72	261.4	-0.003	8	PVC	0.01	6	100	0.1	
GM-GIS-GC_ssGM_197	MH-GIS-GC_ssMH_1581	803.72	MH-GIS-GC_ssMH_1582	792.63	287.3	0.039	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-GC_ssGM_198	MH-GIS-GC_ssMH_1582	792.63	MH-GIS-GC_ssMH_1583	794	172.4	-0.008	8	PVC	0.01	9	100	0.8	
GM-GIS-GC_ssGM_205	MH-GIS-GC_ssMH_1583	794	MH-GIS-GC_ssMH_1588	794	57.2	0	8	PVC	0.01	10	19.9	-0.5	
GM-GIS-GC_ssGM_206	MH-GIS-GC_ssMH_1591	822.34	MH-GIS-GC_ssMH_1589	804.13	208.7	0.087	8	PVC	0.01	10	10.3	-0.6	
GM-GIS-GC_ssGM_210	MH-GIS-GC_ssMH_1589	804.13	MH-GIS-GC_ssMH_1588	794	233.8	0.043	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-GC_ssGM_232	MH-GIS-GC_ssMH_1612	813.35	MH-IS-40	811.95	77.2	0.018	8	PVC	0.01	14	11.9	-0.6	
GM-GIS-GC_ssGM_1080	MH-GIS-GC_ssMH_2208	780.56	MH-IS-38	767.46	246.4	0.053	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-GS_ssGM_779	MH-GIS-GS_ssMH_1470	411.77	MH-IS-193	407.54	62.7	0.067	8	Concrete	0.013	9	9.8	-0.6	
GM-GIS-GS_ssGM_780	MH-GIS-GS_ssMH_1493	414	MH-IS-134	408.52	284.5	0.019	8	Concrete	0.013	3	5.6	-0.6	
GM-GIS-GS_ssGM_883	MH-GIS-GS_ssMH_2090	414.88	MH-GIS-GS_ssMH_2091	415.82	47.9	-0.02	8	Concrete	0.013	22	100	3	SM4
GM-GIS-GS_ssGM_884	MH-GIS-GS_ssMH_1528	416.02	MH-GIS-GS_ssMH_2090	414.88	196.2	0.006	8	PVC	0.01	3	100	1.9	
GM-GIS-GS_ssGM_885	MH-GIS-MH-206	419	MH-GIS-GS_ssMH_2091	415.82	258.5	0.012	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-GS_ssGM_886	MH-GIS-GS_ssMH_2091	415.82	MH-GIS-GS_ssMH_1476	418.34	176.4	-0.014	8	Concrete	0.013	28	100	2.1	SM4
GM-GIS-GS_ssGM_887	MH-GIS-GS_ssMH_1476	418.34	MH-IS-257	414.64	242.3	0.015	8	Concrete	0.013	31	18	-0.5	SM4
GM-GIS-GS_ssGM_888	MH-GIS-GS_ssMH_2092	417.72	MH-IS-266	415.38	344.4	0.007	8	Concrete	0.013	3	6	-0.6	
GM-GIS-GS_ssGM_909	MH-GIS-MB_ssMH_1461	416	MH-GIS-GS_ssMH_1468	415.12	249.2	0.004	8	Concrete	0.013	132	44.6	-0.4	
GM-GIS-GS_ssGM_910	MH-GIS-GS_ssMH_1468	415.12	MH-GIS-GS_ssMH_1467	414.38	299.4	0.002	8	Concrete	0.013	135	50	-0.3	
GM-GIS-GS_ssGM_911	MH-GIS-GS_ssMH_1477	412.88	MH-GIS-GS_ssMH_1478	412.68	30.6	0.007	8	Concrete	0.013	144	39.5	-0.4	
GM-GIS-GS_ssGM_913	MH-GIS-GS_ssMH_1478	412.68	MH-GIS-GS_ssMH_2101	411.66	353.3	0.003	8	Concrete	0.013	148	50.4	-0.3	
GM-GIS-GS_ssGM_914	MH-GIS-GS_ssMH_2101	411.66	MH-IS-GS_ssMH_1480	408.77	302.7	0.01	8	Concrete	0.013	151	40.3	-0.4	
GM-GIS-GS_ssGM_918	MH-GIS-GS_ssMH_2106	414.79	MH-GIS-GS_ssMH_2105	414.08	177.7	0.004	8	Concrete	0.013	3	6.8	-0.6	
GM-GIS-GS_ssGM_919	MH-GIS-GS_ssMH_2105	414.08	MH-IS-GS_ssMH_1480	408.77	152.8	0.035	8	Concrete	0.013	6	8	-0.6	
GM-GIS-GS_ssGM_973	MH-GIS-GS_ssMH_2104	418.06	MH-GIS-GS_ssMH_2154	416.74	329.4	0.004	8	Concrete	0.013	3	6.8	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-GS_ssGM_979	MH-GIS-GS_ssMH_2089	415.97	MH-GIS-GS_ssMH_2090	414.88	302.3	0.004	8	PVC	0.01	9	100	1.9	
GM-GIS-GS_ssGM_980	MH-GIS-MC_ssMH_2159	417.2	MH-GIS-GS_ssMH_2089	415.97	267	0.005	8	Ductile Iron	0.013	6	100	0.7	
GM-GIS-GS_ssGM_981	MH-GIS-MH-21	417.4	MH-GIS-MC_ssMH_2159	417.2	11.7	0.017	8	Ductile Iron	0.013	3	100	0.5	
GM-GIS-GS_ssGM_982	MH-GIS-GS_ssMH_2153	414.94	MH-IS-135	409.66	297.3	0.018	8	Concrete	0.013	6	8	-0.6	
GM-GIS-GS_ssGM_983	MH-GIS-GS_ssMH_2103	416.1	MH-GIS-GS_ssMH_2153	414.94	291	0.004	8	Concrete	0.013	3	6.8	-0.6	
GM-GIS-GS_ssGM_1000	MH-GIS-GS_ssMH_1467	414.38	MH-GIS-GS_ssMH_2172	413.45	139.3	0.007	8	Concrete	0.013	138	38.5	-0.4	
GM-GIS-GS_ssGM_1001	MH-GIS-GS_ssMH_2172	413.45	MH-GIS-GS_ssMH_1477	412.88	163.6	0.003	8	Concrete	0.013	141	46.6	-0.4	
GM-GIS-GS_ssGM_1004	MH-GIS-GS_ssMH_2102	414	MH-GIS-GS_ssMH_1470	411.77	363.2	0.006	8	Concrete	0.013	6	8.5	-0.6	
GM-GIS-GS_ssGM_1005	MH-GIS-MH-176	414.6	MH-GIS-GS_ssMH_2102	414	148.8	0.004	8	Concrete	0.013	3	6.8	-0.6	
GM-GIS-GS_ssGM_1021	MH-GIS-MH-79	415.21	MH-GIS-GS_ssMH_2090	414.88	83.3	0.004	8	Concrete	0.013	6	100	2.7	
GM-GIS-GS_ssGM_1022	MH-GIS-MH-78	416.02	MH-GIS-MH-79	415.21	49.5	0.016	8	PVC	0.01	3	100	1.9	
GM-GIS-IR_ssGM_249	MH-GIS-MH-14	605.02	MH-GIS-MH-41	593.77	28.2	0.399	6	Glass	0.013	11	15.5	-0.4	
GM-GIS-IR_ssGM_250	MH-GIS-MH-13	605.89	MH-GIS-MH-14	605.02	4	0.219	6	Glass	0.013	11	14.9	-0.4	
GM-GIS-IR_ssGM_251	MH-GIS-MH-51	606.69	MH-GIS-MH-13	605.89	97.2	0.008	6	Glass	0.013	10	14.3	-0.4	
GM-GIS-IR_ssGM_252	MH-GIS-IR_ssMH_1623	608.04	MH-GIS-MH-51	606.69	36.1	0.037	6	Glass	0.013	9	13.7	-0.4	
GM-GIS-IR_ssGM_253	MH-GIS-MH-133	618.69	MH-GIS-IR_ssMH_1623	608.04	98	0.109	6	Glass	0.013	8	13.1	-0.4	
GM-GIS-IR_ssGM_254	MH-GIS-MH-137	631.94	MH-GIS-MH-133	618.69	101.2	0.131	6	Glass	0.013	7	12.4	-0.4	
GM-GIS-IR_ssGM_255	MH-GIS-MH-136	641.15	MH-GIS-MH-137	631.94	100	0.092	6	Glass	0.013	6	11.7	-0.4	
GM-GIS-IR_ssGM_256	MH-GIS-MH-138	649.38	MH-GIS-MH-136	641.15	100	0.082	6	Glass	0.013	6	10.9	-0.4	
GM-GIS-IR_ssGM_257	MH-GIS-MH-61	657.01	MH-GIS-MH-138	649.38	100	0.076	6	Glass	0.013	5	10	-0.5	
GM-GIS-IR_ssGM_258	MH-GIS-IR_ssMH_1624	662.95	MH-GIS-MH-61	657.01	41	0.145	6	Glass	0.013	4	9.2	-0.5	
GM-GIS-IR_ssGM_259	MH-GIS-MH-111	676.44	MH-GIS-IR_ssMH_1624	662.95	83.4	0.162	6	Glass	0.013	3	8.2	-0.5	
GM-GIS-IR_ssGM_260	MH-GIS-MH-110	685.5	MH-GIS-MH-111	676.44	73.4	0.123	6	Glass	0.013	2	7.2	-0.5	
GM-GIS-IR_ssGM_261	MH-GIS-MH-23	684.07	MH-GIS-MH-110	685.5	82.7	-0.017	6	Glass	0.013	2	100	1	
GM-GIS-IR_ssGM_262	MH-GIS-MH-22	685.57	MH-GIS-MH-23	684.07	12.3	0.122	6	Glass	0.013	1	4.1	-0.5	
GM-GIS-IR_ssGM_674	MH-GIS-IR_ssMH_1695	661.78	MH-GIS-IR_ssMH_1946	658.6	73.5	0.043	8	Glass	0.013	27	16.6	-0.6	
GM-GIS-IR_ssGM_675	MH-GIS-IR_ssMH_1954	720.01	MH-GIS-IR_ssMH_1948	718.96	30.1	0.035	8	Glass	0.013	2	4.9	-0.6	
GM-GIS-IR_ssGM_676	MH-GIS-IR_ssMH_1973	674.31	MH-GIS-IR_ssMH_1977	664.88	122.9	0.077	8	Glass	0.013	6	8.1	-0.6	
GM-GIS-IR_ssGM_677	MH-GIS-IR_ssMH_1946	658.6	MH-GIS-IR_ssMH_1979	644.64	157.8	0.088	8	Glass	0.013	28	16.9	-0.6	
GM-GIS-IR_ssGM_678	MH-GIS-IR_ssMH_1949	685.69	MH-GIS-IR_ssMH_1976	677.81	118.5	0.066	8	Glass	0.013	16	12.9	-0.6	
GM-GIS-IR_ssGM_679	MH-GIS-IR_ssMH_1952	723.4	MH-GIS-IR_ssMH_1954	720.01	183.1	0.019	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_680	MH-GIS-IR_ssMH_1953	717.36	MH-GIS-IR_ssMH_1954	720.01	224.3	-0.012	8	Glass	0.013	1	100	2	
GM-GIS-IR_ssGM_681	MH-GIS-IR_ssMH_1980	639	MH-GIS-IR_ssMH_1981	641.5	151.6	-0.016	8	Glass	0.013	37	100	2.1	
GM-GIS-IR_ssGM_682	MH-GIS-IR_ssMH_1979	644.64	MH-GIS-IR_ssMH_1980	639	160	0.035	8	Glass	0.013	37	19.4	-0.5	
GM-GIS-IR_ssGM_683	MH-GIS-IR_ssMH_1978	655.71	MH-GIS-IR_ssMH_1979	644.64	169.4	0.065	8	Glass	0.013	8	9	-0.6	
GM-GIS-IR_ssGM_684	MH-GIS-IR_ssMH_1977	664.88	MH-GIS-IR_ssMH_1978	655.71	171	0.054	8	Glass	0.013	7	8.6	-0.6	
GM-GIS-IR_ssGM_685	MH-GIS-IR_ssMH_1955	707.87	MH-GIS-IR_ssMH_1956	701.78	99	0.062	8	Glass	0.013	4	6.4	-0.6	
GM-GIS-IR_ssGM_686	MH-GIS-IR_ssMH_1948	718.96	MH-GIS-IR_ssMH_1955	707.87	140.9	0.079	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_687	MH-GIS-IR_ssMH_1958	705.64	MH-GIS-IR_ssMH_1959	693	126.7	0.1	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-IR_ssGM_688	MH-GIS-IR_ssMH_1957	730.49	MH-GIS-IR_ssMH_1958	705.64	262.3	0.095	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_689	MH-GIS-IR_ssMH_1959	693	MH-GIS-IR_ssMH_1968	689.98	121.5	0.025	8	Glass	0.013	2	4.9	-0.6	
GM-GIS-IR_ssGM_690	MH-GIS-IR_ssMH_1962	747.5	MH-GIS-IR_ssMH_1963	734.42	162.3	0.081	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_691	MH-GIS-IR_ssMH_1961	767.17	MH-GIS-IR_ssMH_1962	747.5	255.4	0.077	8	Glass	0.013	2	4.9	-0.6	
GM-GIS-IR_ssGM_692	MH-GIS-IR_ssMH_1960	766.86	MH-GIS-IR_ssMH_1961	767.17	73.7	-0.004	8	Glass	0.013	2	56.6	-0.3	
GM-GIS-IR_ssGM_693	MH-GIS-MH-114	770.66	MH-GIS-IR_ssMH_1960	766.86	75.3	0.05	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_694	MH-GIS-IR_ssMH_1947	757.4	MH-GIS-IR_ssMH_1969	741.39	147.1	0.109	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_695	MH-GIS-IR_ssMH_1963	734.42	MH-GIS-IR_ssMH_1964	717.96	217.8	0.076	8	Glass	0.013	4	6.4	-0.6	
GM-GIS-IR_ssGM_696	MH-GIS-IR_ssMH_1964	717.96	MH-GIS-IR_ssMH_1965	709.36	93.4	0.092	8	Glass	0.013	5	7	-0.6	
GM-GIS-IR_ssGM_697	MH-GIS-IR_ssMH_1965	709.36	MH-GIS-IR_ssMH_1966	701.3	85.6	0.094	8	Glass	0.013	6	7.6	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-IR_ssGM_698	MH-GIS-IR_ssMH_1966	701.3	MH-GIS-IR_ssMH_1967	695.27	91.3	0.066	8	Glass	0.013	11	10.7	-0.6	
GM-GIS-IR_ssGM_699	MH-GIS-IR_ssMH_1956	701.78	MH-GIS-IR_ssMH_1966	701.3	64.4	0.007	8	Glass	0.013	5	7.2	-0.6	
GM-GIS-IR_ssGM_700	MH-GIS-IR_ssMH_1967	695.27	MH-GIS-IR_ssMH_1968	689.98	197.5	0.027	8	Glass	0.013	12	11.1	-0.6	
GM-GIS-IR_ssGM_701	MH-GIS-IR_ssMH_1968	689.98	MH-GIS-IR_ssMH_1949	685.69	158.1	0.027	8	Glass	0.013	15	12.6	-0.6	
GM-GIS-IR_ssGM_702	MH-GIS-IR_ssMH_1969	741.39	MH-GIS-IR_ssMH_1970	713.33	255.2	0.11	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-IR_ssGM_703	MH-GIS-IR_ssMH_1970	713.33	MH-GIS-IR_ssMH_1971	692.5	189.8	0.11	8	Glass	0.013	2	4.9	-0.6	
GM-GIS-IR_ssGM_704	MH-GIS-IR_ssMH_1971	692.5	MH-GIS-IR_ssMH_1972	677.86	142.1	0.103	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_705	MH-GIS-IR_ssMH_1972	677.86	MH-GIS-IR_ssMH_1973	674.31	55.7	0.064	8	Glass	0.013	4	6.4	-0.6	
GM-GIS-IR_ssGM_706	MH-GIS-IR_ssMH_1974	674	MH-GIS-IR_ssMH_1973	674.31	76.9	-0.004	8	Glass	0.013	2	55.4	-0.3	
GM-GIS-IR_ssGM_707	MH-GIS-IR_ssMH_1975	677.11	MH-GIS-IR_ssMH_1974	674	145.1	0.021	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_708	MH-GIS-IR_ssMH_1981	641.5	MH-GIS-IR_ssMH_1982	609.69	301.6	0.105	8	Glass	0.013	38	19.9	-0.5	
GM-GIS-IR_ssGM_709	MH-GIS-IR_ssMH_1976	677.81	MH-GIS-IR_ssMH_1951	667.09	127.6	0.084	8	Glass	0.013	17	13.2	-0.6	
GM-GIS-IR_ssGM_710	MH-GIS-IR_ssMH_1951	667.09	MH-IS-129	645.79	117.2	0.182	8	Glass	0.013	18	13.5	-0.6	
GM-GIS-IR_ssGM_735	MH-GIS-IR_ssMH_1982	609.69	MH-IS-48	588.13	104.8	0.206	8	Glass	0.013	39	20.1	-0.5	
GM-GIS-JH_ssGM_1102	MH-GIS-MH-74	466.99	MH-IS-16	465.97	48.5	0.021	8	Ductile Iron	0.013	220	49.1	-0.3	
GM-GIS-KC_ssGM_747	MH-GIS-MH-188	418.46	MH-GIS-MH-189	417.83	158.6	0.004	8	PVC	0.01	3	5.5	-0.6	
GM-GIS-KC_ssGM_748	MH-GIS-MH-189	417.83	MH-GIS-KC_ssMH_2009	417.17	163.9	0.004	8	PVC	0.01	5	7.7	-0.6	
GM-GIS-KC_ssGM_749	MH-GIS-KC_ssMH_2009	417.17	MH-GIS-MH-155	416.67	125.3	0.004	8	PVC	0.01	8	9.3	-0.6	
GM-GIS-KC_ssGM_750	MH-GIS-MH-155	416.67	Pump Station No. 6 Wetwell	415	213.3	0.008	8	PVC	0.01	11	49.5	-0.3	
GM-GIS-KC_ssGM_857	MH-GIS-MH-209	418.15	MH-IS-30	415.36	355.8	0.008	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_860	MH-GIS-MH-76	418.62	MH-GIS-KC_ssMH_1509	417.94	49.3	0.014	8	PVC	0.01	9	13.2	-0.6	
GM-GIS-KC_ssGM_861	MH-GIS-KC_ssMH_1509	417.94	MH-IS-24	416.67	281.1	0.005	8	PVC	0.01	17	100	0.1	
GM-GIS-KC_ssGM_870	MH-GIS-KC_ssMH_2084	482.14	MH-GIS-KC_ssMH_2083	463.1	295.4	0.064	8	PVC	0.01	331	60.9	-0.3	
GM-GIS-KC_ssGM_871	MH-GIS-KC_ssMH_2083	463.1	MH-GIS-KC_ssMH_2082	440.53	345.7	0.065	8	PVC	0.01	340	61.7	-0.3	
GM-GIS-KC_ssGM_872	MH-GIS-KC_ssMH_2082	440.53	MH-IS-57	425.87	240.2	0.061	8	PVC	0.01	349	62.5	-0.2	
GM-GIS-KC_ssGM_891	MH-GIS-MH-195	522.26	MH-GIS-KC_ssMH_2084	482.14	281.4	0.143	8	PVC	0.01	44	21.3	-0.5	
GM-GIS-KC_ssGM_892	MH-GIS-MH-199	557.17	MH-GIS-MH-195	522.26	183	0.191	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-KC_ssGM_893	MH-GIS-MH-165	569.29	MH-GIS-MH-199	557.17	203.7	0.06	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-KC_ssGM_894	MH-GIS-MH-164	577.65	MH-GIS-MH-165	569.29	138.8	0.06	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_895	MH-GIS-MH-194	561.05	MH-GIS-MH-195	522.26	173.8	0.223	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_922	MH-GIS-KC_ssMH_2108	1,027.84	MH-GIS-KC_ssMH_2109	1,006.90	270.9	0.077	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_923	MH-GIS-KC_ssMH_2109	1,006.90	MH-GIS-KC_ssMH_2111	970.9	297.5	0.121	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-KC_ssGM_924	MH-GIS-KC_ssMH_2111	970.9	MH-GIS-KC_ssMH_2110	961.14	117.7	0.083	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-KC_ssGM_925	MH-GIS-KC_ssMH_2110	961.14	MH-GIS-KC_ssMH_2112	946.39	98.7	0.149	8	PVC	0.01	35	18.9	-0.5	
GM-GIS-KC_ssGM_926	MH-GIS-KC_ssMH_2112	946.39	MH-GIS-KC_ssMH_2113	926.05	298.9	0.068	8	PVC	0.01	44	21.3	-0.5	
GM-GIS-KC_ssGM_927	MH-GIS-KC_ssMH_2113	926.05	MH-GIS-MH-123	906.59	236.2	0.082	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-KC_ssGM_928	MH-GIS-MH-123	906.59	MH-GIS-KC_ssMH_2115	900.25	83.5	0.076	8	PVC	0.01	61	25.3	-0.5	
GM-GIS-KC_ssGM_929	MH-GIS-KC_ssMH_2115	900.25	MH-GIS-KC_ssMH_2116	887.69	229.2	0.055	8	PVC	0.01	70	27	-0.5	
GM-GIS-KC_ssGM_930	MH-GIS-KC_ssMH_2116	887.69	MH-GIS-KC_ssMH_2117	874.03	141.2	0.097	8	PVC	0.01	78	28.8	-0.5	
GM-GIS-KC_ssGM_931	MH-GIS-KC_ssMH_2117	874.03	MH-GIS-KC_ssMH_2118	847.41	300.1	0.089	8	PVC	0.01	87	30.4	-0.5	
GM-GIS-KC_ssGM_932	MH-GIS-KC_ssMH_2118	847.41	MH-GIS-KC_ssMH_2119	790.79	349.9	0.162	8	PVC	0.01	96	31.9	-0.5	
GM-GIS-KC_ssGM_933	MH-GIS-KC_ssMH_2119	790.79	MH-GIS-KC_ssMH_2122	729.26	389.2	0.158	8	PVC	0.01	105	33.4	-0.4	
GM-GIS-KC_ssGM_934	MH-GIS-KC_ssMH_2122	729.26	MH-GIS-KC_ssMH_2196	707.3	203.5	0.108	8	PVC	0.01	113	34.8	-0.4	
GM-GIS-KC_ssGM_935	MH-GIS-KC_ssMH_2196	707.3	MH-GIS-KC_ssMH_2197	701.32	62.5	0.096	8	PVC	0.01	122	36.2	-0.4	
GM-GIS-KC_ssGM_936	MH-GIS-KC_ssMH_2197	701.32	MH-GIS-KC_ssMH_2123	691.09	106.9	0.096	8	PVC	0.01	131	37.5	-0.4	
GM-GIS-KC_ssGM_937	MH-GIS-KC_ssMH_2123	691.09	MH-GIS-KC_ssMH_2124	686.29	81	0.059	8	PVC	0.01	139	38.7	-0.4	
GM-GIS-KC_ssGM_938	MH-GIS-KC_ssMH_2124	686.29	MH-GIS-KC_ssMH_2125	653.86	85.6	0.379	8	Ductile Iron	0.013	148	40	-0.4	
GM-GIS-KC_ssGM_939	MH-GIS-KC_ssMH_2125	653.86	MH-GIS-KC_ssMH_2126	651.73	144	0.015	8	PVC	0.01	157	41.2	-0.4	
GM-GIS-KC_ssGM_940	MH-GIS-KC_ssMH_2126	651.73	MH-GIS-KC_ssMH_2168	644.03	103.7	0.074	8	PVC	0.01	166	42.4	-0.4	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-KC_ssGM_941	MH-GIS-KC_ssMH_2168	644.03	MH-GIS-KC_ssMH_2127	641.46	315.3	0.008	8	PVC	0.01	174	43.5	-0.4	
GM-GIS-KC_ssGM_942	MH-GIS-KC_ssMH_2127	641.46	MH-GIS-KC_ssMH_2128	634.26	66.3	0.109	8	PVC	0.01	183	44.6	-0.4	
GM-GIS-KC_ssGM_943	MH-GIS-KC_ssMH_2128	634.26	MH-GIS-KC_ssMH_2129	611.91	210.3	0.106	8	PVC	0.01	192	45.8	-0.4	
GM-GIS-KC_ssGM_944	MH-GIS-KC_ssMH_2129	611.91	MH-GIS-KC_ssMH_2130	603.73	76.9	0.106	8	PVC	0.01	201	46.8	-0.4	
GM-GIS-KC_ssGM_945	MH-GIS-KC_ssMH_2130	603.73	MH-GIS-KC_ssMH_2131	592.15	108.9	0.106	8	PVC	0.01	209	47.9	-0.3	
GM-GIS-KC_ssGM_946	MH-GIS-KC_ssMH_2131	592.15	MH-GIS-KC_ssMH_2132	561.7	286.5	0.106	8	PVC	0.01	218	48.9	-0.3	
GM-GIS-KC_ssGM_947	MH-GIS-KC_ssMH_2132	561.7	MH-GIS-KC_ssMH_2133	549	131.6	0.096	8	PVC	0.01	227	49.9	-0.3	
GM-GIS-KC_ssGM_948	MH-GIS-KC_ssMH_2133	549	MH-GIS-KC_ssMH_2134	535.47	176.1	0.077	8	PVC	0.01	235	50.9	-0.3	
GM-GIS-KC_ssGM_949	MH-GIS-KC_ssMH_2134	535.47	MH-GIS-KC_ssMH_2135	534.13	43.6	0.031	8	PVC	0.01	244	51.9	-0.3	
GM-GIS-KC_ssGM_950	MH-GIS-KC_ssMH_2135	534.13	MH-GIS-KC_ssMH_2120	521.21	135.8	0.095	8	PVC	0.01	253	52.8	-0.3	
GM-GIS-KC_ssGM_984	MH-GIS-KC_ssMH_2084	482.14	MH-GIS-KC_ssMH_2160	482.58	9.6	0.046	8	PVC	0.01	279	55.6	0.1	
GM-GIS-KC_ssGM_987	MH-GIS-KC_ssMH_2121	507.3	MH-GIS-KC_ssMH_2160	482.58	373.8	0.066	8	PVC	0.01	270	54.7	-0.3	
GM-GIS-KC_ssGM_988	MH-GIS-KC_ssMH_2120	521.21	MH-GIS-KC_ssMH_2121	507.3	184.9	0.075	8	PVC	0.01	262	53.8	-0.3	
GM-GIS-KR_ssGM_29	MH-GIS-KR_ssMH_1445	579.09	MH-GIS-KR_ssMH_1442	570.02	120.4	0.075	8	PVC	0.01	13	11.5	-0.6	
GM-GIS-KR_ssGM_34	MH-GIS-KR_ssMH_1442	570.02	MH-GIS-KR_ssMH_1441	558.99	117.6	0.094	8	PVC	0.01	15	12.6	-0.6	
GM-GIS-KR_ssGM_35	MH-GIS-KR_ssMH_1441	558.99	MH-GIS-KR_ssMH_1439	565.63	153.6	-0.043	8	PVC	0.01	16	100	6.1	
GM-GIS-KR_ssGM_36	MH-GIS-KR_ssMH_1439	565.63	MH-GIS-KR_ssMH_1431	552.59	70.1	0.186	8	PVC	0.01	19	13.8	-0.6	
GM-GIS-KR_ssGM_554	MH-GIS-MH-88	587.38	MH-IS-89	577.39	54.9	0.182	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_557	MH-GIS-MH-41	593.77	MH-IS-89	577.39	124.3	0.132	6	PVC	0.01	12	16	-0.4	
GM-GIS-KR_ssGM_610	MH-GIS-MH-43	553.07	MH-GIS-KR_ssMH_1900	546.6	29.5	0.219	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-KR_ssGM_611	MH-GIS-KR_ssMH_1899	550.74	MH-GIS-KR_ssMH_1898	549.33	161.7	0.009	8	PVC	0.01	53	23.6	-0.5	
GM-GIS-KR_ssGM_612	MH-GIS-KR_ssMH_1431	552.59	MH-GIS-KR_ssMH_1899	550.74	181.5	0.01	8	PVC	0.01	53	23.4	-0.5	
GM-GIS-KR_ssGM_613	MH-GIS-KR_ssMH_1898	549.33	MH-GIS-KR_ssMH_1901	548.1	163.4	0.008	8	PVC	0.01	54	23.8	-0.5	
GM-GIS-KR_ssGM_614	MH-GIS-KR_ssMH_1901	548.1	MH-GIS-KR_ssMH_1900	546.6	141.6	0.011	8	PVC	0.01	55	24	-0.5	
GM-GIS-KR_ssGM_615	MH-GIS-KR_ssMH_1900	546.6	MH-GIS-KR_ssMH_1897	535.33	181.1	0.062	8	PVC	0.01	57	24.3	-0.5	
GM-GIS-KR_ssGM_616	MH-GIS-KR_ssMH_1897	535.33	MH-GIS-KR_ssMH_1896	518.29	184.2	0.093	8	PVC	0.01	57	24.5	-0.5	
GM-GIS-KR_ssGM_617	MH-GIS-KR_ssMH_1896	518.29	MH-GIS-KR_ssMH_1902	515.25	160.9	0.019	8	PVC	0.01	59	24.8	-0.5	
GM-GIS-KR_ssGM_618	MH-GIS-KR_ssMH_1902	515.25	MH-GIS-KR_ssMH_1903	513.28	230.4	0.009	8	PVC	0.01	60	25	-0.5	
GM-GIS-KR_ssGM_619	MH-GIS-KR_ssMH_1903	513.28	MH-GIS-KR_ssMH_1904	511.5	192.5	0.009	8	PVC	0.01	61	25.2	-0.5	
GM-GIS-KR_ssGM_620	MH-GIS-KR_ssMH_1904	511.5	MH-IS-128	510.28	158.6	0.008	8	PVC	0.01	62	25.4	-0.5	
GM-GIS-KR_ssGM_621	MH-GIS-MH-31	528.89	MH-GIS-KR_ssMH_1896	518.29	19.3	0.55	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_642	MH-GIS-MH-20	570.83	MH-GIS-KR_ssMH_1442	570.02	10.2	0.08	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-KR_ssGM_643	MH-GIS-MH-151	579.54	MH-GIS-MH-20	570.83	118.6	0.073	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_644	MH-GIS-KR_ssMH_1916	559.83	MH-GIS-KR_ssMH_1439	565.63	104.6	-0.055	8	PVC	0.01	1	100	5.2	
GM-GIS-KR_ssGM_645	MH-GIS-KR_ssMH_1917	585.29	MH-GIS-KR_ssMH_1439	565.63	256.8	0.077	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_536	MH-IS-MH-2	408.8	MH-GIS-KV_ssMH_1913	417.96	20.6	0.444	8	PVC	0.01	2	4.9	8.5	
GM-GIS-KV_ssGM_539	MH-GIS-KV_ssMH_2205	458.37	MH-IS-82	448.73	44.8	0.215	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_558	MH-GIS-MH-108	504.12	MH-IS-121	498.94	71.9	0.072	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_752	MH-GIS-AR_ssMH_2017	517.96	MH-IS-154	499.58	185.3	0.099	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-KV_ssGM_970	MH-GIS-KV_ssMH_2150	418.31	MH-GIS-KV_ssMH_1913	417.96	87.6	0.004	8	PVC	0.01	2	4.4	-0.6	
GM-GIS-KV_ssGM_971	MH-GIS-KV_ssMH_2151	419.18	MH-GIS-KV_ssMH_2150	418.31	217.1	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-KV_ssGM_1063	MH-GIS-KV_ssMH_2190	449.99	MH-IS-81	438.64	73.2	0.155	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-KV_ssGM_1064	MH-GIS-KV_ssMH_2191	450.77	MH-GIS-KV_ssMH_2190	449.99	196.2	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-KV_ssGM_1088	MH-GIS-KV_ssMH_2186	457	MH-IS-82	448.73	154.5	0.054	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-MB_ssGM_842	MH-GIS-MB_ssMH_2062	417.89	MH-GIS-MB_ssMH_1459	415.85	296.9	0.007	8	Glass	0.013	12	11.3	-0.6	
GM-GIS-MB_ssGM_843	MH-GIS-MB_ssMH_1459	415.85	MH-GIS-MB_ssMH_1460	414.21	235.7	0.007	8	Concrete	0.013	36	19.3	-0.5	
GM-GIS-MB_ssGM_844	MH-GIS-MB_ssMH_1458	415.48	MH-GIS-MB_ssMH_1459	415.85	258.2	-0.001	8	Glass	0.013	12	79.3	-0.1	
GM-GIS-MB_ssGM_845	MH-GIS-MB_ssMH_1457	416.2	MH-GIS-MB_ssMH_1458	415.48	257.9	0.003	8	Glass	0.013	8	11.5	-0.6	
GM-GIS-MB_ssGM_846	MH-GIS-MB_ssMH_1460	414.21	MH-GIS-MB_ssMH_2063	415.06	147.3	-0.006	8	Glass	0.013	44	100	0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-MB_ssGM_847	MH-GIS-MB_ssMH_2063	415.06	MH-GIS-MB_ssMH_2064	415.09	272.7	-1E-04	8	Concrete	0.013	52	59.6	-0.3	
GM-GIS-MB_ssGM_848	MH-GIS-MB_ssMH_2064	415.09	MH-GIS-MB_ssMH_2066	412.31	270.3	0.01	8	Concrete	0.013	56	24.2	-0.5	
GM-GIS-MB_ssGM_849	MH-GIS-MB_ssMH_2066	412.31	MH-GIS-MB_ssMH_2065	405.51	52.5	0.129	8	Concrete	0.013	60	25.1	-0.5	SM2
GM-GIS-MB_ssGM_850	MH-GIS-MB_ssMH_2065	405.51	MH-GIS-MB_ssMH_2067	408.72	220.6	-0.015	8	Concrete	0.013	64	100	5.6	SM2
GM-GIS-MB_ssGM_851	MH-GIS-MB_ssMH_2068	416.46	MH-GIS-MB_ssMH_2063	415.06	293	0.005	8	Concrete	0.013	4	7.3	-0.6	
GM-GIS-MB_ssGM_852	MH-GIS-MB_ssMH_2070	414	MH-GIS-MB_ssMH_2069	416.57	297.5	-0.009	8	Concrete	0.013	20	100	2.9	
GM-GIS-MB_ssGM_853	MH-GIS-MB_ssMH_2071	414.51	MH-GIS-MB_ssMH_2070	414	236.3	0.002	8	Concrete	0.013	4	100	2.4	
GM-GIS-MB_ssGM_854	MH-GIS-MB_ssMH_2072	417.27	MH-GIS-MB_ssMH_2073	409.91	101.6	0.072	8	Concrete	0.013	52	23.4	-0.5	
GM-GIS-MB_ssGM_896	MH-GIS-MB_ssMH_2073	409.91	MH-GIS-MB_ssMH_2096	411.42	87.3	-0.017	8	PVC	0.01	56	100	1.1	
GM-GIS-MB_ssGM_897	MH-GIS-MB_ssMH_2097	415.13	MH-GIS-MB_ssMH_1460	414.21	432.2	0.002	8	Concrete	0.013	4	51.1	-0.3	
GM-GIS-MB_ssGM_898	MH-GIS-MH-150	418.93	MH-GIS-MB_ssMH_2098	418.47	117	0.004	8	Glass	0.013	4	7.6	-0.6	
GM-GIS-MB_ssGM_899	MH-GIS-MB_ssMH_2098	418.47	MH-GIS-MB_ssMH_2062	417.89	143.9	0.004	8	Vitrified Clay	0.013	8	10.6	-0.6	
GM-GIS-MB_ssGM_902	MH-GIS-MB_ssMH_1456	414	MH-GIS-MB_ssMH_1455	414	185.5	0	8	Concrete	0.013	4	100	2.9	
GM-GIS-MB_ssGM_903	MH-GIS-MB_ssMH_1455	414	MH-GIS-MB_ssMH_2070	414	256.9	0	8	Concrete	0.013	12	100	2.9	
GM-GIS-MB_ssGM_904	MH-GIS-MB_ssMH_2069	416.57	MH-GIS-MB_ssMH_1463	415.51	204.1	0.005	8	Concrete	0.013	32	100	0.3	
GM-GIS-MB_ssGM_905	MH-GIS-MB_ssMH_1463	415.51	MH-GIS-MB_ssMH_1462	414	146.3	0.01	8	Concrete	0.013	36	100	1.4	
GM-GIS-MB_ssGM_906	MH-GIS-MB_ssMH_1462	414	MH-GIS-MB_ssMH_2099	414	152.2	0	8	Concrete	0.013	40	100	2.9	
GM-GIS-MB_ssGM_907	MH-GIS-MB_ssMH_2099	414	MH-GIS-MB_ssMH_2100	412.94	189.2	0.006	8	Concrete	0.013	44	100	2.9	
GM-GIS-MB_ssGM_908	MH-GIS-MB_ssMH_2100	412.94	MH-GIS-MB_ssMH_2072	417.27	140.4	-0.031	8	Concrete	0.013	48	100	3.9	
GM-GIS-MB_ssGM_912	MH-GIS-MH-180	414	MH-GIS-MB_ssMH_1455	414	154	0	8	Concrete	0.013	4	100	2.9	
GM-GIS-MB_ssGM_921	MH-GIS-MB_ssMH_2152	416.16	MH-GIS-MB_ssMH_2069	416.57	399	-0.001	8	Concrete	0.013	8	100	0.8	
GM-GIS-MB_ssGM_997	MH-GIS-MB_ssMH_2170	417.01	MH-GIS-MB_ssMH_1459	415.85	163.5	0.007	8	Concrete	0.013	8	9.2	-0.6	
GM-GIS-MB_ssGM_998	MH-GIS-MB_ssMH_2171	417.99	MH-GIS-MB_ssMH_2170	417.01	263	0.004	8	Concrete	0.013	4	7.8	-0.6	
GM-GIS-MB_ssGM_999	MH-GIS-MH-141	416.19	MH-GIS-MB_ssMH_1457	416.2	101	-1E-04	8	Concrete	0.013	4	17.4	-0.6	
GM-GIS-MB_ssGM_1014	MH-GIS-MB_ssMH_2096	411.42	PS4WW	399.83	3.1	3.713	8	Cast iron	0.013	129	37.1	-0.4	
GM-GIS-MB_ssGM_1017	MH-GIS-MB_ssMH_2067	408.72	MH-GIS-MB_ssMH_2096	411.42	21.2	-0.127	8	Concrete	0.013	68	100	2.3	SM2
GM-GIS-MB_ssGM_1089	MH-GIS-MH-143	417.14	MH-GIS-MB_ssMH_2152	416.16	103.1	0.01	8	Concrete	0.013	4	66.8	-0.2	
GM-GIS-MU_ssGM_332	MH-GIS-MH-130	824.65	MH-GIS-MH-28	822.32	100	0.023	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_333	MH-GIS-MH-129	830.87	MH-GIS-MH-130	824.65	90	0.069	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_334	MH-GIS-MH-201	814.99	MH-GIS-MH-80	819.26	202.5	-0.021	8	PVC	0.01	1	100	6	
GM-GIS-MU_ssGM_335	MH-GIS-MH-204	820.15	MH-GIS-MH-201	814.99	221.1	0.023	8	PVC	0.01	1	100	0.2	
GM-GIS-MU_ssGM_336	MH-GIS-MH-80	819.26	MH-GIS-MU_ssMH_1810	821.61	50	-0.047	8	PVC	0.01	2	100	1.8	
GM-GIS-MU_ssGM_406	MH-GIS-MU_ssMH_1797	844.97	MH-GIS-MU_ssMH_1798	840.84	109.8	0.038	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_407	MH-GIS-MU_ssMH_1798	840.84	MH-GIS-MU_ssMH_1799	841.52	151.2	-0.005	8	PVC	0.01	2	100	0.1	
GM-GIS-MU_ssGM_408	MH-GIS-MU_ssMH_1799	841.52	MH-GIS-MU_ssMH_1809	832.29	149	0.062	8	PVC	0.01	4	6.6	-0.6	
GM-GIS-MU_ssGM_409	MH-GIS-MU_ssMH_1801	839	MH-GIS-MU_ssMH_1800	831.63	206.8	0.036	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_410	MH-GIS-MU_ssMH_1800	831.63	MH-GIS-MU_ssMH_1802	829	42.5	0.062	8	PVC	0.01	1	100	0.1	
GM-GIS-MU_ssGM_411	MH-GIS-MU_ssMH_1803	828.62	MH-GIS-MU_ssMH_1809	832.29	198.9	-0.018	8	PVC	0.01	4	100	3.1	
GM-GIS-MU_ssGM_412	MH-GIS-MU_ssMH_1802	829	MH-GIS-MU_ssMH_1804	827.72	137.6	0.009	8	PVC	0.01	2	100	2.7	
GM-GIS-MU_ssGM_413	MH-GIS-MU_ssMH_1804	827.72	MH-GIS-MU_ssMH_1803	828.62	93.8	-0.01	8	PVC	0.01	3	100	4	
GM-GIS-MU_ssGM_414	MH-GIS-MU_ssMH_1806	845.55	MH-GIS-MU_ssMH_1807	837.51	116.7	0.069	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_415	MH-GIS-MU_ssMH_1807	837.51	MH-GIS-MU_ssMH_1808	836.34	107.4	0.011	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_416	MH-GIS-MU_ssMH_1808	836.34	MH-GIS-MU_ssMH_1809	832.29	160.6	0.025	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-MU_ssGM_417	MH-GIS-MU_ssMH_1811	818.4	MH-GIS-MU_ssMH_1805	809.96	80.2	0.105	8	PVC	0.01	17	13.3	-0.6	
GM-GIS-MU_ssGM_418	MH-GIS-MU_ssMH_1811	818.4	MH-GIS-MH-28	822.32	17.9	0.219	8	PVC	0.01	2	4.7	3.3	
GM-GIS-MU_ssGM_419	MH-GIS-MU_ssMH_1812	841.15	MH-GIS-MU_ssMH_1799	841.52	68.1	-0.005	8	PVC	0.01	1	62.9	-0.2	
GM-GIS-MU_ssGM_420	MH-GIS-MH-146	844.16	MH-GIS-MU_ssMH_1812	841.15	109.6	0.027	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_421	MH-GIS-MH-131	847.51	MH-GIS-MU_ssMH_1797	844.97	94.4	0.027	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_422	MH-GIS-MU_ssMH_1810	821.61	MH-GIS-MU_ssMH_1811	818.4	327.2	0.01	8	PVC	0.01	14	12.1	-0.6	

City of Snoqualmie
General Sewer Plan
SewerGEMS Results

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-MU_ssGM_423	MH-GIS-MU_ssMH_1813	831.08	MH-GIS-MU_ssMH_1810	821.61	160.2	0.059	8	PVC	0.01	12	10.8	-0.6	
GM-GIS-MU_ssGM_424	MH-GIS-MU_ssMH_1809	832.29	MH-GIS-MU_ssMH_1813	831.08	32.4	0.037	8	PVC	0.01	11	10.5	-0.6	
GM-GIS-NC_ssGM_713	MH-GIS-MH-159	411.85	MH-GIS-NC_ssMH_1983	411.33	129.6	0.004	8	Glass	0.013	2	5.9	-0.6	
GM-GIS-NC_ssGM_714	MH-GIS-NC_ssMH_1983	411.33	MH-IS-188	407.79	180.3	0.02	8	Glass	0.013	5	6.9	-0.6	
GM-GIS-NC_ssGM_715	MH-GIS-NC_ssMH_1984	411.05	MH-IS-148	404.7	271.6	0.023	8	Concrete	0.013	40	20.4	-0.5	
GM-GIS-NC_ssGM_716	MH-GIS-NC_ssMH_1985	413.81	MH-GIS-NC_ssMH_1984	411.05	237.1	0.012	8	Concrete	0.013	38	19.8	-0.5	
GM-GIS-NC_ssGM_717	MH-GIS-NC_ssMH_1987	414	MH-GIS-NC_ssMH_1990	414	75	0	8	Concrete	0.013	31	35.1	-0.4	
GM-GIS-NC_ssGM_718	MH-GIS-NC_ssMH_1990	414	MH-GIS-NC_ssMH_1991	413.35	127.3	0.005	8	Concrete	0.013	33	19.7	-0.5	
GM-GIS-NC_ssGM_719	MH-GIS-NC_ssMH_1991	413.35	MH-GIS-NC_ssMH_1985	413.81	73	-0.006	8	Concrete	0.013	35	99.7	0	SM4
GM-GIS-NC_ssGM_720	MH-GIS-NC_ssMH_1986	413.35	MH-GIS-NC_ssMH_1987	414	143.2	-0.005	8	Concrete	0.013	5	100	0.2	
GM-GIS-NC_ssGM_721	MH-GIS-MH-156	410.7	MH-GIS-NC_ssMH_1986	413.35	127.2	-0.021	8	Concrete	0.013	2	100	2.9	
GM-GIS-NC_ssGM_722	MH-GIS-NC_ssMH_1988	414	MH-GIS-NC_ssMH_1987	414	14.9	0	8	Concrete	0.013	24	35.7	-0.4	
GM-GIS-NC_ssGM_723	MH-GIS-NC_ssMH_1989	414	MH-GIS-NC_ssMH_1988	414	49.7	0	8	Concrete	0.013	21	37.2	-0.4	
GM-GIS-NC_ssGM_724	MH-GIS-NC_ssMH_1993	414	MH-GIS-NC_ssMH_1992	414	15.9	0	8	Concrete	0.013	17	40.5	-0.4	
GM-GIS-NC_ssGM_725	MH-GIS-NC_ssMH_1992	414	MH-GIS-NC_ssMH_1989	414	172	0	8	Concrete	0.013	19	40.3	-0.4	
GM-GIS-NC_ssGM_726	MH-GIS-NC_ssMH_1995	412.09	MH-GIS-NC_ssMH_1996	413.4	161.4	-0.008	8	Concrete	0.013	7	100	1.5	
GM-GIS-NC_ssGM_727	MH-GIS-MH-109	412.69	MH-GIS-NC_ssMH_1996	413.4	72.4	-0.01	8	Concrete	0.013	2	100	0.9	
GM-GIS-NC_ssGM_728	MH-GIS-NC_ssMH_1996	413.4	MH-GIS-NC_ssMH_1994	413.99	123.2	-0.005	8	Concrete	0.013	12	100	0.2	
GM-GIS-NC_ssGM_729	MH-GIS-NC_ssMH_1994	413.99	MH-GIS-NC_ssMH_1993	414	192.4	-5E-05	8	Concrete	0.013	14	43.5	-0.4	
GM-GIS-NC_ssGM_730	MH-GIS-NC_ssMH_1998	411.16	MH-IS-248	408.21	455.2	0.006	8	Concrete	0.013	9	9.8	-0.6	
GM-GIS-NC_ssGM_732	MH-GIS-NC_ssMH_2001	414	MH-GIS-NC_ssMH_2000	410.94	267.5	0.011	8	Concrete	0.013	2	4.8	-0.6	
GM-GIS-NC_ssGM_733	MH-GIS-NC_ssMH_2000	410.94	MH-IS-214	408.1	148	0.019	8	Concrete	0.013	5	6.9	-0.6	SM4
GM-GIS-NC_ssGM_739	MH-GIS-NC_ssMH_2004	409.85	MH-GIS-NC_ssMH_1522	409.08	192.1	0.004	8	PVC	0.01	2	5.2	-0.6	
GM-GIS-NC_ssGM_740	MH-GIS-NC_ssMH_1522	409.08	MH-GIS-NC_ssMH_1521	409	164.1	5E-04	8	PVC	0.01	5	12	-0.6	
GM-GIS-NC_ssGM_741	MH-GIS-NC_ssMH_1521	409	MH-IS-144	403.08	174	0.034	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-NC_ssGM_840	MH-GIS-NC_ssMH_2061	411.3	MH-GIS-NC_ssMH_1995	412.09	441.2	-0.002	8	PVC	0.01	2	100	2.3	
GM-GIS-NC_ssGM_841	MH-GIS-MH-56	411.79	MH-GIS-NC_ssMH_1995	412.09	38.2	-0.008	8	PVC	0.01	2	100	1.8	
GM-GIS-NE_ssGM_48	MH-GIS-NE_ssMH_1315	856.39	MH-GIS-NE_ssMH_1297	857.74	45.9	0.029	8	PVC	0.01	4	6.4	0.7	
GM-GIS-NE_ssGM_49	MH-GIS-NE_ssMH_1298	854.31	MH-IS-205	845.9	55	0.153	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-NE_ssGM_50	MH-GIS-NE_ssMH_1295	854.07	MH-IS-205	845.9	36.8	0.222	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_51	MH-GIS-NE_ssMH_1304	862.69	MH-GIS-NE_ssMH_1297	857.74	190.1	0.026	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_52	MH-GIS-NE_ssMH_1303	862.09	MH-GIS-NE_ssMH_1304	862.69	116.7	-0.005	8	PVC	0.01	2	100	0	
GM-GIS-NE_ssGM_53	MH-GIS-NE_ssMH_1296	860.61	MH-GIS-NE_ssMH_1303	862.09	47	-0.031	8	PVC	0.01	2	100	1.5	
GM-GIS-NE_ssGM_54	MH-GIS-NE_ssMH_1300	858.22	MH-GIS-NE_ssMH_1299	857.7	102.5	0.005	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_55	MH-GIS-NE_ssMH_1301	858.5	MH-GIS-NE_ssMH_1300	858.22	148.1	0.002	8	PVC	0.01	2	5.2	-0.6	
GM-GIS-NE_ssGM_56	MH-GIS-NE_ssMH_1299	857.7	MH-GIS-NE_ssMH_1298	854.31	131	0.026	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_57	MH-GIS-MH-57	859.16	MH-GIS-NE_ssMH_1301	858.5	38.4	0.017	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_58	MH-GIS-NE_ssMH_1302	857.22	MH-GIS-NE_ssMH_1295	854.07	114.7	0.027	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_59	MH-GIS-MH-124	859	MH-GIS-NE_ssMH_1302	857.22	84.3	0.021	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_60	MH-GIS-NE_ssMH_1296	860.61	MH-GIS-MH-60	857.92	40.2	-0.067	8	PVC	0.01	1	100	1.5	
GM-GIS-NE_ssGM_61	MH-GIS-NE_ssMH_1677	863	MH-GIS-NE_ssMH_1335	861.87	36.8	0.031	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_62	MH-GIS-NE_ssMH_1315	856.39	MH-GIS-NE_ssMH_1339	851.06	154.4	0.035	8	PVC	0.01	5	7	-0.6	
GM-GIS-NE_ssGM_63	MH-GIS-MH-105	852.15	MH-GIS-NE_ssMH_1317	854.61	68.4	-0.036	8	PVC	0.01	1	100	1.8	
GM-GIS-NE_ssGM_64	MH-GIS-NE_ssMH_1339	851.06	MH-GIS-NE_ssMH_1316	851.91	177.9	-0.005	8	PVC	0.01	7	100	0.3	
GM-GIS-NE_ssGM_66	MH-GIS-MH-125	891.48	MH-GIS-NE_ssMH_1308	889	85.6	0.029	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_67	MH-GIS-NE_ssMH_1343	869	MH-GIS-NE_ssMH_1324	871.3	226.4	-0.01	8	PVC	0.01	5	100	1.7	
GM-GIS-NE_ssGM_68	MH-GIS-NE_ssMH_1312	876.87	MH-GIS-NE_ssMH_1328	865.28	261.4	0.044	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_69	MH-GIS-MH-126	877.34	MH-GIS-NE_ssMH_1312	876.87	85.7	0.005	8	PVC	0.01	1	3	-0.6	
GM-GIS-NE_ssGM_70	MH-GIS-NE_ssMH_1309	882.54	MH-GIS-NE_ssMH_1348	879.07	155.5	0.022	8	PVC	0.01	12	11.1	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-NE_ssGM_71	MH-GIS-DH_ssMH_1310	888.97	MH-GIS-NE_ssMH_1309	882.54	356.7	0.018	8	PVC	0.01	11	10.7	-0.6	
GM-GIS-NE_ssGM_72	MH-GIS-NE_ssMH_1319	869	MH-GIS-NE_ssMH_1343	869	78.2	0	8	PVC	0.01	3	100	1.7	
GM-GIS-NE_ssGM_73	MH-GIS-NE_ssMH_1307	878.68	MH-GIS-NE_ssMH_1324	871.3	225.9	0.033	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_74	MH-GIS-NE_ssMH_1308	889	MH-GIS-NE_ssMH_1307	878.68	292.2	0.035	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_79	MH-GIS-NE_ssMH_1348	879.07	MH-GIS-NE_ssMH_1334	862.57	346.2	0.048	8	PVC	0.01	13	11.5	-0.6	
GM-GIS-NE_ssGM_86	MH-GIS-NE_ssMH_1317	854.61	MH-GIS-NE_ssMH_1339	851.06	191.8	0.019	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_87	MH-GIS-NE_ssMH_1316	851.91	MH-GIS-NE_ssMH_1318	851.7	190.7	0.001	8	PVC	0.01	8	12.7	-0.6	
GM-GIS-NE_ssGM_88	MH-GIS-NE_ssMH_1336	867.41	MH-GIS-NE_ssMH_1335	861.87	386.3	0.014	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_89	MH-GIS-NE_ssMH_1335	861.87	MH-GIS-NE_ssMH_1334	862.57	149.3	-0.005	8	PVC	0.01	7	100	0.1	
GM-GIS-NE_ssGM_90	MH-GIS-NE_ssMH_1334	862.57	MH-GIS-NE_ssMH_1333	860.25	235.6	0.01	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-NE_ssGM_91	MH-GIS-NE_ssMH_1333	860.25	MH-IS-276	849.3	252.6	0.043	8	PVC	0.01	22	15	-0.6	
GM-GIS-NE_ssGM_94	MH-GIS-NE_ssMH_1318	851.7	MH-IS-203	843.68	198.7	0.04	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-NE_ssGM_95	MH-GIS-NE_ssMH_1328	865.28	MH-GIS-NE_ssMH_1329	863.49	157	0.011	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-NE_ssGM_97	MH-GIS-NE_ssMH_1330	859	MH-IS-201	841.44	191.5	0.092	8	PVC	0.01	20	14.4	-0.6	
GM-GIS-NE_ssGM_98	MH-GIS-NE_ssMH_1329	863.49	MH-GIS-NE_ssMH_1330	859	175.2	0.026	8	PVC	0.01	19	13.8	-0.6	
GM-GIS-NE_ssGM_99	MH-GIS-NE_ssMH_1346	864	MH-GIS-NE_ssMH_1328	865.28	168.9	-0.008	8	PVC	0.01	15	100	0.8	
GM-GIS-NE_ssGM_100	MH-GIS-NE_ssMH_1324	871.3	MH-GIS-NE_ssMH_1325	868.22	155.7	0.02	8	PVC	0.01	8	9	-0.6	
GM-GIS-NE_ssGM_101	MH-GIS-NE_ssMH_1327	864	MH-GIS-NE_ssMH_1346	864	158.8	0	8	PVC	0.01	14	100	0.8	
GM-GIS-NE_ssGM_102	MH-GIS-NE_ssMH_1326	865.7	MH-GIS-NE_ssMH_1327	864	117.8	0.014	8	PVC	0.01	10	9.9	-0.6	
GM-GIS-NE_ssGM_103	MH-GIS-NE_ssMH_1325	868.22	MH-GIS-NE_ssMH_1326	865.7	150.3	0.017	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-NE_ssGM_171	MH-GIS-NE_ssMH_1313	868.11	MH-GIS-NE_ssMH_1343	869	96.8	-0.009	8	PVC	0.01	1	100	2.6	
GM-GIS-NE_ssGM_173	MH-GIS-NE_ssMH_1562	831.9	MH-GIS-NE_ssMH_1563	826	111.8	0.053	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_174	MH-GIS-NE_ssMH_1563	826	MH-GIS-NE_ssMH_1564	823	53	0.057	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_175	MH-GIS-NE_ssMH_1565	822.14	MH-GIS-NE_ssMH_1567	819.88	83.3	0.027	8	PVC	0.01	5	7	-0.6	
GM-GIS-NE_ssGM_176	MH-GIS-NE_ssMH_1566	828.75	MH-GIS-NE_ssMH_1565	822.14	180.5	0.037	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_177	MH-GIS-NE_ssMH_1569	831.92	MH-GIS-NE_ssMH_1566	828.75	57.8	0.055	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_178	MH-GIS-NE_ssMH_1567	819.88	MH-IS-3	797.17	107.5	0.211	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_179	MH-GIS-NE_ssMH_1564	823	MH-GIS-NE_ssMH_1565	822.14	167.6	0.005	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_222	MH-GIS-FW_ssMH_1608	884.67	MH-GIS-NE_ssMH_1605	875.6	205.1	0.044	8	PVC	0.01	8	9	-0.6	
GM-GIS-NE_ssGM_224	MH-GIS-MH-115	840.44	MH-IS-249	830.76	75.7	0.128	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_227	MH-GIS-NE_ssMH_1610	840.34	MH-IS-249	830.76	207.6	0.046	8	PVC	0.01	8	9	-0.6	
GM-GIS-NE_ssGM_229	MH-GIS-NE_ssMH_1611	835.16	MH-GIS-NE_ssMH_1610	840.34	206.8	-0.025	8	PVC	0.01	7	100	4.7	
GM-GIS-NE_ssGM_230	MH-GIS-NE_ssMH_2184	836.06	MH-GIS-NE_ssMH_1611	835.16	43.8	0.021	8	PVC	0.01	6	100	3.8	
GM-GIS-NE_ssGM_231	MH-GIS-NE_ssMH_1605	875.6	MH-GIS-NE_ssMH_1604	868.35	211.3	0.034	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-NE_ssGM_318	MH-GIS-NE_ssMH_1679	872.8	MH-GIS-NE_ssMH_1678	871.46	225.6	0.006	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_319	MH-GIS-NE_ssMH_1680	882.57	MH-GIS-NE_ssMH_1679	872.8	205.6	0.048	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_320	MH-GIS-NE_ssMH_1683	879	MH-GIS-NE_ssMH_1682	877.35	185.7	0.009	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_321	MH-GIS-NE_ssMH_1682	877.35	MH-GIS-NE_ssMH_1681	866.6	200.5	0.054	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_322	MH-GIS-NE_ssMH_1678	871.46	MH-GIS-NE_ssMH_1681	866.6	245.7	0.02	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_323	MH-GIS-NE_ssMH_1681	866.6	MH-GIS-NE_ssMH_1677	863	87.3	0.041	8	PVC	0.01	5	7	-0.6	
GM-GIS-NE_ssGM_324	MH-GIS-NE_ssMH_1689	863.6	MH-GIS-NE_ssMH_1690	859	78	0.059	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NE_ssGM_325	MH-GIS-NE_ssMH_1684	865.93	MH-GIS-NE_ssMH_1327	864	131.7	0.015	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_326	MH-GIS-NE_ssMH_1687	868.98	MH-GIS-NE_ssMH_1684	865.93	100.2	0.03	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_327	MH-GIS-NE_ssMH_1686	869.89	MH-GIS-NE_ssMH_1687	868.98	125.7	0.007	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_328	MH-GIS-NE_ssMH_1685	875.58	MH-GIS-NE_ssMH_1686	869.89	120.2	0.047	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_450	MH-GIS-NE_ssMH_1816	878.47	MH-GIS-NE_ssMH_1319	869	175.5	0.054	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_451	MH-GIS-NE_ssMH_1814	882.73	MH-GIS-NE_ssMH_1816	878.47	76.5	0.056	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_452	MH-GIS-NE_ssMH_1815	880.36	MH-GIS-NE_ssMH_1814	882.73	104.7	-0.023	8	PVC	0.01	1	100	1.7	
GM-GIS-NE_ssGM_476	MH-GIS-ST_ssMH_1541	863.36	MH-IS-70	866.12	62.4	-0.044	8	Ductile Iron	0.013	33	100	2.3	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-NE_ssGM_480	MH-GIS-NE_ssMH_1690	859	MH-IS-71	858.15	143.8	0.006	8	Ductile Iron	0.013	3	5.6	-0.6	
GM-GIS-NE_ssGM_481	MH-GIS-MH-98	858	MH-IS-71	858.15	62.3	-0.002	8	Ductile Iron	0.013	1	43.3	-0.4	
GM-GIS-NE_ssGM_486	MH-GIS-NE_ssMH_1847	871.21	MH-IS-70	866.12	168.5	0.03	8	Ductile Iron	0.013	8	8.8	-0.6	
GM-GIS-NE_ssGM_487	MH-GIS-NE_ssMH_1849	881.09	MH-GIS-NE_ssMH_1848	875.96	197.5	0.026	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_488	MH-GIS-NE_ssMH_1851	886.82	MH-GIS-NE_ssMH_1849	881.09	122.4	0.047	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-NE_ssGM_489	MH-GIS-NE_ssMH_1852	891.98	MH-GIS-NE_ssMH_1851	886.82	137.9	0.037	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-NE_ssGM_490	MH-GIS-NE_ssMH_1850	896.68	MH-GIS-NE_ssMH_1852	891.98	192.4	0.024	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NE_ssGM_491	MH-GIS-NE_ssMH_1848	875.96	MH-GIS-NE_ssMH_1847	871.21	211.2	0.022	8	PVC	0.01	6	8	-0.6	
GM-GIS-NE_ssGM_492	MH-GIS-NE_ssMH_1853	894	MH-IS-69	876.77	174.8	0.099	8	Ductile Iron	0.013	1	2.9	-0.6	
GM-GIS-NE_ssGM_587	MH-GIS-NE_ssMH_1688	874	MH-GIS-NE_ssMH_1312	876.87	130.5	-0.022	8	PVC	0.01	1	100	2.2	
GM-GIS-NE_ssGM_1035	MH-GIS-NE_ssMH_2177	838.01	MH-GIS-NE_ssMH_2184	836.06	62.9	0.031	8	PVC	0.01	6	100	1.8	
GM-GIS-NE_ssGM_1036	MH-GIS-NE_ssMH_2179	840.41	MH-GIS-NE_ssMH_2177	838.01	169.7	0.014	8	PVC	0.01	5	11.7	-0.6	
GM-GIS-NE_ssGM_1037	MH-GIS-NE_ssMH_2181	842.94	MH-GIS-NE_ssMH_2178	842.59	125.8	0.003	8	PVC	0.01	2	5.8	-0.6	
GM-GIS-NE_ssGM_1038	MH-GIS-NE_ssMH_2178	842.59	MH-GIS-NE_ssMH_2179	840.41	30.9	0.071	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-NE_ssGM_1039	MH-GIS-NE_ssMH_2183	844	MH-GIS-NE_ssMH_2181	842.94	122.6	0.009	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_1040	MH-GIS-NE_ssMH_2180	843.16	MH-GIS-NE_ssMH_2178	842.59	145.7	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-NE_ssGM_1041	MH-GIS-NE_ssMH_2182	846.38	MH-GIS-NE_ssMH_2183	844	123	0.019	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_1048	MH-GIS-DH_ssMH_1841	902.08	MH-GIS-NE_ssMH_1839	898.53	148.7	0.024	8	PVC	0.01	17	13.2	-0.6	
GM-GIS-NE_ssGM_1049	MH-GIS-NE_ssMH_1839	898.53	MH-IS-69	876.77	141	0.154	8	Ductile Iron	0.013	18	13.5	-0.6	
GM-GIS-NE_ssGM_1068	MH-GIS-NE_ssMH_2195	863.72	MH-GIS-NE_ssMH_1330	859	60.5	0.078	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_1071	MH-GIS-NE_ssMH_2198	844	MH-IS-233	831.11	105.7	0.122	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_1072	MH-GIS-NE_ssMH_2199	846.87	MH-GIS-NE_ssMH_2198	844	114	0.025	8	PVC	0.01	5	7	-0.6	
GM-GIS-NE_ssGM_1073	MH-GIS-NE_ssMH_2200	849	MH-GIS-NE_ssMH_2199	846.87	43	0.05	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-NE_ssGM_1074	MH-GIS-NE_ssMH_2201	853.71	MH-GIS-NE_ssMH_2200	849	114.1	0.041	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_1075	MH-GIS-NE_ssMH_2203	854	MH-GIS-NE_ssMH_2201	853.71	44.2	0.007	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_1076	MH-GIS-NE_ssMH_2202	854	MH-GIS-NE_ssMH_2203	854	45.5	0	8	PVC	0.01	2	9	-0.6	
GM-GIS-NE_ssGM_1077	MH-GIS-NE_ssMH_2204	854	MH-GIS-NE_ssMH_2202	854	83.8	0	8	PVC	0.01	1	9.6	-0.6	
GM-GIS-NE_ssGM_1081	MH-GIS-NE_ssMH_2176	877.99	MH-GIS-NE_ssMH_1311	872.35	59.6	0.095	6	PVC	0.01	1	4.1	-0.5	
GM-GIS-NE_ssGM_1082	MH-GIS-NE_ssMH_1311	872.35	MH-IS-234	862.31	64.7	0.155	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NJ_ssGM_581	MH-GIS-MH-174	854.94	MH-GIS-MH-173	852.82	148.4	0.014	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NJ_ssGM_582	MH-GIS-MH-172	854.95	MH-GIS-MH-173	852.82	147.7	0.014	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-PA_ssGM_817	MH-GIS-PA_ssMH_2041	819.14	MH-GIS-PA_ssMH_2042	811.79	123.1	0.06	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-PA_ssGM_818	MH-GIS-PA_ssMH_2042	811.79	MH-GIS-PA_ssMH_2038	801.05	124.5	0.086	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-PA_ssGM_819	MH-GIS-PA_ssMH_2048	797.66	MH-GIS-PA_ssMH_2047	802.09	122.8	-0.036	8	Glass	0.013	3	100	3.8	
GM-GIS-PA_ssGM_820	MH-GIS-PA_ssMH_2046	800.91	MH-GIS-PA_ssMH_2060	794.84	112.5	0.054	8	Glass	0.013	5	7	-0.6	
GM-GIS-PA_ssGM_821	MH-GIS-PA_ssMH_2060	794.84	MH-GIS-GC_ssMH_2059	794	187.5	0.004	8	Glass	0.013	6	8.7	-0.6	
GM-GIS-PA_ssGM_822	MH-GIS-PA_ssMH_2038	801.05	MH-GIS-PA_ssMH_2048	797.66	117.6	0.029	8	Glass	0.013	2	100	0.5	
GM-GIS-PA_ssGM_823	MH-GIS-PA_ssMH_2047	802.09	MH-GIS-PA_ssMH_2046	800.91	400.3	0.003	8	Glass	0.013	4	8.2	-0.6	
GM-GIS-PA_ssGM_824	MH-GIS-GC_ssMH_2059	794	MH-GIS-MH-97	794	36.9	0	8	Glass	0.013	6	16.8	-0.6	
GM-GIS-RI_ssGM_1244	MH-GIS-EP_ssMH_2317	1,044.00	MH-GIS-RI_ssMH_2318	1,044.79	392.6	-0.002	8	PVC	0.01	79	100	0.5	
GM-GIS-RI_ssGM_1245	MH-GIS-RI_ssMH_2318	1,044.79	MH-GIS-RI_ssMH_2326	1,044.00	75.5	0.01	8	PVC	0.01	80	29.1	-0.5	
GM-GIS-RI_ssGM_1246	MH-GIS-RI_ssMH_2319	1,043.14	MH-GIS-RI_ssMH_2329	1,034.10	162.8	0.056	8	PVC	0.01	83	29.6	-0.5	
GM-GIS-RI_ssGM_1247	MH-GIS-RI_ssMH_2327	1,009.32	MH-GIS-RI_ssMH_2322	995.97	127.4	0.105	8	PVC	0.01	104	33.3	-0.4	
GM-GIS-RI_ssGM_1248	MH-GIS-RI_ssMH_2322	995.97	MH-GIS-RI_ssMH_2320	987.3	88.6	0.098	8	PVC	0.01	106	33.5	-0.4	
GM-GIS-RI_ssGM_1249	MH-GIS-RI_ssMH_2326	1,044.00	MH-GIS-RI_ssMH_2319	1,043.14	102.7	0.008	8	PVC	0.01	82	29.3	-0.5	
GM-GIS-RI_ssGM_1257	MH-GIS-RI_ssMH_2320	987.3	MH-GIS-CR_ssMH_2331	979.07	98.4	0.084	8	PVC	0.01	109	34.2	-0.4	
GM-GIS-RI_ssGM_1264	MH-GIS-RI_ssMH_2329	1,034.10	MH-GIS-RI_ssMH_2327	1,009.32	233.9	0.106	8	PVC	0.01	103	33.1	-0.4	
GM-GIS-RI_ssGM_1265	MH-GIS-RI_ssMH_2567	1,034.71	MH-GIS-RI_ssMH_2329	1,034.10	75	0.008	8	PVC	0.01	19	14	-0.6	
GM-GIS-RI_ssGM_1302	MH-GIS-RI_ssMH_2376	1,051.81	MH-GIS-RI_ssMH_2389	1,049.11	213.9	0.013	8	PVC	0.01	1	3.6	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-RI_ssGM_1303	MH-GIS-RI_ssMH_2389	1,049.11	MH-GIS-RI_ssMH_2366	1,048.11	52.9	0.019	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-RI_ssGM_1304	MH-GIS-RI_ssMH_2375	1,029.15	MH-GIS-RI_ssMH_2371	1,019.04	178.5	0.057	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-RI_ssGM_1305	MH-GIS-RI_ssMH_2371	1,019.04	MH-GIS-RI_ssMH_2384	1,014.00	142.3	0.035	8	PVC	0.01	6	8	-0.6	
GM-GIS-RI_ssGM_1306	MH-GIS-RI_ssMH_2384	1,014.00	MH-GIS-RI_ssMH_2381	1,010.84	138.8	0.023	8	PVC	0.01	10	10.2	-0.6	
GM-GIS-RI_ssGM_1307	MH-GIS-RI_ssMH_2377	1,003.28	MH-GIS-RI_ssMH_2378	992.3	95.6	0.115	8	PVC	0.01	29	17.4	-0.6	
GM-GIS-RI_ssGM_1308	MH-GIS-RI_ssMH_2373	1,023.44	MH-GIS-RI_ssMH_2371	1,019.04	85	0.052	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-RI_ssGM_1309	MH-GIS-RI_ssMH_2368	1,044.30	MH-GIS-RI_ssMH_2369	1,017.04	363.5	0.075	8	PVC	0.01	6	8	-0.6	
GM-GIS-RI_ssGM_1310	MH-GIS-RI_ssMH_2372	1,028.88	MH-GIS-RI_ssMH_2373	1,023.44	43.3	0.126	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-RI_ssGM_1311	MH-GIS-RI_ssMH_2374	1,040.14	MH-GIS-RI_ssMH_2372	1,028.88	144.1	0.078	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-RI_ssGM_1312	MH-GIS-RI_ssMH_2378	992.3	MH-GIS-RI_ssMH_2380	976.93	128.1	0.12	8	PVC	0.01	30	17.7	-0.5	
GM-GIS-RI_ssGM_1313	MH-GIS-RI_ssMH_2380	976.93	MH-GIS-CR_ssMH_2379	970.91	51.8	0.116	8	PVC	0.01	32	18.1	-0.5	
GM-GIS-RI_ssGM_1314	MH-GIS-RI_ssMH_2381	1,010.84	MH-GIS-RI_ssMH_2390	1,009.47	70.7	0.019	8	PVC	0.01	11	10.8	-0.6	
GM-GIS-RI_ssGM_1315	MH-GIS-RI_ssMH_2390	1,009.47	MH-GIS-RI_ssMH_2377	1,003.28	62.9	0.098	8	PVC	0.01	13	11.3	-0.6	
GM-GIS-RI_ssGM_1316	MH-GIS-RI_ssMH_2382	1,011.10	MH-GIS-RI_ssMH_2370	1,008.28	173.5	0.016	8	PVC	0.01	10	10.2	-0.6	
GM-GIS-RI_ssGM_1317	MH-GIS-RI_ssMH_2369	1,017.04	MH-GIS-RI_ssMH_2386	1,013.87	37.7	0.084	8	PVC	0.01	8	8.8	-0.6	
GM-GIS-RI_ssGM_1318	MH-GIS-RI_ssMH_2370	1,008.28	MH-GIS-RI_ssMH_2383	1,007.11	182	0.006	8	PVC	0.01	11	10.8	-0.6	
GM-GIS-RI_ssGM_1319	MH-GIS-RI_ssMH_2367	1,046.50	MH-GIS-RI_ssMH_2368	1,044.30	81.4	0.027	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-RI_ssGM_1320	MH-GIS-RI_ssMH_2366	1,048.11	MH-GIS-RI_ssMH_2367	1,046.50	162.4	0.01	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-RI_ssGM_1321	MH-GIS-RI_ssMH_2385	1,019.49	MH-GIS-RI_ssMH_2384	1,014.00	81.2	0.068	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-RI_ssGM_1322	MH-GIS-RI_ssMH_2386	1,013.87	MH-GIS-RI_ssMH_2382	1,011.10	71.9	0.039	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-RI_ssGM_1323	MH-GIS-RI_ssMH_2388	1,027.47	MH-GIS-RI_ssMH_2385	1,019.49	58.3	0.137	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-RI_ssGM_1324	MH-GIS-RI_ssMH_2391	1,000.58	MH-GIS-RI_ssMH_2377	1,003.28	88.8	-0.03	8	PVC	0.01	15	100	2.2	
GM-GIS-RI_ssGM_1325	MH-GIS-RI_ssMH_2383	1,007.11	MH-GIS-RI_ssMH_2387	1,000.16	291.1	0.024	8	PVC	0.01	13	11.3	-0.6	
GM-GIS-RI_ssGM_1326	MH-GIS-RI_ssMH_2387	1,000.16	MH-GIS-RI_ssMH_2391	1,000.58	44.8	-0.009	8	PVC	0.01	14	100	2.6	
GM-GIS-RI_ssGM_1327	MH-GIS-RI_ssMH_2392	1,037.74	MH-GIS-RI_ssMH_2396	1,030.17	175.3	0.043	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-RI_ssGM_1328	MH-GIS-RI_ssMH_2394	1,033.48	MH-GIS-RI_ssMH_2393	1,025.56	221	0.036	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-RI_ssGM_1329	MH-GIS-RI_ssMH_2566	1,032.26	MH-GIS-RI_ssMH_2395	1,034.00	142	-0.012	8	PVC	0.01	1	100	1.1	
GM-GIS-RI_ssGM_1330	MH-GIS-RI_ssMH_2395	1,034.00	MH-GIS-RI_ssMH_2394	1,033.48	43.7	0.012	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-RI_ssGM_1331	MH-GIS-RI_ssMH_2400	1,039.67	MH-GIS-RI_ssMH_2392	1,037.74	63	0.031	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-RI_ssGM_1332	MH-GIS-RI_ssMH_2399	1,037.54	MH-GIS-RI_ssMH_2392	1,037.74	77.9	-0.003	8	PVC	0.01	1	37.1	-0.4	
GM-GIS-RI_ssGM_1333	MH-GIS-RI_ssMH_2393	1,025.56	MH-GIS-RI_ssMH_2401	1,025.26	79.7	0.004	8	PVC	0.01	5	100	5	
GM-GIS-RI_ssGM_1334	MH-GIS-RI_ssMH_2401	1,025.26	MH-GIS-RI_ssMH_2404	1,026.47	33.5	-0.036	8	PVC	0.01	6	100	6.5	
GM-GIS-RI_ssGM_1335	MH-GIS-RI_ssMH_2397	1,027.19	MH-GIS-RI_ssMH_2567	1,034.71	256.3	-0.029	8	PVC	0.01	18	100	7.1	
GM-GIS-RI_ssGM_1336	MH-GIS-RI_ssMH_2398	1,033.56	MH-GIS-RI_ssMH_2396	1,030.17	81.7	0.042	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-RI_ssGM_1337	MH-GIS-RI_ssMH_2396	1,030.17	MH-GIS-RI_ssMH_2402	1,028.72	62.6	0.023	8	PVC	0.01	6	100	2.4	
GM-GIS-RI_ssGM_1338	MH-GIS-RI_ssMH_2402	1,028.72	MH-GIS-RI_ssMH_2403	1,028.11	119.1	0.005	8	PVC	0.01	15	100	3.8	
GM-GIS-RI_ssGM_1339	MH-GIS-RI_ssMH_2404	1,026.47	MH-GIS-RI_ssMH_2402	1,028.72	84.5	-0.027	8	PVC	0.01	8	100	6.1	
GM-GIS-RI_ssGM_1340	MH-GIS-RI_ssMH_2403	1,028.11	MH-GIS-RI_ssMH_2397	1,027.19	39.3	0.023	8	PVC	0.01	17	100	4.4	
GM-GIS-RW_ssGM_731	MH-GIS-RW_ssMH_1999	416.83	MH-GIS-RW_ssMH_1527	415.93	225.3	0.004	8	Concrete	0.013	9	11	-0.6	
GM-GIS-RW_ssGM_757	MH-GIS-RW_ssMH_1506	417.71	MH-IS-97	412.47	183	0.029	8	Concrete	0.013	35	18.9	-0.5	SM4
GM-GIS-RW_ssGM_758	MH-GIS-RW_ssMH_2019	417	MH-GIS-RW_ssMH_2018	416.02	278.1	0.004	8	Glass	0.013	2	6.1	-0.6	
GM-GIS-RW_ssGM_759	MH-GIS-RW_ssMH_2018	416.02	MH-IS-245	410.33	46.7	0.122	8	Concrete	0.013	5	6.9	-0.6	
GM-GIS-RW_ssGM_772	MH-GIS-RW_ssMH_1527	415.93	MH-GIS-RW_ssMH_1526	414.56	342.1	0.004	8	Concrete	0.013	17	15.3	-0.6	
GM-GIS-RW_ssGM_773	MH-GIS-RW_ssMH_1526	414.56	MH-IS-267	409.97	102.7	0.045	8	Concrete	0.013	26	16.4	-0.6	
GM-GIS-RW_ssGM_790	MH-GIS-RW_ssMH_1486	417.09	MH-GIS-RW_ssMH_1485	415.75	164.7	0.008	8	Concrete	0.013	53	23.6	-0.5	
GM-GIS-RW_ssGM_792	MH-GIS-RW_ssMH_1469	414.1	MH-GIS-RW_ssMH_1485	415.75	250.1	-0.007	8	Concrete	0.013	3	100	1.2	SM4
GM-GIS-RW_ssGM_793	MH-GIS-RW_ssMH_1502	416.26	MH-GIS-RW_ssMH_1487	416.66	173.4	-0.002	8	Concrete	0.013	41	100	0.4	
GM-GIS-RW_ssGM_794	MH-GIS-RW_ssMH_1487	416.66	MH-GIS-RW_ssMH_1486	417.09	126.5	-0.003	8	Concrete	0.013	50	100	0	
GM-GIS-RW_ssGM_795	MH-GIS-MH-203	418.22	MH-GIS-RW_ssMH_1487	416.66	220.3	0.007	8	Concrete	0.013	3	5.9	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-RW_ssGM_796	MH-GIS-RW_ssMH_1488	414.61	MH-GIS-RW_ssMH_1487	416.66	419.1	-0.005	8	Concrete	0.013	3	100	2.1	SM4
GM-GIS-RW_ssGM_797	MH-GIS-RW_ssMH_2027	414.03	MH-GIS-RW_ssMH_2028	415.82	340	-0.005	8	Concrete	0.013	13	100	2.7	
GM-GIS-RW_ssGM_798	MH-GIS-RW_ssMH_2028	415.82	MH-GIS-RW_ssMH_1502	416.26	62.1	-0.007	8	Concrete	0.013	28	100	0.9	
GM-GIS-RW_ssGM_799	MH-GIS-RW_ssMH_1500	415.02	MH-GIS-RW_ssMH_1501	415.3	35.3	-0.008	8	PVC	0.01	9	100	1.7	
GM-GIS-RW_ssGM_800	MH-GIS-RW_ssMH_1501	415.3	MH-GIS-RW_ssMH_2028	415.82	127.5	-0.004	8	PVC	0.01	13	100	1.4	
GM-GIS-RW_ssGM_801	MH-GIS-RW_ssMH_1499	414	MH-GIS-RW_ssMH_1500	415.02	153.5	-0.007	8	PVC	0.01	6	100	2.7	
GM-GIS-RW_ssGM_803	MH-GIS-MH-208	415.42	MH-GIS-RW_ssMH_1498	414	352	0.004	8	Glass	0.013	9	11	-0.6	
GM-GIS-RW_ssGM_811	MH-GIS-RW_ssMH_2032	419	MH-GIS-RW_ssMH_2033	415.4	230.7	0.016	8	Concrete	0.013	13	11.3	-0.6	
GM-GIS-RW_ssGM_812	MH-GIS-RW_ssMH_2033	415.4	MH-GIS-RW_ssMH_2034	414	87.2	0.016	8	Concrete	0.013	22	15	-0.6	
GM-GIS-RW_ssGM_814	MH-GIS-RW_ssMH_2035	417.46	MH-GIS-RW_ssMH_2032	419	228.5	-0.007	8	Concrete	0.013	6	100	1	
GM-GIS-RW_ssGM_815	MH-GIS-MH-153	419	MH-GIS-RW_ssMH_2032	419	123.5	0	8	Concrete	0.013	3	15.5	-0.6	
GM-GIS-RW_ssGM_816	MH-GIS-MH-58	417.61	MH-GIS-RW_ssMH_2035	417.46	39.9	0.004	8	Glass	0.013	3	100	0.8	
GM-GIS-RW_ssGM_873	MH-GIS-RW_ssMH_2085	418.19	MH-GIS-RW_ssMH_2086	416.31	246	0.008	8	PVC	0.01	6	8	-0.6	
GM-GIS-RW_ssGM_874	MH-GIS-RW_ssMH_2086	416.31	MH-GIS-RW_ssMH_1502	416.26	83.6	6E-04	8	PVC	0.01	9	100	0.4	
GM-GIS-RW_ssGM_976	MH-GIS-RW_ssMH_2156	415.17	MH-GIS-RW_ssMH_2033	415.4	20.6	-0.011	8	PVC	0.01	6	50.1	-0.3	
GM-GIS-RW_ssGM_977	MH-GIS-RW_ssMH_2157	417.22	MH-GIS-RW_ssMH_2156	415.17	184.2	0.011	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-RW_ssGM_1006	MH-GIS-MH-181	417.73	MH-GIS-RW_ssMH_2085	418.19	154.4	-0.003	8	PVC	0.01	3	80.2	-0.1	
GM-GIS-RW_ssGM_1012	MH-GIS-RW_ssMH_2094	417.87	MH-GIS-RW_ssMH_2095	415.61	328.5	0.007	8	Concrete	0.013	17	13.4	-0.6	
GM-GIS-RW_ssGM_1032	MH-GIS-MH-35	414	MH-IS-1	413.11	23	0.039	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-RW_ssGM_1033	MH-GIS-RW_ssMH_1514	414.67	MH-GIS-MH-35	414	413.4	0.002	8	Concrete	0.013	9	13.6	-0.6	
GM-GIS-RW_ssGM_1103	MH-GIS-MH-15	414.08	MH-GIS-MH-11	414.05	4.5	0.007	8	PVC	0.01	6	100	2.6	
GM-GIS-RW_ssGM_1104	MH-GIS-RW_ssMH_2027	414.03	MH-GIS-MH-11	414.05	2.8	0.007	8	Concrete	0.013	9	100	2.7	
GM-GIS-RW_ssGM_1105	MH-GIS-MH-82	414	MH-GIS-RW_ssMH_1499	414	51.2	0	8	PVC	0.01	3	100	2.7	
GM-GIS-SC_ssGM_124	MH-GIS-SC_ssMH_1387	832.42	MH-GIS-SC_ssMH_1388	826.75	115.7	0.049	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_125	MH-GIS-SC_ssMH_1393	827.52	MH-GIS-SC_ssMH_1414	821.04	88.4	0.073	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_126	MH-GIS-SC_ssMH_1414	821.04	MH-GIS-SC_ssMH_1415	816.57	117.4	0.038	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_127	MH-GIS-SC_ssMH_1415	816.57	MH-GIS-SC_ssMH_1394	817.44	123.6	-0.007	8	PVC	0.01	7	100	2.5	
GM-GIS-SC_ssGM_128	MH-GIS-MH-64	823.45	MH-GIS-SC_ssMH_1413	818.04	42.7	0.127	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_129	MH-GIS-SC_ssMH_1409	837.73	MH-GIS-SC_ssMH_1410	826.59	124.1	0.09	8	PVC	0.01	40	20.3	-0.5	
GM-GIS-SC_ssGM_130	MH-GIS-SC_ssMH_1408	876.06	MH-GIS-SC_ssMH_1385	868.7	62	0.119	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_131	MH-GIS-SC_ssMH_1407	882.65	MH-GIS-SC_ssMH_1408	876.06	62.9	0.105	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_132	MH-GIS-SC_ssMH_1384	888.26	MH-GIS-SC_ssMH_1407	882.65	62.5	0.09	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-SC_ssGM_133	MH-GIS-SC_ssMH_1406	893.38	MH-GIS-SC_ssMH_1384	888.26	61.8	0.083	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_134	MH-GIS-SC_ssMH_1383	900.79	MH-GIS-SC_ssMH_1406	893.38	105	0.071	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_135	MH-GIS-SC_ssMH_1405	844.7	MH-GIS-SC_ssMH_1382	850.2	58.7	0.094	8	PVC	0.01	20	14.3	4.9	
GM-GIS-SC_ssGM_136	MH-GIS-SC_ssMH_1404	853.62	MH-GIS-SC_ssMH_1382	850.2	57.5	0.059	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_137	MH-GIS-SC_ssMH_1394	817.44	MH-GIS-SC_ssMH_1401	819.51	60.7	-0.034	8	PVC	0.01	33	100	1.6	
GM-GIS-SC_ssGM_138	MH-GIS-SC_ssMH_1412	821.98	MH-GIS-SC_ssMH_1401	819.51	98.4	0.025	8	PVC	0.01	46	22	-0.5	
GM-GIS-SC_ssGM_139	MH-GIS-SC_ssMH_1403	801.9	MH-GIS-SC_ssMH_1386	800.02	89.6	0.021	8	PVC	0.01	86	100	3.5	
GM-GIS-SC_ssGM_140	MH-GIS-SC_ssMH_1402	806.3	MH-GIS-SC_ssMH_1403	801.9	85.7	0.051	8	PVC	0.01	84	29.8	-0.5	
GM-GIS-SC_ssGM_141	MH-GIS-SC_ssMH_1401	819.51	MH-GIS-SC_ssMH_1402	806.3	135.3	0.098	8	PVC	0.01	82	29.4	-0.5	
GM-GIS-SC_ssGM_142	MH-GIS-SC_ssMH_1405	844.7	MH-GIS-SC_ssMH_1400	825.38	130.2	0.148	8	PVC	0.01	22	15.1	-0.6	
GM-GIS-SC_ssGM_143	MH-GIS-SC_ssMH_1400	825.38	MH-GIS-SC_ssMH_1394	817.44	96.3	0.082	8	PVC	0.01	24	15.8	-0.6	
GM-GIS-SC_ssGM_144	MH-GIS-SC_ssMH_1379	808.09	MH-GIS-SC_ssMH_1399	805.62	196.3	0.013	8	PVC	0.01	111	34.3	-0.4	
GM-GIS-SC_ssGM_146	MH-GIS-SC_ssMH_1399	805.62	MH-IS-147	790.4	124.5	0.122	8	PVC	0.01	283	56.1	-0.3	
GM-GIS-SC_ssGM_151	MH-GIS-SC_ssMH_1390	815.09	MH-GIS-SC_ssMH_1391	809	119	0.051	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_152	MH-GIS-SC_ssMH_1391	809	MH-IS-235	798.05	86.9	0.126	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_153	MH-GIS-SC_ssMH_1389	821.1	MH-GIS-SC_ssMH_1390	815.09	101.1	0.059	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-SC_ssGM_154	MH-GIS-SC_ssMH_1388	826.75	MH-GIS-SC_ssMH_1389	821.1	106	0.053	8	PVC	0.01	4	6.7	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-SC_ssGM_155	MH-GIS-SC_ssMH_1411	824	MH-GIS-SC_ssMH_1412	821.98	149.8	0.013	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-SC_ssGM_156	MH-GIS-SC_ssMH_1410	826.59	MH-GIS-SC_ssMH_1411	824	130.1	0.02	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-SC_ssGM_158	MH-GIS-SC_ssMH_1386	800.02	MH-GIS-SC_ssMH_1378	800.92	127.1	-0.007	8	PVC	0.01	88	100	6.3	
GM-GIS-SC_ssGM_159	MH-GIS-SC_ssMH_1385	868.7	MH-GIS-SC_ssMH_1382	850.2	167	0.111	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-SC_ssGM_160	MH-GIS-SC_ssMH_1373	860.98	MH-GIS-SC_ssMH_1404	853.62	158.8	0.046	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_162	MH-GIS-SC_ssMH_1378	800.92	MH-GIS-SC_ssMH_1381	806.03	218.6	-0.023	8	PVC	0.01	91	100	6.9	
GM-GIS-SC_ssGM_163	MH-GIS-SC_ssMH_1381	806.03	MH-GIS-SC_ssMH_1380	805.45	127.1	0.005	8	PVC	0.01	93	100	1.8	
GM-GIS-SC_ssGM_164	MH-GIS-SC_ssMH_1380	805.45	MH-GIS-SC_ssMH_1379	808.09	138.7	-0.019	8	PVC	0.01	95	100	2.3	
GM-GIS-SC_ssGM_165	MH-GIS-SC_ssMH_1377	812.62	MH-GIS-SC_ssMH_1379	808.09	137.7	0.033	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-SC_ssGM_166	MH-GIS-SC_ssMH_1376	817.41	MH-GIS-SC_ssMH_1377	812.62	119.1	0.04	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_167	MH-GIS-SC_ssMH_1375	823.01	MH-GIS-SC_ssMH_1376	817.41	255.8	0.022	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_168	MH-GIS-SC_ssMH_1374	818.18	MH-GIS-SC_ssMH_1375	823.01	220.3	-0.022	8	PVC	0.01	7	100	4.3	
GM-GIS-SC_ssGM_169	MH-GIS-SC_ssMH_1413	818.04	MH-GIS-SC_ssMH_1374	818.18	168.6	-8E-04	8	PVC	0.01	4	100	4.4	
GM-GIS-SF_ssGM_186	MH-GIS-SF_ssMH_2138	441.25	MH-GIS-SF_ssMH_1574	441.02	84.7	0.003	8	Concrete	0.013	93	39.7	-0.4	
GM-GIS-SF_ssGM_187	MH-GIS-SF_ssMH_1574	441.02	MH-GIS-SF_ssMH_1575	438.75	461.7	0.005	8	Concrete	0.013	96	34.3	-0.4	
GM-GIS-SF_ssGM_188	MH-GIS-SF_ssMH_1575	438.75	MH-GIS-SF_ssMH_1576	438.31	233.1	0.002	8	Concrete	0.013	99	44.9	-0.4	
GM-GIS-SF_ssGM_879	MH-GIS-SF_ssMH_1450	417.9	MH-GIS-SF_ssMH_1447	416.32	98.7	0.016	10	Glass	0.013	49	17	-0.7	
GM-GIS-SF_ssGM_880	MH-GIS-SF_ssMH_1449	419.28	MH-GIS-SF_ssMH_1450	417.9	179	0.008	10	Glass	0.013	23	11.6	-0.7	
GM-GIS-SF_ssGM_881	MH-GIS-SF_ssMH_1447	410.46	IPPS Wetwell	400.65	77.2	0.127	14	Glass	0.013	223	24	-0.9	
GM-GIS-SF_ssGM_882	MH-GIS-SF_ssMH_2088	429.06	MH-IS-27	424.37	121.1	0.039	8	PVC	0.01	106	33.6	-0.4	
GM-GIS-SF_ssGM_951	MH-GIS-MH-24	428.63	MH-GIS-SF_ssMH_1449	424.58	13.2	0.307	10	Ductile Iron	0.013	3	3.9	-0.8	
GM-GIS-SF_ssGM_952	MH-GIS-MH-202	430.39	MH-GIS-MH-190	429.57	206.8	0.004	8	PVC	0.01	3	5.5	-0.6	
GM-GIS-SF_ssGM_953	MH-GIS-MH-190	429.57	MH-GIS-MH-83	428.92	162.1	0.004	8	PVC	0.01	5	7.6	-0.6	
GM-GIS-SF_ssGM_954	MH-GIS-MH-83	428.92	MH-GIS-MH-84	428.71	51.9	0.004	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-SF_ssGM_955	MH-GIS-MH-134	429.8	MH-GIS-SF_ssMH_2137	429.41	98.6	0.004	8	PVC	0.01	3	5.5	-0.6	
GM-GIS-SF_ssGM_956	MH-GIS-SF_ssMH_2137	429.41	MH-GIS-MH-84	428.71	174.2	0.004	8	PVC	0.01	5	7.6	-0.6	
GM-GIS-SF_ssGM_957	MH-GIS-MH-84	428.71	MH-GIS-SF_ssMH_2136	424.95	169	0.022	8	PVC	0.01	15	12.6	-0.6	
GM-GIS-SF_ssGM_958	MH-GIS-SF_ssMH_2136	424.95	MH-GIS-SF_ssMH_1449	424.28	139	0.005	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-SF_ssGM_959	MH-GIS-SF_ssMH_2149	477.68	MH-GIS-SF_ssMH_2148	476.43	12.3	0.101	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-SF_ssGM_960	MH-GIS-SF_ssMH_2148	476.43	MH-GIS-SF_ssMH_2147	471.41	67	0.075	8	PVC	0.01	36	19.4	-0.5	
GM-GIS-SF_ssGM_961	MH-GIS-SF_ssMH_2147	471.41	MH-GIS-SF_ssMH_2146	461.32	244.6	0.041	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-SF_ssGM_962	MH-GIS-SF_ssMH_2146	461.32	MH-GIS-SF_ssMH_2145	459.29	35.8	0.057	8	PVC	0.01	42	20.8	-0.5	
GM-GIS-SF_ssGM_963	MH-GIS-SF_ssMH_2145	459.29	MH-GIS-SF_ssMH_2141	457.36	36.5	0.053	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-SF_ssGM_964	MH-GIS-SF_ssMH_2141	457.36	MH-GIS-SF_ssMH_2140	451.88	23.7	0.231	8	PVC	0.01	86	30.1	-0.5	
GM-GIS-SF_ssGM_965	MH-GIS-SF_ssMH_2140	451.88	MH-GIS-SF_ssMH_2139	443.69	35.4	0.231	8	Concrete	0.013	88	30.6	-0.5	
GM-GIS-SF_ssGM_966	MH-GIS-SF_ssMH_2139	443.69	MH-GIS-SF_ssMH_2138	441.25	341.2	0.007	8	Concrete	0.013	91	31	-0.5	
GM-GIS-SF_ssGM_967	MH-GIS-SF_ssMH_2144	458.32	MH-GIS-SF_ssMH_2143	458.08	61.3	0.004	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-SF_ssGM_968	MH-GIS-SF_ssMH_2143	458.08	MH-GIS-SF_ssMH_2142	457.95	32.3	0.004	8	PVC	0.01	36	19.4	-0.5	
GM-GIS-SF_ssGM_969	MH-GIS-SF_ssMH_2142	457.95	MH-GIS-SF_ssMH_2141	457.36	108.4	0.005	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-SF_ssGM_1057(1)	MH-GIS-SF_ssMH_1451	419.29	MH-GIS-MH-69	419.11	31.1	0.006	10	Glass	0.013	8	7.2	-0.8	
GM-GIS-SF_ssGM_1057(2)(1)	MH-GIS-MH-69	419.11	MH-GIS-MH-63	418.7	73.7	0.006	10	Glass	0.013	13	9.2	-0.8	
GM-GIS-SF_ssGM_1057(2)(2)(1)	MH-GIS-MH-63	418.7	MH-GIS-MH-67	418.13	99.4	0.006	10	Glass	0.013	18	10.8	-0.7	
GM-GIS-SF_ssGM_1057(2)(2)(2)	MH-GIS-MH-67	418.13	MH-GIS-SF_ssMH_1450	417.9	41.1	0.006	10	Glass	0.013	23	12.1	-0.7	
GM-GIS-SF_ssGM_1058	MH-GIS-SF_ssMH_1452	423.36	MH-GIS-SF_ssMH_1451	423.29	17	0.004	8	Glass	0.013	5	8.5	-0.6	
GM-GIS-SF_ssGM_1059	MH-GIS-MH-66	419	MH-GIS-MH-67	418.13	44.6	0.019	8	Glass	0.013	3	5.1	-0.6	
GM-GIS-SF_ssGM_1060	MH-GIS-MH-68	419.29	MH-GIS-MH-69	419.11	45.6	0.004	8	Glass	0.013	3	6.2	-0.6	
GM-GIS-SF_ssGM_1061	MH-GIS-MH-62	419	MH-GIS-MH-63	418.7	43	0.007	8	Glass	0.013	3	5.4	-0.6	
GM-GIS-SF_ssGM_1062	MH-GIS-SF_ssMH_1452	423.36	MH-GIS-SF_ssMH_2224	423.37	3	0.004	8	Glass	0.013	3	7.2	-0.6	
GM-GIS-SF_ssGM_1065	MH-GIS-MH-94	427.82	MH-IS-27	424.37	61.4	0.056	8	PVC	0.01	57	24.5	-0.5	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-SF_ssGM_1067	MH-GIS-MH-72	431.47	MH-GIS-SF_ssMH_2088	429.06	47.5	0.051	8	Glass	0.013	3	5.1	-0.6	
GM-GIS-SF_ssGM_1079	MH-GIS-SF_ssMH_1576	438.31	MH-GIS-SF_ssMH_2088	429.06	123.5	0.075	8	Concrete	0.013	101	32.8	-0.4	
GM-GIS-ST_ssGM_425	MH-GIS-MH-183	855.01	MH-GIS-ST_ssMH_1545	857.37	157.3	-0.015	8	PVC	0.01	1	100	7.7	
GM-GIS-ST_ssGM_426	MH-GIS-ST_ssMH_1548	860.52	MH-GIS-ST_ssMH_1546	859	76.6	0.02	8	PVC	0.01	18	100	2.2	
GM-GIS-ST_ssGM_427	MH-GIS-ST_ssMH_1547	856.62	MH-GIS-ST_ssMH_1546	859	136.9	-0.017	8	PVC	0.01	3	100	6.1	
GM-GIS-ST_ssGM_428	MH-GIS-MH-118	855.03	MH-GIS-ST_ssMH_1547	856.62	78.3	-0.02	8	PVC	0.01	1	100	6.9	
GM-GIS-ST_ssGM_429	MH-GIS-ST_ssMH_1546	859	MH-GIS-ST_ssMH_1545	857.37	140.4	0.012	8	PVC	0.01	22	100	3.7	
GM-GIS-ST_ssGM_430	MH-GIS-MH-158	859.17	MH-GIS-ST_ssMH_1545	857.37	129.6	0.014	8	PVC	0.01	1	100	3.5	
GM-GIS-ST_ssGM_431	MH-GIS-ST_ssMH_1545	857.37	MH-GIS-ST_ssMH_1544	859	146	-0.011	8	PVC	0.01	25	100	6.7	
GM-GIS-ST_ssGM_432	MH-GIS-MH-71	857.99	MH-GIS-ST_ssMH_1543	858.72	45	-0.016	8	PVC	0.01	1	100	6.1	
GM-GIS-ST_ssGM_433	MH-GIS-MH-161	854.41	MH-GIS-ST_ssMH_1549	857.28	134.8	-0.021	8	PVC	0.01	1	100	8.2	
GM-GIS-ST_ssGM_434	MH-GIS-ST_ssMH_1549	857.28	MH-GIS-ST_ssMH_1551	859.25	122.2	-0.016	8	PVC	0.01	3	100	5.4	
GM-GIS-ST_ssGM_435	MH-GIS-ST_ssMH_1550	857.16	MH-GIS-ST_ssMH_1551	859.25	176.8	-0.012	8	PVC	0.01	1	100	5.5	
GM-GIS-ST_ssGM_436	MH-GIS-ST_ssMH_1551	859.25	MH-GIS-ST_ssMH_1548	860.52	98.6	-0.013	8	PVC	0.01	5	100	3.5	
GM-GIS-ST_ssGM_437	MH-GIS-ST_ssMH_1556	870.35	MH-GIS-ST_ssMH_1554	865.14	151.1	0.034	8	PVC	0.01	6	8	-0.6	
GM-GIS-ST_ssGM_438	MH-GIS-ST_ssMH_1557	873.32	MH-GIS-ST_ssMH_1556	870.35	103.9	0.029	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-ST_ssGM_439	MH-GIS-ST_ssMH_1558	875.23	MH-GIS-ST_ssMH_1557	873.32	103.4	0.018	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-ST_ssGM_440	MH-GIS-ST_ssMH_1560	882.81	MH-GIS-ST_ssMH_1559	877.89	159.8	0.031	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-ST_ssGM_441	MH-GIS-ST_ssMH_1559	877.89	MH-GIS-ST_ssMH_1558	875.23	106.9	0.025	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-ST_ssGM_442	MH-GIS-ST_ssMH_1555	871.37	MH-GIS-ST_ssMH_1554	865.14	264.7	0.024	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-ST_ssGM_443	MH-GIS-ST_ssMH_1548	860.52	MH-GIS-ST_ssMH_1552	861.96	96.3	0.015	8	PVC	0.01	11	100	2.2	
GM-GIS-ST_ssGM_444	MH-GIS-ST_ssMH_1553	864	MH-GIS-ST_ssMH_1552	861.96	112.2	0.018	8	PVC	0.01	10	10.2	-0.6	
GM-GIS-ST_ssGM_445	MH-GIS-ST_ssMH_1554	865.14	MH-GIS-ST_ssMH_1553	864	141.7	0.008	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-ST_ssGM_446	MH-GIS-ST_ssMH_1542	864	MH-GIS-ST_ssMH_1541	863.36	251.8	0.003	8	PVC	0.01	32	100	1.7	
GM-GIS-ST_ssGM_447	MH-GIS-ST_ssMH_1543	858.72	MH-GIS-ST_ssMH_1542	864	63	-0.084	8	PVC	0.01	30	100	6.9	
GM-GIS-ST_ssGM_448	MH-GIS-MH-157	862.37	MH-GIS-ST_ssMH_1544	859	128.5	0.026	8	PVC	0.01	1	100	1.7	
GM-GIS-ST_ssGM_449	MH-GIS-ST_ssMH_1544	859	MH-GIS-ST_ssMH_1543	858.72	178.5	0.002	8	PVC	0.01	28	100	5.1	
GM-GIS-TH_ssGM_145	MH-GIS-MH-205	810.83	MH-GIS-SC_ssMH_1399	805.62	257.5	0.02	8	PVC	0.01	170	43	-0.4	
GM-GIS-TH_ssGM_1341	MH-GIS-TH_ssMH_2410	832.92	MH-GIS-TH_ssMH_2411	845.81	261.2	-0.049	8	PVC	0.01	4	100	12.5	
GM-GIS-TH_ssGM_1342	MH-GIS-TH_ssMH_2409	831.23	MH-GIS-TH_ssMH_2410	832.92	85.5	-0.02	8	PVC	0.01	2	100	7	
GM-GIS-TH_ssGM_1343	MH-GIS-TH_ssMH_2411	845.81	MH-GIS-TH_ssMH_2427	845.8	117.2	9E-05	8	PVC	0.01	35	35.8	-0.4	
GM-GIS-TH_ssGM_1344	MH-GIS-TH_ssMH_2412	847.58	MH-GIS-TH_ssMH_2411	845.81	36.7	0.048	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-TH_ssGM_1345	MH-GIS-TH_ssMH_2414	827.68	MH-GIS-TH_ssMH_2406	822.5	238.3	0.022	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1346	MH-GIS-TH_ssMH_2405	814	MH-GIS-TH_ssMH_2407	814	129.2	0	8	PVC	0.01	2	100	2.8	
GM-GIS-TH_ssGM_1347	MH-GIS-TH_ssMH_2408	818.97	MH-GIS-TH_ssMH_2407	814	237.6	0.021	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-TH_ssGM_1348	MH-GIS-TH_ssMH_2406	822.5	MH-GIS-TH_ssMH_2408	818.97	219.6	0.016	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1349	MH-GIS-TH_ssMH_2415	824	MH-GIS-TH_ssMH_2416	819	239.9	0.021	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1350	MH-GIS-TH_ssMH_2416	819	MH-GIS-TH_ssMH_2417	819	71.4	0	8	PVC	0.01	4	100	3	
GM-GIS-TH_ssGM_1351	MH-GIS-TH_ssMH_2417	819	MH-GIS-TH_ssMH_2418	816.63	84	0.028	8	PVC	0.01	7	100	3	
GM-GIS-TH_ssGM_1352	MH-GIS-TH_ssMH_2407	814	MH-GIS-TH_ssMH_2419	814	171.7	0	8	PVC	0.01	11	100	2.8	
GM-GIS-TH_ssGM_1353	MH-GIS-TH_ssMH_2450	887.77	MH-GIS-TH_ssMH_2449	883.57	209	0.02	8	PVC	0.01	22	15.1	-0.6	
GM-GIS-TH_ssGM_1354	MH-GIS-TH_ssMH_2423	867.07	MH-GIS-TH_ssMH_2424	862.29	356	0.013	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1355	MH-GIS-TH_ssMH_2424	862.29	MH-GIS-TH_ssMH_2444	861.48	53.6	0.015	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1356	MH-GIS-TH_ssMH_2426	851.47	MH-GIS-TH_ssMH_2509	829	339.7	0.066	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1357	MH-GIS-TH_ssMH_2419	814	MH-GIS-TH_ssMH_2420	812.28	95.3	0.018	8	PVC	0.01	13	100	2.8	
GM-GIS-TH_ssGM_1358	MH-GIS-TH_ssMH_2418	816.63	MH-GIS-TH_ssMH_2421	817.85	62.8	-0.019	8	PVC	0.01	31	100	6.5	
GM-GIS-TH_ssGM_1359	MH-GIS-TH_ssMH_2421	817.85	MH-GIS-TH_ssMH_2429	817.77	109.3	7E-04	8	PVC	0.01	33	100	5.3	
GM-GIS-TH_ssGM_1360	MH-GIS-TH_ssMH_2429	817.77	MH-GIS-MH-127	824	199.8	-0.031	8	PVC	0.01	35	100	7.6	
GM-GIS-TH_ssGM_1361	MH-GIS-TH_ssMH_2436	878.25	MH-GIS-MH-122	882.33	165.9	-0.025	8	PVC	0.01	44	100	3.7	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-TH_ssGM_1362	MH-GIS-TH_ssMH_2430	874	MH-GIS-TH_ssMH_2436	878.25	265.8	-0.016	8	PVC	0.01	42	100	7.9	
GM-GIS-TH_ssGM_1363	MH-GIS-TH_ssMH_2431	874	MH-GIS-TH_ssMH_2430	874	62.3	0	8	PVC	0.01	40	100	5.3	
GM-GIS-TH_ssGM_1364	MH-GIS-TH_ssMH_2448	880.86	MH-GIS-TH_ssMH_2431	874	233.9	0.029	8	PVC	0.01	38	19.7	-0.5	
GM-GIS-TH_ssGM_1365	MH-GIS-TH_ssMH_2433	889.23	MH-GIS-TH_ssMH_2432	883.44	165.9	0.035	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-TH_ssGM_1366	MH-GIS-TH_ssMH_2434	891.21	MH-GIS-TH_ssMH_2433	889.23	60.7	0.033	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-TH_ssGM_1367	MH-GIS-TH_ssMH_2447	852.59	MH-GIS-TH_ssMH_2411	845.81	181.1	0.037	8	PVC	0.01	22	15.1	-0.6	
GM-GIS-TH_ssGM_1368	MH-GIS-TH_ssMH_2451	889	MH-GIS-TH_ssMH_2434	891.21	150.2	-0.015	8	PVC	0.01	4	100	1.6	
GM-GIS-TH_ssGM_1369	MH-GIS-TH_ssMH_2413	851.14	MH-GIS-TH_ssMH_2412	847.58	101	0.035	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1370	MH-GIS-TH_ssMH_2420	812.28	MH-GIS-TH_ssMH_2428	811.46	71	0.012	8	PVC	0.01	15	100	4.5	
GM-GIS-TH_ssGM_1371	MH-GIS-TH_ssMH_2428	811.46	MH-GIS-TH_ssMH_2437	813.12	87.5	-0.019	8	PVC	0.01	18	100	7	
GM-GIS-TH_ssGM_1372	MH-GIS-TH_ssMH_2438	814	MH-GIS-TH_ssMH_2418	816.63	164.2	-0.016	8	PVC	0.01	22	100	8	
GM-GIS-TH_ssGM_1373	MH-GIS-TH_ssMH_2437	813.12	MH-GIS-TH_ssMH_2438	814	71.7	-0.012	8	PVC	0.01	20	100	6.2	
GM-GIS-TH_ssGM_1374	MH-GIS-TH_ssMH_2439	851.96	MH-GIS-TH_ssMH_2413	851.14	87.8	0.009	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1375	MH-GIS-TH_ssMH_2442	862.25	MH-GIS-TH_ssMH_2443	859.08	180.9	0.018	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-TH_ssGM_1376	MH-GIS-TH_ssMH_2441	863.07	MH-GIS-TH_ssMH_2442	862.25	48	0.017	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1377	MH-GIS-TH_ssMH_2440	865.19	MH-GIS-TH_ssMH_2441	863.07	53.8	0.039	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1378	MH-GIS-TH_ssMH_2445	862.69	MH-GIS-TH_ssMH_2444	861.48	101.3	0.012	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1379	MH-GIS-TH_ssMH_2446	866.93	MH-GIS-TH_ssMH_2445	862.69	116.3	0.036	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1380	MH-GIS-TH_ssMH_2444	861.48	MH-GIS-TH_ssMH_2443	859.08	57.1	0.042	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-TH_ssGM_1381	MH-GIS-TH_ssMH_2443	859.08	MH-GIS-TH_ssMH_2447	852.59	148.8	0.044	8	PVC	0.01	20	14.3	-0.6	
GM-GIS-TH_ssGM_1382	MH-GIS-TH_ssMH_2449	883.57	MH-GIS-TH_ssMH_2448	880.86	161	0.017	8	PVC	0.01	24	15.8	-0.6	
GM-GIS-TH_ssGM_1383	MH-GIS-TH_ssMH_2432	883.44	MH-GIS-TH_ssMH_2448	880.86	77.1	0.033	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-TH_ssGM_1384	MH-GIS-MH-102	888.77	MH-GIS-TH_ssMH_2450	887.77	125.1	0.008	8	PVC	0.01	20	14.3	-0.6	
GM-GIS-TH_ssGM_1385	MH-GIS-TH_ssMH_2422	818.06	MH-GIS-MH-107	817.34	113.5	0.006	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1386	MH-GIS-TH_ssMH_2425	853.07	MH-GIS-MH-59	852.02	244.7	0.004	8	PVC	0.01	2	5	-0.6	
GM-GIS-TH_ssGM_1387	MH-GIS-TH_ssMH_2435	892.75	MH-GIS-TH_ssMH_2451	889	240.4	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1388	MH-GIS-TH_ssMH_2427	845.8	MH-GIS-MH-119	845.1	150.8	0.005	8	PVC	0.01	38	19.7	-0.5	
GM-GIS-TH_ssGM_1389	MH-GIS-TH_ssMH_2454	822.12	MH-GIS-TH_ssMH_2452	816.34	144.8	0.04	8	PVC	0.01	162	41.9	-0.4	
GM-GIS-TH_ssGM_1390	MH-GIS-TH_ssMH_2457	829	MH-GIS-TH_ssMH_2453	824	231.3	0.022	8	PVC	0.01	117	35.4	-0.4	
GM-GIS-TH_ssGM_1391	MH-GIS-TH_ssMH_2452	816.34	MH-GIS-MH-205	810.83	158.4	0.035	8	PVC	0.01	168	42.7	-0.4	
GM-GIS-TH_ssGM_1392	MH-GIS-TH_ssMH_2458	881.69	MH-GIS-TH_ssMH_2465	867.84	238.2	0.058	8	PVC	0.01	49	22.5	-0.5	
GM-GIS-TH_ssGM_1393	MH-GIS-TH_ssMH_2456	863.88	MH-GIS-TH_ssMH_2459	854.04	157.3	0.063	8	PVC	0.01	53	23.5	-0.5	
GM-GIS-TH_ssGM_1394	MH-GIS-MH-107	817.34	MH-GIS-TH_ssMH_2452	816.34	71.8	0.014	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1395	MH-GIS-MH-59	852.02	MH-GIS-TH_ssMH_2464	851.09	39.9	0.023	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1396	MH-GIS-TH_ssMH_2509	829	MH-GIS-TH_ssMH_2457	829	43.6	0	8	PVC	0.01	4	35.4	-0.4	
GM-GIS-TH_ssGM_1397	MH-GIS-TH_ssMH_2464	851.09	MH-GIS-TH_ssMH_2460	842.8	136.1	0.061	8	PVC	0.01	62	25.5	-0.5	
GM-GIS-TH_ssGM_1398	MH-GIS-MH-119	845.1	MH-GIS-TH_ssMH_2460	842.8	78.7	0.029	8	PVC	0.01	40	20.3	-0.5	
GM-GIS-TH_ssGM_1399	MH-GIS-MH-127	824	MH-GIS-TH_ssMH_2453	824	85.7	0	8	PVC	0.01	38	100	1.4	
GM-GIS-TH_ssGM_1400	MH-GIS-TH_ssMH_2462	829.3	MH-GIS-TH_ssMH_2457	829	204.4	0.001	8	PVC	0.01	111	44.5	-0.4	
GM-GIS-TH_ssGM_1401	MH-GIS-TH_ssMH_2463	829	MH-GIS-TH_ssMH_2462	829.3	152	-0.002	8	PVC	0.01	108	100	0	
GM-GIS-TH_ssGM_1402	MH-GIS-TH_ssMH_2459	854.04	MH-GIS-TH_ssMH_2464	851.09	49.3	0.06	8	PVC	0.01	55	24	-0.5	
GM-GIS-TH_ssGM_1403	MH-GIS-TH_ssMH_2465	867.84	MH-GIS-TH_ssMH_2456	863.88	68.1	0.058	8	PVC	0.01	51	23.1	-0.5	
GM-GIS-TH_ssGM_1404	MH-GIS-MH-122	882.33	MH-GIS-TH_ssMH_2458	881.69	83.1	0.008	8	PVC	0.01	46	22	-0.5	
GM-GIS-TH_ssGM_1405	MH-GIS-TH_ssMH_2466	825.56	MH-GIS-TH_ssMH_2454	822.12	400.2	0.009	8	PVC	0.01	159	41.5	-0.4	
GM-GIS-TH_ssGM_1406	MH-GIS-TH_ssMH_2453	824	MH-GIS-TH_ssMH_2466	825.56	214.6	-0.007	8	PVC	0.01	157	100	1.4	
GM-GIS-TH_ssGM_1407	MH-GIS-TH_ssMH_2460	842.8	MH-GIS-TH_ssMH_2461	837.94	79.3	0.061	8	PVC	0.01	104	33.3	-0.4	
GM-GIS-TH_ssGM_1408	MH-GIS-TH_ssMH_2461	837.94	MH-GIS-TH_ssMH_2463	829	173.6	0.052	8	PVC	0.01	106	33.6	-0.4	
GM-GIS-TH_ssGM_1409	MH-GIS-MH-96	891.26	MH-GIS-TH_ssMH_2467	889.56	60.3	0.028	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-TH_ssGM_1410	MH-GIS-TH_ssMH_2468	886.14	MH-GIS-TH_ssMH_2467	889.56	115.7	-0.03	8	PVC	0.01	2	100	2.8	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-TH_ssGM_1411	MH-GIS-TH_ssMH_2467	889.56	MH-GIS-MH-102	888.77	65.6	0.012	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-TH_ssGM_1412	MH-GIS-MH-39	899.81	MH-GIS-MH-40	899.01	27.4	0.029	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-TH_ssGM_1413	MH-GIS-TH_ssMH_2508	895.72	MH-GIS-MH-96	891.26	227.1	0.02	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-TH_ssGM_1414	MH-GIS-MH-40	899.01	MH-GIS-TH_ssMH_2508	895.72	166.5	0.02	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-TH_ssGM_1415	MH-GIS-TH_ssMH_2469	899.48	MH-GIS-MH-39	899.81	94.7	-0.003	8	PVC	0.01	4	61.7	-0.3	
GM-GIS-TH_ssGM_1416	MH-GIS-TH_ssMH_2470	900.98	MH-GIS-TH_ssMH_2469	899.48	61.6	0.024	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-WC_ssGM_30	MH-GIS-WC_ssMH_1443	584.4	MH-GIS-WC_ssMH_1444	576.86	105.9	0.071	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-WC_ssGM_31	MH-GIS-WC_ssMH_1430	568.76	MH-GIS-WC_ssMH_1444	576.86	119.6	-0.068	8	PVC	0.01	7	100	9.8	
GM-GIS-WC_ssGM_32	MH-GIS-WC_ssMH_1438	586.92	MH-GIS-WC_ssMH_1443	584.4	113	0.022	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-WC_ssGM_33	MH-GIS-WC_ssMH_1444	576.86	MH-GIS-KR_ssMH_1445	579.09	178.7	-0.012	8	PVC	0.01	12	100	1.7	
GM-GIS-WC_ssGM_37	MH-GIS-MH-152	645.99	MH-GIS-WC_ssMH_1433	638.58	120.9	0.061	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_38	MH-GIS-WC_ssMH_1432	627.41	MH-GIS-WC_ssMH_1434	616.89	337.6	0.031	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-WC_ssGM_39	MH-GIS-WC_ssMH_1433	638.58	MH-GIS-WC_ssMH_1432	627.41	257.8	0.043	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-WC_ssGM_40	MH-GIS-WC_ssMH_1437	570.16	MH-GIS-WC_ssMH_1430	568.76	272.9	0.005	8	PVC	0.01	6	100	3.9	
GM-GIS-WC_ssGM_41	MH-GIS-MH-170	634.14	MH-GIS-WC_ssMH_1446	626.21	147.1	0.054	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_42	MH-GIS-WC_ssMH_1446	626.21	MH-GIS-WC_ssMH_1440	607.87	280.7	0.065	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-WC_ssGM_43	MH-GIS-WC_ssMH_1440	607.87	MH-GIS-WC_ssMH_1438	586.92	304	0.069	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-WC_ssGM_44	MH-GIS-WC_ssMH_1436	600.59	MH-GIS-WC_ssMH_1437	570.16	340.3	0.089	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-WC_ssGM_45	MH-GIS-WC_ssMH_1435	611.95	MH-GIS-WC_ssMH_1436	600.59	130.7	0.087	8	PVC	0.01	5	7	-0.6	
GM-GIS-WC_ssGM_46	MH-GIS-WC_ssMH_1434	616.89	MH-GIS-WC_ssMH_1435	611.95	85.2	0.058	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-WC_ssGM_47	MH-GIS-MH-120	629.37	MH-GIS-WC_ssMH_1432	627.41	79.5	0.025	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_108	MH-GIS-WC_ssMH_1561	651.21	MH-IS-107	644.73	77.8	0.083	8	PVC	0.01	1	2.9	-0.6	
GM-IS-2	MH-IS-276	849.3	MH-IS-205	845.9	150.7	0.023	10	PVC	0.01	70	20.4	-0.7	
GM-IS-3	MH-IS-221	840.61	MH-IS-223	839.61	174.8	0.006	10	PVC	0.01	109	25.6	-0.6	
GM-IS-4	MH-IS-201	841.44	MH-IS-221	840.61	69.9	0.012	10	PVC	0.01	108	25.5	-0.6	
GM-IS-5	MH-IS-229	834.38	MH-IS-233	831.11	247	0.013	10	PVC	0.01	112	25.9	-0.6	
GM-IS-6	MH-IS-225	838.58	MH-IS-227	835.69	254.9	0.011	10	PVC	0.01	110	25.8	-0.6	
GM-IS-7	MH-IS-223	839.61	MH-IS-225	838.58	237.4	0.004	10	PVC	0.01	110	25.7	-0.6	
GM-IS-8	MH-IS-234	862.31	MH-IS-243	858.19	164.3	0.025	10	PVC	0.01	44	16.1	-0.7	
GM-IS-9	MH-IS-227	835.69	MH-IS-229	834.38	95.6	0.014	10	PVC	0.01	111	25.9	-0.6	
GM-IS-10	MH-IS-251	855.2	MH-IS-261	853.85	164.5	0.008	10	PVC	0.01	45	16.4	-0.7	
GM-IS-11	MH-IS-243	858.19	MH-IS-251	855.2	188.2	0.016	10	PVC	0.01	45	16.2	-0.7	
GM-IS-12	MH-IS-269	850.48	MH-IS-276	849.3	264.6	0.004	10	PVC	0.01	47	16.6	-0.7	
GM-IS-13	MH-IS-261	853.85	MH-IS-269	850.48	285.6	0.012	10	PVC	0.01	46	16.5	-0.7	
GM-IS-14	MH-IS-203	843.68	MH-IS-201	841.44	159.9	0.014	10	PVC	0.01	87	22.8	-0.6	
GM-IS-15	MH-IS-211	869.29	MH-IS-234	862.31	166	0.042	10	PVC	0.01	41	15.6	-0.7	
GM-IS-16	MH-IS-185	875.33	MH-IS-211	869.29	249.3	0.024	10	PVC	0.01	41	15.5	-0.7	
GM-IS-17	MH-IS-146	876.12	MH-IS-185	875.33	147.9	0.005	10	Ductile Iron	0.013	40	16	-0.7	
GM-IS-18	MH-IS-18	799.57	MH-IS-235	798.05	144.3	0.011	12	PVC	0.01	52	13.9	-0.9	
GM-IS-19	MH-IS-147	790.4	PSLWW	789.9	57.6	0.009	12	PVC	0.01	355	37.2	-0.6	
GM-IS-20	MH-IS-186	794.7	MH-IS-147	790.4	84.3	0.051	12	PVC	0.01	70	16.1	-0.8	
GM-IS-21	MH-IS-212	795.56	MH-IS-186	794.7	81.7	0.011	12	PVC	0.01	67	15.9	-0.8	
GM-IS-22	MH-IS-235	798.05	MH-IS-212	795.56	92	0.027	12	PVC	0.01	65	15.6	-0.8	
GM-IS-23	MH-IS-3	797.17	MH-IS-117	796.57	128.5	0.005	12	PVC	0.01	6	4.9	-1	
GM-IS-28	MH-IS-187	422.69	MH-IS-213	420.51	310.9	0.007	12	PVC	0.01	169	25.3	-0.7	
GM-IS-29	MH-IS-27	424.37	MH-IS-187	422.69	270.5	0.006	12	PVC	0.01	166	25.1	-0.7	
GM-IS-30	MH-IS-39	847.91	MH-IS-290	832.16	182.5	0.086	12	PVC	0.01	613	49.4	-0.5	
GM-IS-31	MH-IS-233	831.11	MH-IS-249	830.76	39.8	0.009	10	PVC	0.01	119	26.7	-0.6	
GM-IS-32	MH-IS-249	830.76	MH-IS-126	830.14	295.5	0.002	10	PVC	0.01	128	31.8	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-33	MH-IS-40	811.95	MH-IS-36	792.15	132.2	0.15	12	PVC	0.01	632	50.2	-0.5	
GM-IS-34	MH-IS-290	832.16	MH-IS-31	830.87	241	0.005	12	PVC	0.01	614	49.5	-0.5	
GM-IS-35	MH-IS-31	830.87	MH-IS-32	829.81	139.4	0.008	12	PVC	0.01	615	49.5	-0.5	
GM-IS-36	MH-IS-32	829.81	MH-IS-33	827.47	336.3	0.007	12	PVC	0.01	616	49.5	-0.5	
GM-IS-37	MH-IS-33	827.47	MH-IS-35	824.02	225.5	0.015	12	PVC	0.01	616	49.6	-0.5	
GM-IS-38	MH-IS-35	824.02	MH-IS-40	811.95	301.4	0.04	12	PVC	0.01	617	49.6	-0.5	
GM-IS-39	MH-IS-36	792.15	MH-IS-37	788.58	65.5	0.054	12	PVC	0.01	633	50.2	-0.5	
GM-IS-40	MH-IS-37	788.58	MH-IS-38	767.46	126.7	0.167	12	PVC	0.01	633	50.3	-0.5	
GM-IS-42	MH-IS-MH-3	801.7	MH-GIS-DH_ssMH_1627	801.8	292	-3E-04	10	PVC	0.01	48	45.5	-0.5	
GM-IS-43	MH-IS-MH-4	873	MH-IS-46	869.81	399.4	0.008	12	PVC	0.01	457	42.4	-0.6	
GM-IS-44	MH-IS-43	861.48	MH-IS-44	849.46	145.7	0.083	12	PVC	0.01	463	42.7	-0.6	
GM-IS-45	MH-IS-44	849.46	MH-IS-39	847.91	70.6	0.022	12	PVC	0.01	464	42.7	-0.6	
GM-IS-46	MH-IS-46	869.81	MH-IS-43	861.48	366.7	0.023	12	PVC	0.01	458	42.4	-0.6	
GM-IS-47(1)	MH-IS-198	779.52	MH-IS-MH-210	778.16	18.4	0.074	10	PVC	0.01	586	61.3	-0.3	
GM-IS-47(2)	MH-IS-MH-210	778.16	MH-IS-195	775.63	34.1	0.074	10	PVC	0.01	589	61.4	-0.3	
GM-IS-48	MH-IS-MH-5	825.27	MH-IS-54	819.68	193.9	0.029	10	PVC	0.01	597	61.9	-0.3	
GM-IS-49	MH-IS-49	804.65	MH-IS-51	801.25	273	0.012	10	PVC	0.01	66	19.8	-0.7	
GM-IS-50	MH-IS-51	801.25	MH-IS-50	797.44	305.3	0.012	10	PVC	0.01	67	20	-0.7	
GM-IS-51	MH-IS-54	819.68	MH-IS-61	800.77	221.8	0.085	10	PVC	0.01	598	62	-0.3	
GM-IS-52	MH-IS-50	797.44	MH-IS-198	779.52	269.6	0.066	10	PVC	0.01	71	20.6	-0.7	
GM-IS-53	MH-IS-195	775.63	PSBPWW	775.63	45.7	0	10	PVC	0.01	590	88.3	-0.1	
GM-IS-54	MH-IS-59	828.09	MH-IS-58	819.51	192.3	0.045	10	PVC	0.01	57	18.4	-0.7	
GM-IS-55	MH-IS-53	830.15	MH-IS-59	828.09	188.3	0.011	10	PVC	0.01	56	18.2	-0.7	
GM-IS-56	MH-IS-58	819.51	MH-IS-60	809.95	383.8	0.025	10	PVC	0.01	61	19	-0.7	
GM-IS-57	MH-IS-60	809.95	MH-IS-49	804.65	214.5	0.025	10	PVC	0.01	62	19.2	-0.7	
GM-IS-58	MH-IS-64	788.27	MH-IS-65	770.15	350.9	0.052	10	Ductile Iron	0.013	602	62.1	-0.3	
GM-IS-59	MH-IS-63	796.38	MH-IS-64	788.27	45.8	0.177	10	Ductile Iron	0.013	601	62.1	-0.3	
GM-IS-60	MH-IS-61	800.77	MH-IS-62	799.18	294.1	0.005	10	Ductile Iron	0.013	599	69.5	-0.3	
GM-IS-61	MH-IS-65	770.15	MH-IS-116	769.83	183.2	0.002	10	Ductile Iron	0.013	602	100	0.2	
GM-IS-63	MH-IS-62	799.18	MH-IS-63	796.38	321.1	0.009	10	Ductile Iron	0.013	600	62	-0.3	
GM-IS-64(1)	MH-IS-152	852.91	MH-IS-BP_ssMH_2512	837.33	197.1	0.079	10	PVC	0.01	48	16.9	-0.7	
GM-IS-64(2)	MH-IS-BP_ssMH_2512	837.33	MH-IS-67	832.9	282.2	0.016	10	PVC	0.01	50	17.1	-0.7	
GM-IS-66	MH-IS-67	832.9	MH-IS-53	830.15	327.8	0.008	10	PVC	0.01	51	17.3	-0.7	
GM-IS-67	MH-IS-69	876.77	MH-IS-146	876.12	109.3	0.006	10	Ductile Iron	0.013	39	15.4	-0.7	
GM-IS-68	MH-IS-70	866.12	MH-IS-71	858.15	228.3	0.035	10	Ductile Iron	0.013	42	15.7	-0.7	
GM-IS-69	MH-IS-71	858.15	MH-IS-152	852.91	245.9	0.021	10	Ductile Iron	0.013	47	16.6	-0.7	
GM-IS-70	MH-IS-294	409.13	MH-IS-230	408.12	139.2	0.007	12	PVC	0.01	1	62.8	-0.4	
GM-IS-71	MH-IS-72	415.04	MH-IS-230	408.12	240.6	0.029	15	PVC	0.01	1,550	60	-0.5	
GM-IS-72	MH-IS-77	422.01	MH-IS-72	415.04	250	0.028	15	PVC	0.01	1,549	60	-0.5	
GM-IS-73	MH-IS-MH-2	408.8	MH-IS-232	406.2	302.4	0.009	36	Concrete	0.013	3,257	28.3	-2.2	
GM-IS-74	MH-IS-230	408.12	MH-IS-MH-2	408.8	32.2	-0.021	24	Concrete	0.013	1,552	81.9	-0.4	
GM-IS-75	MH-IS-81	438.64	MH-IS-78	430.27	309.1	0.027	15	PVC	0.01	1,548	59.9	-0.5	
GM-IS-76	MH-IS-82	448.73	MH-IS-81	438.64	294.7	0.034	15	PVC	0.01	1,545	59.9	-0.5	
GM-IS-77	MH-IS-76	491.15	MH-IS-75	479.82	294.7	0.038	15	PVC	0.01	1,541	59.8	-0.5	
GM-IS-78	MH-IS-74	465.04	MH-IS-82	448.73	296.4	0.055	15	PVC	0.01	1,543	59.8	-0.5	
GM-IS-79	MH-IS-75	479.82	MH-IS-74	465.04	275	0.054	15	PVC	0.01	1,542	59.8	-0.5	
GM-IS-80	MH-IS-78	430.27	MH-IS-77	422.01	303.5	0.027	15	PVC	0.01	1,548	60	-0.5	
GM-IS-81	MH-IS-128	510.28	MH-IS-84	509.54	45.6	0.016	12	PVC	0.01	62	15.2	-0.8	
GM-IS-82	MH-IS-154	499.58	MH-IS-121	498.94	147.4	0.004	12	PVC	0.01	5	10.8	-0.9	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-83	MH-IS-84	509.54	MH-IS-121	498.94	356.1	0.03	15	PVC	0.01	1,534	59.7	-0.5	
GM-IS-84	MH-IS-83	573.01	MH-IS-87	563.08	301	0.033	15	PVC	0.01	1,468	58.3	-0.5	
GM-IS-85	MH-IS-87	563.08	MH-IS-86	543.15	300	0.066	15	PVC	0.01	1,469	58.3	-0.5	
GM-IS-86	MH-IS-86	543.15	MH-IS-85	525.48	251.4	0.07	15	PVC	0.01	1,470	58.3	-0.5	
GM-IS-87	MH-IS-85	525.48	MH-IS-84	509.54	296.7	0.054	15	PVC	0.01	1,471	58.4	-0.5	
GM-IS-88	MH-IS-48	588.13	MH-IS-99	587.49	150.6	0.004	12	PVC	0.01	40	12.2	-0.9	
GM-IS-89	MH-IS-90	583.48	MH-IS-89	577.39	235.4	0.026	15	PVC	0.01	1,454	58	-0.5	
GM-IS-90	MH-IS-99	587.49	MH-IS-90	583.48	306.8	0.013	15	PVC	0.01	1,453	58	-0.5	
GM-IS-91	MH-IS-101	594.05	MH-IS-99	587.49	246	0.027	15	PVC	0.01	1,412	57.1	-0.5	
GM-IS-92	MH-IS-89	577.39	MH-IS-83	573.01	316.6	0.014	15	PVC	0.01	1,467	58.3	-0.5	
GM-IS-93	MH-IS-121	498.94	MH-IS-76	491.15	268.4	0.029	15	PVC	0.01	1,540	59.8	-0.5	
GM-IS-94	MH-IS-112	687.28	MH-IS-111	668.45	304.2	0.062	15	PVC	0.01	1,388	56.6	-0.5	
GM-IS-95	MH-IS-113	708.48	MH-IS-112	687.28	306.5	0.069	15	PVC	0.01	1,387	56.6	-0.5	
GM-IS-96	MH-IS-117	796.57	MH-IS-116	769.83	386.7	0.069	15	PVC	0.01	145	17.6	-1	
GM-IS-97	MH-IS-118	807.25	MH-IS-117	796.57	109.3	0.098	12	PVC	0.01	136	22.7	-0.8	
GM-IS-98	MH-IS-119	829.53	MH-IS-118	807.25	297.4	0.075	12	PVC	0.01	136	22.6	-0.8	
GM-IS-99	MH-IS-120	850.27	MH-IS-119	829.53	297.3	0.07	12	PVC	0.01	6	4.6	-1	
GM-IS-100	MH-IS-123	863.89	MH-IS-120	850.27	318.5	0.043	12	PVC	0.01	5	4.2	-1	
GM-IS-101	MH-IS-124	870.98	MH-IS-123	863.89	227.3	0.031	12	PVC	0.01	2	3	-1	
GM-IS-102	MH-IS-125	874.79	MH-IS-124	870.98	247.6	0.015	12	PVC	0.01	2	2.4	-1	
GM-IS-103	MH-IS-129	645.79	MH-IS-107	644.73	147.5	0.007	12	PVC	0.01	19	8.3	-0.9	
GM-IS-104	MH-IS-296	797.56	MH-IS-117	796.57	70.4	0.014	12	PVC	0.01	1	1.7	-1	
GM-IS-105	MH-IS-116	769.83	MH-IS-115	750.98	298.9	0.063	15	PVC	0.01	748	41	-0.7	
GM-IS-106	MH-IS-291	874.15	MH-IS-125	874.79	46.8	-0.014	12	PVC	0.01	1	67.3	-0.3	
GM-IS-107	MH-IS-111	668.45	MH-IS-108	657.51	300.5	0.036	15	PVC	0.01	1,389	56.6	-0.5	
GM-IS-108	MH-IS-108	657.51	MH-IS-107	644.73	299.4	0.043	15	PVC	0.01	1,389	56.7	-0.5	
GM-IS-109	MH-IS-107	644.73	MH-IS-106	632.04	300.6	0.042	15	PVC	0.01	1,410	57.1	-0.5	
GM-IS-110	MH-IS-106	632.04	MH-IS-105	612.67	299.9	0.065	15	PVC	0.01	1,410	57.1	-0.5	
GM-IS-111	MH-IS-115	750.98	MH-IS-114	728.11	298.5	0.077	15	PVC	0.01	1,385	56.6	-0.5	
GM-IS-112	MH-IS-114	728.11	MH-IS-113	708.48	305.3	0.064	15	PVC	0.01	1,386	56.6	-0.5	
GM-IS-113	MH-IS-126	830.14	MH-IS-119	829.53	121.4	0.005	12	PVC	0.01	129	22.1	-0.8	
GM-IS-114	MH-IS-127	755.09	MH-IS-115	750.98	63.4	0.065	12	PVC	0.01	637	50.4	-0.5	
GM-IS-115	MH-IS-102	756.47	MH-IS-127	755.09	85.5	0.016	12	PVC	0.01	636	50.4	-0.5	
GM-IS-116	MH-IS-105	612.67	MH-IS-101	594.05	299.6	0.062	15	PVC	0.01	1,411	57.1	-0.5	
GM-IS-117	MH-IS-214	408.1	MH-IS-188	407.79	51	0.006	10	Concrete	0.013	17	10.1	-0.7	SM4
GM-IS-118	MH-IS-188	407.79	MH-IS-148	404.7	143.4	0.022	10	Concrete	0.013	24	11.7	-0.7	SM4
GM-IS-119	MH-IS-238	409.5	MH-IS-214	408.1	378.8	0.004	10	Concrete	0.013	9	8.8	-0.8	
GM-IS-120	MH-IS-148	404.7	MH-IS-145	404.12	72.9	0.008	10	Concrete	0.013	66	19.8	-0.7	SM4
GM-IS-121	MH-IS-145	404.12	MH-IS-144	403.08	80.2	0.013	10	Concrete	0.013	68	20.1	-0.7	SM4
GM-IS-122	MH-IS-144	403.08	PS2WW	399.5	22.6	0.159	10	Concrete	0.013	78	21.5	-0.7	SM4
GM-IS-124	MH-IS-192	405.19	PS1WW	401	69.8	0.06	15	Concrete	0.013	1,702	63	-0.5	SM3A
GM-IS-125	MH-IS-242	406.96	MH-IS-218	405.44	302.2	0.005	15	Concrete	0.013	1,667	94.1	-0.1	SM3A
GM-IS-126	MH-IS-218	405.44	MH-IS-192	405.19	294	9E-04	15	Concrete	0.013	1,676	100	0.5	SM3A
GM-IS-127	MH-IS-248	408.21	MH-IS-242	406.96	304.1	0.004	15	Concrete	0.013	1,658	73.6	-0.3	SM3A
GM-IS-128	MH-IS-245	410.33	MH-IS-238	409.5	339.2	0.002	10	Concrete	0.013	7	8.4	-0.8	
GM-IS-130	MH-IS-162	413.59	MH-IS-156	413.09	173.5	0.003	12	Concrete	0.013	428	50	-0.5	
GM-IS-131	MH-IS-278	412.1	MH-IS-271	410.4	374.1	0.005	12	Concrete	0.013	445	44.8	-0.6	
GM-IS-132	MH-IS-156	413.09	MH-IS-278	412.1	264.7	0.004	12	Concrete	0.013	437	46.7	-0.5	
GM-IS-134	MH-IS-140	409.52	MH-IS-256	408.25	330.5	0.004	15	Concrete	0.013	1,632	100	0.5	SM3A

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-135	MH-IS-256	408.25	MH-IS-248	408.21	330.4	1E-04	15	Concrete	0.013	1,641	100	0.8	SM3A
GM-IS-136	MH-IS-MH-6	414.56	MH-IS-267	409.97	156.9	0.029	10	Concrete	0.013	87	22.7	-0.6	
GM-IS-137	MH-IS-134	408.52	MH-IS-193	407.54	156	0.006	10	Concrete	0.013	132	28.2	-0.6	
GM-IS-139	MH-IS-193	407.54	MH-IS-155	406.97	73.7	0.008	10	Concrete	0.013	390	49.5	-0.4	
GM-IS-140	MH-IS-155	406.97	PS3WW	402.5	38.7	0.116	10	Concrete	0.013	393	49.7	-0.4	
GM-IS-141	MH-IS-136	409.7	MH-IS-134	408.52	183.2	0.006	10	Concrete	0.013	126	27.6	-0.6	
GM-IS-142	MH-IS-167	414.72	MH-IS-162	413.59	394.7	0.003	12	Concrete	0.013	419	49.4	-0.5	
GM-IS-143	MH-IS-170	415.38	MH-IS-167	414.72	402.9	0.002	12	Concrete	0.013	410	57.7	-0.4	
GM-IS-144	MH-IS-172	416.48	MH-IS-170	415.38	421.1	0.003	12	Concrete	0.013	402	49.5	-0.5	SM3B
GM-IS-145	MH-IS-138	409.59	MH-IS-136	409.7	170.6	-6E-04	10	Concrete	0.013	116	63.4	-0.3	
GM-IS-146	MH-IS-139	410.69	MH-IS-138	409.59	287.4	0.004	10	Concrete	0.013	110	28.8	-0.6	
GM-IS-147	MH-IS-30	415.33	MH-IS-168	415.07	234.8	0.001	10	PVC	0.01	813	100	0.6	SM1A
GM-IS-148	MH-IS-28	415.3	MH-IS-30	415.38	32	-0.003	10	PVC	0.01	795	100	0.7	SM1A
GM-IS-149	MH-IS-26	415.99	MH-IS-28	415.36	243.8	0.003	10	PVC	0.01	786	100	1	SM1A
GM-IS-150	MH-IS-24	416.67	MH-IS-26	415.99	247.7	0.003	10	PVC	0.01	778	100	1.2	SM1B
GM-IS-151	MH-IS-23	417.17	MH-IS-24	416.67	121	0.004	10	PVC	0.01	751	100	1.1	SM1B
GM-IS-152	MH-IS-21	417.29	MH-IS-23	417.17	10.7	0.011	10	PVC	0.01	743	100	1	SM1B
GM-IS-153	MH-IS-19	418.18	MH-IS-21	417.29	400.3	0.002	10	PVC	0.01	734	100	1.5	SM1B
GM-IS-154	MH-IS-14	419.81	MH-IS-19	418.18	399.8	0.004	10	PVC	0.01	725	100	1.1	SM1C
GM-IS-155	MH-IS-122	420.49	MH-IS-14	419.81	271.6	0.003	10	PVC	0.01	717	100	1.3	SM1C
GM-IS-156	MH-IS-110	420.69	MH-IS-122	420.49	37.8	0.005	10	PVC	0.01	708	100	1.2	
GM-IS-157	MH-IS-98	421.68	MH-IS-110	420.69	269.9	0.004	10	PVC	0.01	699	100	1	
GM-IS-158	MH-IS-80	422.48	MH-IS-98	421.68	122	0.007	10	PVC	0.01	690	100	0.6	
GM-IS-162	MH-IS-213	410.46	MH-GIS-SF_ssMH_1447	410.46	125.9	0	48	Glass	0.013	171	8.6	-3.7	
GM-IS-166	MH-IS-266	415.38	MH-IS-253	412.61	351	0.008	10	Concrete	0.013	9	7.4	-0.8	
GM-IS-167	MH-IS-253	412.61	MH-IS-137	411.83	356.6	0.002	10	Concrete	0.013	63	25	-0.6	
GM-IS-168	MH-IS-260	419.11	MH-IS-259	418.07	388.7	0.003	10	Concrete	0.013	3	5.6	-0.8	
GM-IS-169	MH-IS-259	418.07	MH-SUR-5103	416.7	121.3	0.011	10	Concrete	0.013	6	6	-0.8	
GM-IS-170(1)	MH-IS-135	409.66	MH-IS-GS_ssMH_1480	408.77	316.2	0.003	10	Concrete	0.013	85	27.2	-0.6	SM4
GM-IS-171	MH-IS-237	410.7	MH-IS-135	409.66	244	0.004	10	Concrete	0.013	76	23.2	-0.6	
GM-IS-172	MH-IS-137	411.83	MH-IS-237	410.7	353.6	0.003	10	Concrete	0.013	72	24.4	-0.6	SM4
GM-IS-174	MH-IS-0	414.12	MH-IS-253	412.61	403.5	0.004	10	Concrete	0.013	50	19.6	-0.7	
GM-IS-175	MH-IS-257	414.64	MH-IS-0	414.12	186.8	0.003	10	Concrete	0.013	47	20.3	-0.7	
GM-IS-185	MH-IS-274	415.08	MH-IS-266	415.38	300.2	-1E-03	10	Concrete	0.013	3	46.3	-0.4	
GM-IS-187(1)	MH-SUR-5103	416.7	MH-SUR-5001	414.95	586.6	0.003	10	Concrete	0.013	9	9.2	-0.8	
GM-IS-187(2)	MH-SUR-5001	414.95	MH-IS-257	414.64	53.7	0.006	10	Concrete	0.013	13	9	-0.8	
GM-IS-191	MH-IS-232	406.2	KCPSWW	405.5	50.1	0.014	36	Concrete	0.013	3,257	28.3	-2.2	
GM-IS-192	MH-IS-168	414.99	MH-IS-166	414.65	213.7	0.002	12	PVC	0.01	821	78.3	-0.2	
GM-IS-193	MH-IS-166	414.65	MH-IS-161	413.96	200.6	0.003	12	PVC	0.01	830	60.5	-0.4	
GM-IS-194	MH-IS-161	413.96	MH-IS-1	413.11	256.6	0.003	12	PVC	0.01	839	61.7	-0.4	
GM-IS-198	MH-IS-132	430.98	MH-IS-57	425.87	109.1	0.047	10	PVC	0.01	324	45	-0.5	
GM-IS-199	MH-IS-4	435.34	MH-IS-132	430.98	200.3	0.022	10	PVC	0.01	316	44.3	-0.5	
GM-IS-200	MH-IS-5	436.69	MH-IS-4	435.34	150.2	0.009	10	PVC	0.01	307	43.7	-0.5	
GM-IS-201	MH-IS-6	446.59	MH-IS-5	436.69	299.9	0.033	10	PVC	0.01	298	43	-0.5	
GM-IS-202	MH-IS-7	454.62	MH-IS-6	446.59	271.1	0.03	10	PVC	0.01	289	42.4	-0.5	
GM-IS-203	MH-IS-8	461.15	MH-IS-7	454.62	331.7	0.02	10	PVC	0.01	281	41.7	-0.5	
GM-IS-204	MH-IS-9	462.21	MH-IS-8	461.15	263.7	0.004	10	Ductile Iron	0.013	272	46.2	-0.4	
GM-IS-205	MH-IS-10	462.79	MH-IS-9	462.21	184.3	0.003	10	Ductile Iron	0.013	263	48.6	-0.4	
GM-IS-206	MH-IS-11	463.53	MH-IS-10	462.79	260.7	0.003	10	Ductile Iron	0.013	255	49.2	-0.4	

City of Snoqualmie
General Sewer Plan
SewerGEMS Results

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-207	MH-IS-12	464.55	MH-IS-11	463.53	301.3	0.003	10	PVC	0.01	246	39.6	-0.5	
GM-IS-208	MH-IS-13	465.69	MH-IS-12	464.55	286.9	0.004	10	PVC	0.01	237	38.2	-0.5	
GM-IS-209	MH-IS-16	465.97	MH-IS-13	465.69	190.1	0.001	10	Ductile Iron	0.013	228	56.4	-0.4	
GM-IS-302	MH-IS-205	845.9	MH-IS-203	843.68	158.3	0.014	10	PVC	0.01	77	21.4	-0.7	
GM-IS-306	MH-IS-38	767.46	MH-IS-102	756.47	256.2	0.043	12	PVC	0.01	635	50.4	-0.5	
GM-IS-500	MH-IS-1	413.11	MH-IS-96	412.74	165.9	0.002	12	PVC	0.01	865	72.6	-0.3	
GM-IS-501	MH-IS-96	412.74	MH-IS-95	411.63	253.7	0.004	12	PVC	0.01	908	60.7	-0.4	
GM-IS-502	MH-IS-95	411.63	MH-IS-94	411.22	254.7	0.002	15	PVC	0.01	917	56.2	-0.5	
GM-IS-503	MH-IS-94	411.22	MH-IS-93	410.62	358.1	0.002	15	PVC	0.01	978	58	-0.5	
GM-IS-504	MH-IS-93	410.62	MH-IS-92	409.88	276.6	0.003	15	PVC	0.01	987	74.4	-0.3	
GM-IS-505	MH-IS-92	409.88	MH-IS-140	409.52	236.8	0.002	18	PVC	0.01	1,117	100	0	
GM-IS-506	MH-IS-267	409.97	MH-IS-92	409.88	18	0.005	15	PVC	0.01	121	100	0.2	
GM-IS-507	MH-IS-97	412.47	MH-IS-94	411.22	158.6	0.008	10	Concrete	0.013	52	17.6	-0.7	SM4
GM-IS-508	MH-IS-275	417.67	MH-IS-97	412.47	203.5	0.026	10	Concrete	0.013	9	7.1	-0.8	
GM-IS-509(1)	MH-GIS-DT_ssMH_2513	414.27	MH-IS-277	413.81	32.9	0.014	10	Concrete	0.013	9	7.1	-0.8	
GM-RD-SSGM-CO-6	GM-RD-MH-7	902.6	MH-GIS-NJ_ssMH_2565	895.08	195.7	0.038	12		0.013	116	20.9	-0.8	
GM-RD-SSGM-CO-7	GM-RD-MH-8	909.76	GM-RD-MH-7	902.6	223	0.032	12		0.013	115	20.8	-0.8	
GM-RD-SSGM-CO-8	GM-RD-MH-9	910.89	GM-RD-MH-8	909.76	54.1	0.021	12		0.013	97	19	-0.8	
GM-RD-SSGM-CO-9	GM-RD-MH-10	920.14	GM-RD-MH-9	910.89	217.2	0.043	12		0.013	95	18.9	-0.8	
GM-RD-SSGM-CO-10	GM-RD-MH-11	928.71	GM-RD-MH-10	920.14	99.4	0.086	12		0.013	94	18.8	-0.8	
GM-RD-SSGM-CO-11	GM-RD-MH-11	928.71	GM-RD-MH-12	955.39	204.3	0.131	12		0.013	60	14.9	25.8	
GM-RD-SSGM-CO-12	GM-RD-MH-12	955.39	GM-RD-MH-13	973.11	125.1	0.142	12		0.013	58	14.7	16.9	
GM-RD-SSGM-CO-13	GM-RD-MH-13	973.11	GM-RD-MH-14	980.3	57.9	0.124	12		0.013	22	8.9	6.3	
GM-RD-SSGM-CO-14	GM-RD-MH-14	980.3	GM-RD-MH-15	1,011.97	230.2	0.138	12		0.013	20	8.7	30.8	
GM-RD-SSGM-CO-15	GM-RD-MH-15	1,011.97	GM-RD-MH-16	1,025.99	104.2	0.135	12		0.013	19	8.4	13.1	
GM-RD-SSGM-CO-16	GM-RD-MH-16	1,025.99	GM-RD-MH-17	1,043.99	150	0.12	12		0.013	18	8.1	17.1	
GM-RD-SSGM-CO-17	GM-RD-MH-17	1,043.99	GM-RD-MH-18	1,053.31	89.7	0.104	12		0.013	17	7.8	8.4	
GM-RD-SSGM-CO-18	GM-RD-MH-18	1,053.31	GM-RD-MH-19	1,065.28	121.3	0.099	12		0.013	15	7.5	11	
GM-RD-SSGM-CO-19	GM-RD-MH-19	1,065.28	GM-RD-MH-20	1,090.77	317.5	0.08	12		0.013	6	4.8	24.5	
GM-RD-SSGM-CO-20	GM-RD-MH-20	1,090.77	GM-RD-MH-21	1,092.07	86.3	0.015	8		0.013	5	7.2	0.7	
GM-RD-SSGM-CO-21	GM-RD-MH-21	1,092.07	GM-RD-MH-22	1,106.43	133.2	0.108	8		0.013	4	6.2	13.7	
GM-RD-SSGM-CO-22	GM-RD-MH-22	1,106.43	GM-RD-MH-23	1,119.30	193.9	0.066	8		0.013	3	5.1	12.2	
GM-RD-SSGM-CO-23	GM-RD-MH-23	1,119.30	GM-RD-MH-24	1,128.16	217.4	0.041	8		0.013	1	3.6	8.2	
GM-RD-SSGM-CO-24	GM-RD-MH-25	1,128.84	GM-RD-MH-26	1,126.66	170	0.013	8		0.013	3	5.1	-0.6	
GM-RD-SSGM-CO-25	GM-RD-MH-26	1,126.66	GM-RD-MH-27	1,115.27	187.2	0.061	8		0.013	4	6.2	-0.6	
GM-RD-SSGM-CO-26	GM-RD-MH-27	1,115.27	GM-RD-MH-28	1,044.72	264.2	0.267	8		0.013	5	7.2	-0.6	
GM-RD-SSGM-CO-27	GM-RD-MH-28	1,044.72	GM-RD-MH-29	1,026.74	124.6	0.144	8		0.013	6	8	-0.6	
GM-RD-SSGM-CO-28	GM-RD-MH-29	1,026.74	GM-RD-MH-30	1,018.26	68.8	0.123	8		0.013	8	8.8	-0.6	
GM-RD-SSGM-CO-29	GM-RD-MH-30	1,018.26	GM-RD-MH-31	1,006.12	259	0.047	8		0.013	10	10.2	-0.6	
GM-RD-SSGM-CO-30	GM-RD-MH-31	1,006.12	GM-RD-MH-32	999.84	80.1	0.078	8		0.013	28	17	-0.6	
GM-RD-SSGM-CO-31	GM-RD-MH-32	999.84	GM-RD-MH-33	994	75	0.078	8		0.013	29	17.4	-0.6	
GM-RD-SSGM-CO-32	GM-RD-MH-33	994	GM-RD-MH-34	989	71.9	0.07	8		0.013	30	17.7	-0.5	
GM-RD-SSGM-CO-33	GM-RD-MH-34	989	GM-RD-MH-35	983.13	219.9	0.027	8		0.013	32	18.1	-0.5	
GM-RD-SSGM-CO-34	GM-RD-MH-35	983.13	GM-RD-MH-36	979.25	64.8	0.06	8		0.013	33	18.5	-0.5	
GM-RD-SSGM-CO-35	GM-RD-MH-36	979.25	GM-RD-MH-37	973.65	81.8	0.068	8		0.013	34	18.9	-0.5	
GM-RD-SSGM-CO-36	GM-RD-MH-37	973.65	GM-RD-MH-13	973.11	55.4	0.01	8		0.013	36	19.2	-0.5	
GM-RD-SSGM-CO-37	GM-RD-MH-38	1,018.43	GM-RD-MH-30	1,018.26	88.7	0.002	8		0.013	1	5.3	-0.6	
GM-RD-SSGM-CO-38	GM-RD-MH-39	1,073.12	GM-RD-MH-40	1,069.72	58.7	0.058	8		0.013	1	3.6	-0.6	
GM-RD-SSGM-CO-39	GM-RD-MH-40	1,069.72	GM-RD-MH-41	1,067.73	67.4	0.03	8		0.013	3	5.1	-0.6	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-RD-SSGM-CO-40	GM-RD-MH-41	1,067.73	GM-RD-MH-42	1,064.52	194.6	0.016	8		0.013	4	6.2	-0.6	
GM-RD-SSGM-CO-41	GM-RD-MH-42	1,064.52	GM-RD-MH-43	1,045.23	230.8	0.084	8		0.013	11	10.8	-0.6	
GM-RD-SSGM-CO-42	GM-RD-MH-43	1,045.23	GM-RD-MH-44	1,036.63	67.3	0.128	8		0.013	13	11.3	-0.6	
GM-RD-SSGM-CO-43	GM-RD-MH-44	1,036.63	GM-RD-MH-45	1,025.54	81.4	0.136	8		0.013	14	11.9	-0.6	
GM-RD-SSGM-CO-44	GM-RD-MH-45	1,025.54	GM-RD-MH-46	1,015.06	80.5	0.13	8		0.013	15	12.5	-0.6	
GM-RD-SSGM-CO-45	GM-RD-MH-46	1,015.06	GM-RD-MH-31	1,006.12	139.9	0.064	8		0.013	17	13	-0.6	
GM-RD-SSGM-CO-46	GM-RD-MH-47	1,109.18	GM-RD-MH-48	1,098.20	120	0.091	8		0.013	1	3.6	-0.6	
GM-RD-SSGM-CO-47	GM-RD-MH-48	1,098.20	GM-RD-MH-49	1,084.11	175.3	0.08	8		0.013	3	5.1	-0.6	
GM-RD-SSGM-CO-48	GM-RD-MH-49	1,084.11	GM-RD-MH-50	1,072.16	112.2	0.107	8		0.013	4	6.2	-0.6	
GM-RD-SSGM-CO-49	GM-RD-MH-50	1,072.16	GM-RD-MH-51	1,067.51	71.6	0.065	8		0.013	5	7.2	-0.6	
GM-RD-SSGM-CO-50	GM-RD-MH-51	1,067.51	GM-RD-MH-42	1,064.52	83.4	0.036	8		0.013	6	8	-0.6	
GM-RD-SSGM-CO-51	GM-RD-MH-11	928.71	GM-RD-MH-52	932.05	49.2	0.068	12		0.013	33	11	2.5	
GM-RD-SSGM-CO-52	GM-RD-MH-52	932.05	GM-RD-MH-53	942.75	83.4	0.128	8		0.013	32	18.1	10.2	
GM-RD-SSGM-CO-53	GM-RD-MH-53	942.75	GM-RD-MH-54	941.38	109.6	-0.013	8		0.013	30	100	-0.5	
GM-RD-SSGM-CO-54	GM-RD-MH-54	941.38	GM-RD-MH-55	945.93	125.1	0.036	8		0.013	29	17.4	4	
GM-RD-SSGM-CO-55	GM-RD-MH-55	945.93	GM-RD-MH-56	951.31	95.3	0.056	8		0.013	28	17	4.8	
GM-RD-SSGM-CO-56	GM-RD-MH-56	951.31	GM-RD-MH-57	951.46	124.2	0.001	8		0.013	27	25.4	-0.3	
GM-RD-SSGM-CO-57	GM-RD-MH-57	951.46	GM-RD-MH-58	954.56	111.1	0.028	8		0.013	25	16.2	2.5	
GM-RD-SSGM-CO-58	GM-RD-MH-58	954.56	GM-RD-MH-59	955.5	50	0.019	8		0.013	24	15.7	0.4	
GM-RD-SSGM-CO-59	GM-RD-MH-59	955.5	GM-RD-MH-60	956.79	162.2	0.008	8		0.013	23	15.3	0.7	
GM-RD-SSGM-CO-60	GM-RD-MH-60	956.79	GM-RD-MH-61	956.83	60.7	7E-04	8		0.013	22	25.2	-0.5	
GM-RD-SSGM-CO-61	GM-RD-MH-61	956.83	GM-RD-MH-62	959.5	45.9	0.058	8		0.013	20	14.4	2.1	
GM-RD-SSGM-CO-62	GM-RD-MH-62	959.5	GM-RD-MH-63	965.81	54	0.117	8		0.013	19	14	5.7	
GM-RD-SSGM-CO-63	GM-RD-MH-63	965.81	GM-RD-MH-64	974.99	51	0.18	8		0.013	18	13.5	8.6	
GM-RD-SSGM-CO-64	GM-RD-MH-64	974.99	GM-RD-MH-65	980.22	31.5	0.166	8		0.013	17	13	4.6	
GM-RD-SSGM-CO-65	GM-RD-MH-65	980.22	GM-RD-MH-66	984.57	48.7	0.089	8		0.013	4	6.2	3.7	
GM-RD-SSGM-CO-66	GM-RD-MH-66	984.57	GM-RD-MH-67	985.09	49	0.011	8		0.013	3	5.1	-0.1	
GM-RD-SSGM-CO-67	GM-RD-MH-67	985.09	GM-RD-MH-68	986.37	112.9	0.011	8		0.013	1	3.6	0.6	
GM-RD-SSGM-CO-68	GM-RD-MH-65	980.22	GM-RD-MH-69	983.64	29.6	0.116	8		0.013	11	10.8	2.8	
GM-RD-SSGM-CO-69	GM-RD-MH-69	983.64	GM-RD-MH-70	996.1	49.5	0.252	8		0.013	10	10.2	11.9	
GM-RD-SSGM-CO-70	GM-RD-MH-70	996.1	GM-RD-MH-71	1,022.88	97.9	0.273	8		0.013	9	9.5	26.2	
GM-RD-SSGM-CO-71	GM-RD-MH-71	1,022.88	GM-RD-MH-72	1,021.26	29.9	-0.054	8		0.013	4	100	-0.6	
GM-RD-SSGM-CO-72	GM-RD-MH-72	1,021.26	GM-RD-MH-73	1,021.56	157.3	0.002	8		0.013	3	100	1	
GM-RD-SSGM-CO-73	GM-RD-MH-73	1,021.56	GM-RD-MH-74	1,021.12	97.7	-0.005	8		0.013	1	100	0.7	
GM-RD-SSGM-CO-74	GM-RD-MH-71	1,022.88	GM-RD-MH-75	1,020.90	83.5	-0.024	8		0.013	4	100	-0.6	
GM-RD-SSGM-CO-75	GM-RD-MH-75	1,020.90	GM-RD-MH-76	1,026.26	80.9	0.066	8		0.013	3	5.1	4.7	
GM-RD-SSGM-CO-76	GM-RD-MH-76	1,026.26	GM-RD-MH-77	1,030.33	30.7	0.133	8		0.013	1	3.6	3.4	
GM-RD-SSGM-CO-77	GM-RD-MH-19	1,065.28	GM-RD-MH-78	1,067.51	67.3	0.033	12		0.013	8	5.3	1.3	
GM-RD-SSGM-CO-78	GM-RD-MH-78	1,067.51	GM-RD-MH-79	1,071.77	88.8	0.048	12		0.013	6	4.8	3.3	
GM-RD-SSGM-CO-79	GM-RD-MH-79	1,071.77	GM-RD-MH-80	1,088.22	247.9	0.066	12		0.013	5	4.3	15.5	
GM-RD-SSGM-CO-80	GM-RD-MH-80	1,088.22	GM-RD-MH-81	1,097.92	142	0.068	12		0.013	4	3.7	8.7	
GM-RD-SSGM-CO-81	MH-GIS-EP_ssMH_2584	1,074.61	GM-RD-MH-82	1,079.02	76.1	0.058	12		0.013	10	6.1	3.5	
GM-RD-SSGM-CO-82	GM-RD-MH-82	1,079.02	GM-RD-MH-83	1,085.84	121	0.056	12		0.013	9	5.7	5.9	
GM-RD-SSGM-CO-83	GM-RD-MH-83	1,085.84	GM-RD-MH-84	1,093.77	148	0.054	12		0.013	8	5.3	7	
GM-RD-SSGM-CO-84	GM-RD-MH-84	1,093.77	GM-RD-MH-85	1,102.24	156.9	0.054	12		0.013	6	4.8	7.5	
GM-RD-SSGM-CO-85	GM-RD-MH-85	1,102.24	GM-RD-MH-86	1,106.41	149.2	0.028	12		0.013	5	4.3	3.2	
GM-RD-SSGM-CO-86	GM-RD-MH-86	1,106.41	GM-RD-MH-87	1,108.92	95.6	0.026	8		0.013	4	6.2	1.9	
GM-RD-SSGM-CO-87	GM-RD-MH-87	1,108.92	GM-RD-MH-88	1,109.78	86.5	0.01	8		0.013	3	5.1	0.2	
GM-RD-SSGM-CO-88	GM-RD-MH-88	1,109.78	GM-RD-MH-89	1,109.94	125.1	0.001	8		0.013	1	5.8	-0.5	

Existing (2017) - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-RD-SSGM-CO-89	MH-GIS-MH-197	1,071.22	GM-RD-MH-90	1,081.74	199.5	0.053	8		0.013	5	7.2	9.9	
GM-RD-SSGM-CO-90	GM-RD-MH-90	1,081.74	GM-RD-MH-91	1,096.59	307.4	0.048	8		0.013	4	6.2	14.2	
GM-RD-SSGM-CO-91	GM-RD-MH-91	1,096.59	GM-RD-MH-92	1,102.46	128.9	0.046	8		0.013	3	5.1	5.2	
GM-RD-SSGM-CO-92	GM-RD-MH-92	1,102.46	GM-RD-MH-93	1,108.54	143.4	0.042	8		0.013	1	3.6	5.4	
GM-RD-SSGM-CO-93	GM-RD-MH-94	1,108.82	MH-GIS-MH-99	1,100.90	141.1	0.056	8		0.013	5	7.2	-0.6	
GM-RD-SSGM-CO-94	GM-RD-MH-95	1,118.63	GM-RD-MH-94	1,108.82	155.1	0.063	8		0.013	4	6.2	-0.6	
GM-RD-SSGM-CO-95	GM-RD-MH-96	1,123.41	GM-RD-MH-95	1,118.63	101.1	0.047	8		0.013	3	5.1	-0.6	
GM-RD-SSGM-CO-96	GM-RD-MH-97	1,128.94	GM-RD-MH-96	1,123.41	140.5	0.039	8		0.013	1	3.6	-0.6	
GM-RD-SSGM-CO-97	GM-RD-MH-99	978.38	GM-RD-MH-98	985.89	85.6	0.088	8		0.013	1	2.3	6.9	
GM-RD-SSGM-CO-98	GM-RD-MH-100	977.51	GM-RD-MH-99	978.38	95.9	0.009	8		0.013	1	3.3	0.2	
GM-RD-SSGM-CO-99	GM-RD-MH-101	971.18	GM-RD-MH-100	977.51	141.5	0.045	8		0.013	2	3.9	5.7	
GM-RD-SSGM-CO-100	GM-RD-MH-102	968.37	GM-RD-MH-101	971.18	122.5	0.023	8		0.013	2	4.6	2.2	
GM-RD-SSGM-CO-101	GM-RD-MH-103	965.89	GM-RD-MH-102	968.37	138.9	0.018	8		0.013	3	100	2.6	
GM-RD-SSGM-CO-102	GM-RD-MH-104	969.05	GM-RD-MH-103	965.89	103.3	-0.031	8		0.013	3	100	-0.6	
GM-RD-SSGM-CO-103	GM-RD-MH-105	962.62	GM-RD-MH-104	969.05	193.1	0.033	8		0.013	4	6.1	5.8	
GM-RD-SSGM-CO-104	GM-RD-MH-106	958.2	GM-RD-MH-105	962.62	161.8	0.027	8		0.013	4	6.5	3.8	
GM-RD-SSGM-CO-105	GM-RD-MH-107	961.88	GM-RD-MH-106	958.2	108.8	-0.034	8		0.013	5	100	-0.6	
GM-RD-SSGM-CO-106	GM-RD-MH-108	962.13	GM-RD-MH-107	961.88	36.4	0.007	8		0.013	3	5.5	-0.6	
GM-RD-SSGM-CO-107	GM-RD-MH-109	965.58	GM-RD-MH-108	962.13	43.9	0.079	8		0.013	2	4.6	-0.6	
GM-RD-SSGM-CO-108	GM-RD-MH-110	975.13	GM-RD-MH-109	965.58	64	0.149	8		0.013	2	3.9	-0.6	
GM-RD-SSGM-CO-109	GM-RD-MH-111	977.36	GM-RD-MH-110	975.13	149.8	0.015	8		0.013	1	3.3	-0.6	
GM-RD-SSGM-CO-110	GM-RD-MH-112	977.65	GM-RD-MH-111	977.36	81.3	0.004	8		0.013	1	3	-0.6	
GM-RD-SSGM-CO-113	GM-RD-MH-107	961.88	Hospital PS-WW	958	13.6	0.284	8		0.013	8	8.9	-0.6	
GM-RD-SSGM-CO-114	GM-RD-MH-113	884	PSS12A-WW	871.69	17.5	0.704	8		0.013	16	12.7	-0.6	
GM-RD-SSGM-CO-115	GM-RD-MH-114	884.05	GM-RD-MH-113	884	37.5	0.001	8		0.013	14	18.2	-0.5	
GM-RD-SSGM-CO-116	GM-RD-MH-115	884.22	GM-RD-MH-114	884.05	131.6	0.001	8		0.013	13	17.5	-0.5	
GM-RD-SSGM-CO-117	GM-RD-MH-116	884.37	GM-RD-MH-115	884.22	121.1	0.001	8		0.013	11	16.5	-0.6	
GM-RD-SSGM-CO-118	GM-RD-MH-117	884.76	GM-RD-MH-116	884.37	97.6	0.004	8		0.013	10	11.8	-0.6	
GM-RD-SSGM-CO-119	GM-RD-MH-118	886.88	GM-RD-MH-117	884.76	146.4	0.014	8		0.013	9	9.4	-0.6	
GM-RD-SSGM-CO-120	GM-RD-MH-119	888.51	GM-RD-MH-118	886.88	176.8	0.009	8		0.013	7	8.6	-0.6	
GM-RD-SSGM-CO-121	GM-RD-MH-120	890.76	GM-RD-MH-119	888.51	178.6	0.013	8		0.013	6	7.6	-0.6	
GM-RD-SSGM-CO-122	GM-RD-MH-121	891.95	GM-RD-MH-120	890.76	79.1	0.015	8		0.013	4	6.6	-0.6	
GM-RD-SSGM-CO-123	GM-RD-MH-122	892.48	GM-RD-MH-121	891.95	164.2	0.003	8		0.013	3	6.9	-0.6	
GM-RD-SSGM-CO-124	GM-RD-MH-123	892.86	GM-RD-MH-122	892.48	116.5	0.003	8		0.013	1	4.9	-0.6	
GM-RD-SSGM-CO-125	GM-RD-MH-8	909.76	GM-RD-MH-124	905.29	53.2	-0.084	8		0.013	17	100	-0.5	
GM-RD-SSGM-CO-127	GM-RD-MH-25	1,128.84	GM-RD-MH-125	1,134.00	185.7	0.028	8		0.013	1	3.6	4.5	
GM-RD-SSGM-CO-128	GM-RD-MH-81	1,097.92	GM-RD-MH-126	1,114.04	236.1	0.068	12		0.013	3	3	15.2	
GM-RD-SSGM-CO-129	GM-RD-MH-126	1,114.04	GM-RD-MH-127	1,130.57	225.3	0.073	12		0.013	1	2.1	15.6	
GM-RD-SSGM-CO-130	GM-RD-MH-128	1,124.84	MH-GIS-MH-75	1,110.99	148.4	0.093	8		0.013	4	6.2	-0.6	
GM-RD-SSGM-CO-131	GM-RD-MH-129	1,134.00	GM-RD-MH-128	1,124.84	196.7	0.047	8		0.013	3	5.1	-0.6	
GM-RD-SSGM-CO-132	GM-RD-MH-130	1,134.71	GM-RD-MH-129	1,134.00	177.5	0.004	8		0.013	1	4.4	-0.6	
GM-SUR-304	MH-IS-57	425.87	MH-IS-80	422.48	336.3	0.01	10	Ductile Iron	0.013	682	66.3	-0.3	
GM-SUR-5001	MH-IS-271	410.4	MH-SUR-5002	410.5	88.2	-0.001	12	Concrete	0.013	471	100	0	
GM-SUR-5002	MH-SUR-5002	410.5	MH-IS-140	409.52	29.8	0.033	12	Concrete	0.013	480.21	82.9	-0.2	

Existing (2017) - Peak Hour Flow - Wet Well Table

Label	Ground Elevation (ft)	Maximum Level (ft)	Initial Level (ft)	Minimum Level (ft)	Base Elevation (ft)	Flow In (gpm)	Flow Out (gpm)	Net Flow In (gpm)
Hospital PS-WW	968	3.75	1.7	0	958	8	225	-217
IPPS Wetwell	430.65	4	2.5	0	400.65	223	4,852	-4629
KCPSWW	428.11	14	0.6	0	399.5	3,257	9,079	-5821
PS1WW	419.19	7.6	5	0	394.33	1,702	2,066	-364
PS2WW	415.2	4.25	2	0	395.25	78	499	-421
PS3WW	418.23	5.15	2.85	0	401.67	393	756	-363
PS4WW	417.46	4.2	3	0	399.83	129	243	-114
PSBPWW	796.77	9.7	4.5	0	765.5	590	1,039	-448
PSEWW	762.77	6.5	3.5	0	736.5	138	280	-142
PSFWW	721.2	4	2.5	0	704	47	272	-225
PSK3-WW	818.91	7.1	3.1	0	793	100	241	-142
PSLWW	807.37	11.1	5.6	0	777.9	355	493	-138
PSS12A-WW	886.8	4.1	2.1	0	871.69	16	123	-108
Pump Station K2 (Burke St) Wetwell	698.45	6.6	3.1	0	688.45	28	89	-62
Pump Station N6 Wetwell	727.14	4.4	2.9	0	717.14	18	120	-102
Pump Station No. 6 Wetwell	425	4	2	0	415	11	0	11
Pump Station Z (Gala) Wetwell	537.95	7.1	3.5	0	527.95	33	84	-50

City of Snoqualmie
General Sewer Plan
SewerGEMS Results

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
CO-28	MH-GIS-MH-36	749.5	PSEWW	736.5	15.4	0.847	8	PVC	0.01	83	29.5	-0.5	
CO-30	MH-GIS-MH-77	756.31	PSEWW	736.5	8.8	2.263	8	PVC	0.01	56	24.1	-0.5	
GM-GIS-AC_ssGM_1255	MH-GIS-AC_ssMH_2569	987.01	MH-GIS-RI_ssMH_2320	987.3	60	-0.005	8	PVC	0.01	3	77.7	-0.1	
GM-GIS-AC_ssGM_1266	MH-GIS-AC_ssMH_2570	966.73	MH-GIS-CR_ssMH_2321	968.83	100.7	-0.021	8	PVC	0.01	47	100	1.7	
GM-GIS-AC_ssGM_1419	MH-GIS-AC_ssMH_2543	957.94	MH-GIS-AC_ssMH_2522	961.45	68	0.052	8	PVC	0.01	4	58.3	3.2	
GM-GIS-AC_ssGM_1420	MH-GIS-AC_ssMH_2522	961.45	MH-GIS-AC_ssMH_2530	980.95	400	0.049	8	PVC	0.01	3	5.1	18.9	
GM-GIS-AC_ssGM_1421	MH-GIS-AC_ssMH_2533	955.84	MH-GIS-AC_ssMH_2521	970.9	260	0.058	8	PVC	0.01	4	6.2	14.4	
GM-GIS-AC_ssGM_1422	MH-GIS-AC_ssMH_2521	970.9	MH-GIS-AC_ssMH_2529	986.8	240	0.066	8	PVC	0.01	3	5.1	15.3	
GM-GIS-AC_ssGM_1423	MH-GIS-AC_ssMH_2537	990.52	MH-GIS-AC_ssMH_2529	986.8	137.1	0.027	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1424	MH-GIS-AC_ssMH_2539	981.15	MH-GIS-AC_ssMH_2527	977.75	175.8	0.019	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1425	MH-GIS-AC_ssMH_2540	975.33	MH-GIS-AC_ssMH_2544	973.78	90.9	0.017	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1426	MH-GIS-AC_ssMH_2518	963.48	MH-GIS-AC_ssMH_2514	975.79	158.5	0.078	8	PVC	0.01	9	9.5	11.7	
GM-GIS-AC_ssGM_1427	MH-GIS-AC_ssMH_2514	975.79	MH-GIS-AC_ssMH_2534	992.06	244.7	0.066	8	PVC	0.01	4	6.2	15.6	
GM-GIS-AC_ssGM_1428	MH-GIS-AC_ssMH_2569	987.01	MH-GIS-AC_ssMH_2517	987.35	74.8	0.005	8	PVC	0.01	1	26.7	-0.1	
GM-GIS-AC_ssGM_1429	MH-GIS-AC_ssMH_2523	960.92	MH-GIS-AC_ssMH_2524	964.82	121.6	-0.032	8	PVC	0.01	43	100	7.5	
GM-GIS-AC_ssGM_1430	MH-GIS-AC_ssMH_2525	957.38	MH-GIS-AC_ssMH_2535	965.08	175.4	0.044	8	PVC	0.01	15	12.5	7.1	
GM-GIS-AC_ssGM_1431	MH-GIS-AC_ssMH_2535	965.08	MH-GIS-AC_ssMH_2527	977.75	300.5	0.042	8	PVC	0.01	4	6.2	12	
GM-GIS-AC_ssGM_1432	MH-GIS-AC_ssMH_2524	964.82	MH-GIS-AC_ssMH_2526	966.2	72.7	-0.019	8	PVC	0.01	44	100	3.6	
GM-GIS-AC_ssGM_1433	MH-GIS-AC_ssMH_2526	966.2	MH-GIS-AC_ssMH_2570	966.73	37.3	-0.014	8	PVC	0.01	46	100	2.3	
GM-GIS-AC_ssGM_1434	MH-GIS-AC_ssMH_2531	960.07	MH-GIS-AC_ssMH_2546	971.34	240.5	0.047	8	PVC	0.01	9	9.5	10.7	
GM-GIS-AC_ssGM_1435	MH-GIS-AC_ssMH_2528	957.15	MH-GIS-AC_ssMH_2525	957.38	35.4	0.006	8	PVC	0.01	17	100	4	
GM-GIS-AC_ssGM_1436	MH-GIS-AC_ssMH_2523	960.92	MH-GIS-AC_ssMH_2532	960.88	126.7	-3E-04	8	PVC	0.01	42	100	5.3	
GM-GIS-AC_ssGM_1437	MH-GIS-AC_ssMH_2532	960.88	MH-GIS-AC_ssMH_2519	957.9	120.4	-0.025	8	PVC	0.01	30	100	5.3	
GM-GIS-AC_ssGM_1438	MH-GIS-AC_ssMH_2519	957.9	MH-GIS-AC_ssMH_2533	955.84	123.8	-0.017	8	PVC	0.01	29	100	5.3	
GM-GIS-AC_ssGM_1439	MH-GIS-AC_ssMH_2520	956.8	MH-GIS-AC_ssMH_2533	955.84	270	0.004	8	PVC	0.01	24	100	4.4	
GM-GIS-AC_ssGM_1440	MH-GIS-AC_ssMH_2515	981.51	MH-GIS-AC_ssMH_2516	977.36	84.2	0.049	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-AC_ssGM_1441	MH-GIS-AC_ssMH_2518	963.48	MH-GIS-AC_ssMH_2532	960.88	90.8	0.029	8	PVC	0.01	10	100	2.7	
GM-GIS-AC_ssGM_1442	MH-GIS-AC_ssMH_2528	957.15	MH-GIS-AC_ssMH_2520	956.8	244.1	0.001	8	PVC	0.01	18	100	4	
GM-GIS-AC_ssGM_1443	MH-GIS-AC_ssMH_2515	981.51	MH-GIS-AC_ssMH_2536	986.72	122.9	0.042	8	PVC	0.01	1	3.6	4.6	
GM-GIS-AC_ssGM_1444	MH-GIS-AC_ssMH_2538	982.94	MH-GIS-AC_ssMH_2530	980.95	159.3	0.012	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1445	MH-GIS-AC_ssMH_2535	965.08	MH-GIS-AC_ssMH_2531	960.07	276	-0.018	8	PVC	0.01	10	100	-0.5	
GM-GIS-AC_ssGM_1446	MH-GIS-AC_ssMH_2542	992.86	MH-GIS-AC_ssMH_2534	992.06	87.2	0.009	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1447	MH-GIS-AC_ssMH_2516	977.36	MH-GIS-AC_ssMH_2514	975.79	71.6	0.022	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-AC_ssGM_1448	MH-GIS-MH-86	993.66	MH-GIS-AC_ssMH_2534	992.06	54	0.03	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-AC_ssGM_1449	MH-GIS-MH-55	976.71	MH-GIS-AC_ssMH_2527	977.75	37.6	-0.028	8	PVC	0.01	1	100	0.4	
GM-GIS-AC_ssGM_1450	MH-GIS-AC_ssMH_2520	956.8	MH-GIS-AC_ssMH_2543	957.94	32	0.036	8	PVC	0.01	5	100	4.4	
GM-GIS-AC_ssGM_1451	MH-GIS-AC_ssMH_2544	973.78	MH-GIS-AC_ssMH_2545	972.76	41.9	0.024	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-AC_ssGM_1452	MH-GIS-AC_ssMH_2546	971.34	MH-GIS-AC_ssMH_2545	972.76	53.2	0.027	8	PVC	0.01	8	8.8	0.8	
GM-GIS-AC_ssGM_1453	MH-GIS-AC_ssMH_2547	974.61	MH-GIS-AC_ssMH_2545	972.76	39.9	0.046	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-AC_ssGM_1454	MH-GIS-AC_ssMH_2541	978.1	MH-GIS-AC_ssMH_2547	974.61	162	0.022	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-AC_ssGM_1455	MH-GIS-MH-46	977.43	MH-GIS-AC_ssMH_2541	978.1	30	-0.022	8	PVC	0.01	1	100	0	
GM-GIS-AR_ssGM_751	MH-GIS-AR_ssMH_2012	534.92	MH-GIS-AR_ssMH_2015	531.19	92.4	0.04	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AR_ssGM_753	MH-GIS-AR_ssMH_2015	531.19	MH-GIS-AR_ssMH_2017	517.96	169.4	0.078	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-AR_ssGM_754	MH-GIS-AR_ssMH_2014	539.39	MH-GIS-AR_ssMH_2015	531.19	249.8	0.033	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AR_ssGM_755	MH-GIS-AR_ssMH_2013	551.42	MH-GIS-AR_ssMH_2015	531.19	287.7	0.07	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AU_ssGM_218	MH-GIS-AU_ssMH_1599	866.04	MH-GIS-AU_ssMH_1600	851.08	203.6	0.073	8	PVC	0.01	4	6.6	-0.6	
GM-GIS-AU_ssGM_219	MH-GIS-FW_ssMH_1596	871.76	MH-GIS-AU_ssMH_1599	866.04	192.1	0.03	8	PVC	0.01	4	6	-0.6	
GM-GIS-AU_ssGM_220	MH-GIS-AU_ssMH_1600	851.08	MH-GIS-DH_ssMH_1601	841.46	194.5	0.049	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-AU_ssGM_367	MH-GIS-AU_ssMH_1767	885.96	MH-GIS-FW_ssMH_1608	884.67	106.1	0.012	8	PVC	0.01	6	7.6	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-AU_ssGM_368	MH-GIS-AU_ssMH_1765	892.62	MH-GIS-AU_ssMH_1766	889	127.1	0.028	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-AU_ssGM_369	MH-GIS-AU_ssMH_1764	894	MH-GIS-AU_ssMH_1765	892.62	263.7	0.005	8	PVC	0.01	2	5	-0.6	
GM-GIS-AU_ssGM_370	MH-GIS-AU_ssMH_1768	892.9	MH-GIS-AU_ssMH_1764	894	127	-0.009	8	PVC	0.01	1	100	0.5	
GM-GIS-AU_ssGM_371	MH-GIS-MH-166	894	MH-GIS-AU_ssMH_1764	894	139.4	0	8	PVC	0.01	1	8.4	-0.6	
GM-GIS-AU_ssGM_372	MH-GIS-MH-191	894	MH-GIS-AU_ssMH_1765	892.62	162.7	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AU_ssGM_373	MH-GIS-AU_ssMH_1766	889	MH-GIS-AU_ssMH_1767	885.96	213.5	0.014	8	PVC	0.01	5	7	-0.6	
GM-GIS-AU_ssGM_374	MH-GIS-AU_ssMH_1761	877.23	MH-GIS-AU_ssMH_1760	876.04	130.6	0.009	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-AU_ssGM_375	MH-GIS-AU_ssMH_1762	882.91	MH-GIS-AU_ssMH_1761	877.23	279.6	0.02	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AU_ssGM_376	MH-GIS-AU_ssMH_1760	876.04	MH-GIS-AU_ssMH_1600	851.08	129.2	0.193	8	PVC	0.01	4	6	-0.6	
GM-GIS-AU_ssGM_377	MH-GIS-AU_ssMH_1769	889.03	MH-GIS-AU_ssMH_1763	885.95	170	0.018	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-AU_ssGM_378	MH-GIS-AU_ssMH_1763	885.95	MH-GIS-AU_ssMH_1762	882.91	118.2	0.026	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-AU_ssGM_379	MH-GIS-AU_ssMH_1770	856.12	MH-GIS-AU_ssMH_1771	842.97	132.6	0.099	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-AU_ssGM_380	MH-GIS-AU_ssMH_1771	842.97	MH-GIS-DH_ssMH_1773	832.79	221.5	0.046	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AU_ssGM_382	MH-GIS-MH-85	861.23	MH-GIS-AU_ssMH_1770	856.12	52.7	0.097	6	PVC	0.01	1	3.8	-0.5	
GM-GIS-AZ_ssGM_1106	MH-GIS-AZ_ssMH_2479	751.27	MH-GIS-AZ_ssMH_2495	736.45	117	0.127	8	PVC	0.01	14	11.9	-0.6	
GM-GIS-AZ_ssGM_1107	MH-GIS-AZ_ssMH_2472	826.5	MH-GIS-AZ_ssMH_2471	823.93	56.8	0.045	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-AZ_ssGM_1108	MH-GIS-AZ_ssMH_2474	822.64	MH-GIS-AZ_ssMH_2475	825.15	283.1	-0.009	8	PVC	0.01	11	100	2	
GM-GIS-AZ_ssGM_1109	MH-GIS-AZ_ssMH_2473	822.85	MH-GIS-AZ_ssMH_2474	822.64	39.4	0.005	8	PVC	0.01	9	100	1.8	
GM-GIS-AZ_ssGM_1110	MH-GIS-AZ_ssMH_2475	825.15	MH-GIS-AZ_ssMH_2485	809.69	332.1	0.047	8	PVC	0.01	15	12.6	-0.6	
GM-GIS-AZ_ssGM_1111	MH-GIS-AZ_ssMH_2483	790.7	MH-GIS-AZ_ssMH_2477	788.86	75.8	0.024	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-AZ_ssGM_1112	MH-GIS-AZ_ssMH_2478	770.13	MH-GIS-AZ_ssMH_2479	751.27	144.5	0.13	8	PVC	0.01	10	9.9	-0.6	
GM-GIS-AZ_ssGM_1113	MH-GIS-AZ_ssMH_2480	725.46	MH-GIS-AZ_ssMH_2481	722.02	56.6	0.061	8	PVC	0.01	16	12.8	-0.6	
GM-GIS-AZ_ssGM_1114	MH-GIS-AZ_ssMH_2505	771.4	MH-GIS-AZ_ssMH_2504	770.86	66.9	0.008	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-AZ_ssGM_1115	MH-GIS-AZ_ssMH_2476	814.59	MH-GIS-AZ_ssMH_2477	788.86	314.7	0.082	8	PVC	0.01	2	4.6	-0.6	
GM-GIS-AZ_ssGM_1116	MH-GIS-AZ_ssMH_2498	814.65	MH-GIS-AZ_ssMH_2482	806.69	220.5	0.036	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-AZ_ssGM_1117	MH-GIS-AZ_ssMH_2503	748.41	MH-GIS-AZ_ssMH_2488	733.3	174	0.087	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-AZ_ssGM_1118	MH-GIS-AZ_ssMH_2488	733.3	MH-GIS-AZ_ssMH_2486	724.31	122	0.074	8	PVC	0.01	6	8	-0.6	
GM-GIS-AZ_ssGM_1119	MH-GIS-AZ_ssMH_2506	777.34	MH-GIS-AZ_ssMH_2505	771.4	145.7	0.041	8	PVC	0.01	2	4.6	-0.6	
GM-GIS-AZ_ssGM_1120	MH-GIS-AZ_ssMH_2482	806.69	MH-GIS-AZ_ssMH_2484	799.77	225.1	0.031	8	PVC	0.01	2	4.6	-0.6	
GM-GIS-AZ_ssGM_1121	MH-GIS-AZ_ssMH_2492	802.29	MH-GIS-AZ_ssMH_2483	790.7	192.3	0.06	8	PVC	0.01	4	6.6	-0.6	
GM-GIS-AZ_ssGM_1122	MH-GIS-AZ_ssMH_2489	806.65	MH-IS-18	799.57	257.4	0.028	8	PVC	0.01	50	22.8	-0.5	
GM-GIS-AZ_ssGM_1123	MH-GIS-AZ_ssMH_2471	823.93	MH-GIS-AZ_ssMH_2473	822.85	148	0.007	8	PVC	0.01	7	100	0.7	
GM-GIS-AZ_ssGM_1124	MH-GIS-AZ_ssMH_2477	788.86	MH-GIS-AZ_ssMH_2478	770.13	151.6	0.124	8	PVC	0.01	9	9.3	-0.6	
GM-GIS-AZ_ssGM_1125	MH-GIS-AZ_ssMH_2485	809.69	MH-GIS-AZ_ssMH_2491	807.92	226.7	0.008	8	PVC	0.01	45	21.7	-0.5	
GM-GIS-AZ_ssGM_1126	MH-GIS-AZ_ssMH_2491	807.92	MH-GIS-AZ_ssMH_2489	806.65	193.7	0.007	8	PVC	0.01	48	22.3	-0.5	
GM-GIS-AZ_ssGM_1127	MH-GIS-AZ_ssMH_2481	722.02	MH-GIS-AZ_ssMH_2486	724.31	231.9	-0.01	8	PVC	0.01	17	100	1.8	
GM-GIS-AZ_ssGM_1128	MH-GIS-AZ_ssMH_2507	793.93	MH-GIS-AZ_ssMH_2506	777.34	311.8	0.053	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-AZ_ssGM_1129	MH-GIS-AZ_ssMH_2484	799.77	MH-GIS-AZ_ssMH_2492	802.29	112.1	-0.022	8	PVC	0.01	3	100	1.9	
GM-GIS-AZ_ssGM_1130	MH-GIS-AZ_ssMH_2504	770.86	MH-GIS-AZ_ssMH_2503	748.41	196.1	0.114	8	PVC	0.01	4	6.6	-0.6	
GM-GIS-AZ_ssGM_1131	MH-GIS-AZ_ssMH_2493	760.45	MH-GIS-AZ_ssMH_2479	751.27	163.2	0.056	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-AZ_ssGM_1132	MH-GIS-AZ_ssMH_2494	777.45	MH-GIS-AZ_ssMH_2493	760.45	193.7	0.088	8	PVC	0.01	2	4.6	-0.6	
GM-GIS-AZ_ssGM_1133	MH-GIS-AZ_ssMH_2495	736.45	MH-GIS-AZ_ssMH_2480	725.46	123.1	0.089	8	PVC	0.01	15	12.3	-0.6	
GM-GIS-AZ_ssGM_1134	MH-GIS-AZ_ssMH_2496	827.6	MH-GIS-AZ_ssMH_2475	825.15	82	0.03	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1135	MH-GIS-AZ_ssMH_2497	817.01	MH-GIS-AZ_ssMH_2476	814.59	110.9	0.022	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-AZ_ssGM_1136	MH-GIS-AZ_ssMH_2499	783.08	MH-GIS-AZ_ssMH_2494	777.45	94.7	0.059	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-AZ_ssGM_1137	MH-GIS-AZ_ssMH_2486	724.31	MH-GIS-AZ_ssMH_2500	713.38	121.3	0.09	8	PVC	0.01	24	15.9	-0.6	
GM-GIS-AZ_ssGM_1138	MH-GIS-AZ_ssMH_2500	713.38	MH-GIS-AZ_ssMH_2487	707.6	37.2	0.155	8	PVC	0.01	26	16.2	-0.6	
GM-GIS-AZ_ssGM_1139	MH-GIS-AZ_ssMH_2487	707.6	MH-GIS-AZ_ssMH_2502	691.99	195.9	0.08	8	PVC	0.01	27	16.5	-0.6	
GM-GIS-AZ_ssGM_1140	MH-GIS-AZ_ssMH_2502	691.99	ump Station K2 (Burke St) Wetw	688.45	7.8	0.453	8	PVC	0.01	28	16.9	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-AZ_ssGM_1417	MH-GIS-AZ_ssMH_2501	832.13	MH-GIS-AZ_ssMH_2472	826.5	177.9	0.032	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-BA_ssGM_622	MH-GIS-BR_ssMH_1261	547.04	MH-GIS-BR_ssMH_1256	547.29	34.7	-0.007	8	Glass	0.013	28	63.7	-0.2	
GM-GIS-BA_ssGM_623	MH-GIS-BR_ssMH_1258	534.86	MH-GIS-BR_ssMH_1257	532.52	21.3	0.11	8	Glass	0.013	31	18	-0.5	
GM-GIS-BA_ssGM_624	MH-GIS-BR_ssMH_1257	532.52	Pump Station Z (Gala) Wetwell	527.95	6.8	0.676	8	Glass	0.013	33	18.5	-0.5	
GM-GIS-BA_ssGM_625	MH-GIS-BR_ssMH_1262	543.07	MH-GIS-BR_ssMH_1261	547.04	112.7	-0.035	8	Glass	0.013	26	100	3.7	
GM-GIS-BA_ssGM_626	MH-GIS-BR_ssMH_1258	534.86	MH-GIS-BR_ssMH_1256	547.29	123.7	0.1	8	Glass	0.013	30	17.5	11.9	
GM-GIS-BA_ssGM_627	MH-GIS-BR_ssMH_1275	560.87	MH-GIS-BR_ssMH_1274	553.5	109.5	0.067	8	Glass	0.013	3	5.8	-0.6	
GM-GIS-BA_ssGM_628	MH-GIS-BR_ssMH_1260	564	MH-GIS-BR_ssMH_1275	560.87	106.8	0.029	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-BA_ssGM_629	MH-GIS-BR_ssMH_1259	564	MH-GIS-BR_ssMH_1263	564	153.3	0	8	Glass	0.013	2	12.8	-0.6	
GM-GIS-BA_ssGM_630	MH-GIS-BR_ssMH_1269	551.44	MH-GIS-BR_ssMH_1265	548.23	68.3	0.047	8	Glass	0.013	8	100	1.1	
GM-GIS-BA_ssGM_631	MH-GIS-BR_ssMH_1265	548.23	MH-GIS-BR_ssMH_1264	547.25	116.7	0.008	8	Glass	0.013	10	100	4.4	
GM-GIS-BA_ssGM_632	MH-GIS-BR_ssMH_1264	547.25	MH-GIS-BR_ssMH_1266	552.11	140.5	-0.035	8	Glass	0.013	12	100	10.2	
GM-GIS-BA_ssGM_633	MH-GIS-BR_ssMH_1266	552.11	MH-GIS-BR_ssMH_1267	559.23	115.6	-0.062	8	Glass	0.013	13	100	7.7	
GM-GIS-BA_ssGM_634	MH-GIS-BR_ssMH_1267	559.23	MH-GIS-BR_ssMH_1268	560.34	122.1	-0.009	8	Glass	0.013	15	100	0.6	
GM-GIS-BA_ssGM_635	MH-GIS-BR_ssMH_1268	560.34	MH-GIS-BR_ssMH_1272	557.8	102.3	0.025	8	Glass	0.013	17	13	-0.6	
GM-GIS-BA_ssGM_636	MH-GIS-BR_ssMH_1270	552.27	MH-GIS-BR_ssMH_1269	551.44	328	0.003	8	Glass	0.013	7	100	0.3	
GM-GIS-BA_ssGM_637	MH-GIS-BR_ssMH_1263	564	MH-GIS-BR_ssMH_1271	563.3	116.1	0.006	8	Glass	0.013	3	6.3	-0.6	
GM-GIS-BA_ssGM_638	MH-GIS-BR_ssMH_1271	563.3	MH-GIS-BR_ssMH_1272	557.8	111.4	0.049	8	Glass	0.013	5	7.1	-0.6	
GM-GIS-BA_ssGM_639	MH-GIS-BR_ssMH_1272	557.8	MH-GIS-BR_ssMH_1273	544	227.8	0.061	8	Glass	0.013	23	15.4	-0.6	
GM-GIS-BA_ssGM_640	MH-GIS-BR_ssMH_1273	544	MH-GIS-BR_ssMH_1262	543.07	92.4	0.01	8	Glass	0.013	25	100	2.8	
GM-GIS-BA_ssGM_641	MH-GIS-BR_ssMH_1274	553.5	MH-GIS-BR_ssMH_1270	552.27	52.5	0.023	8	Glass	0.013	5	7.1	-0.6	
GM-GIS-BA_ssGM_646	MH-GIS-BA_ssMH_1930	789.51	MH-GIS-BA_ssMH_1942	788.17	202.8	0.007	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_647	MH-GIS-BA_ssMH_1919	830.9	MH-GIS-BA_ssMH_1923	831.44	93.5	-0.006	8	PVC	0.01	1	88.3	-0.1	
GM-GIS-BA_ssGM_648	MH-GIS-BA_ssMH_1925	830.88	MH-GIS-BA_ssMH_1924	830.07	46.9	0.017	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-BA_ssGM_649	MH-GIS-BA_ssMH_1926	768.21	MH-GIS-BA_ssMH_1927	766.81	90.4	0.015	8	PVC	0.01	53	23.4	-0.5	
GM-GIS-BA_ssGM_650	MH-GIS-BA_ssMH_1924	830.07	MH-GIS-BA_ssMH_1933	829.47	40.8	0.015	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-BA_ssGM_651	MH-GIS-BA_ssMH_1936	844	MH-GIS-BA_ssMH_1929	839.27	124	0.038	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-BA_ssGM_652	MH-GIS-BA_ssMH_1928	769.11	MH-GIS-BA_ssMH_1926	768.21	59.2	0.015	8	PVC	0.01	51	23.2	-0.5	
GM-GIS-BA_ssGM_653	MH-GIS-BA_ssMH_1931	809	MH-GIS-BA_ssMH_1940	804.21	206.8	0.023	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_654	MH-GIS-BA_ssMH_1941	821.69	MH-GIS-BA_ssMH_1939	818.4	207.3	0.016	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_655	MH-GIS-BA_ssMH_1932	824.81	MH-GIS-BA_ssMH_1939	818.4	116.8	0.055	8	PVC	0.01	21	14.5	-0.6	
GM-GIS-BA_ssGM_656	MH-GIS-BA_ssMH_1938	828.53	MH-GIS-BA_ssMH_1932	824.81	83.3	0.045	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-BA_ssGM_657	MH-GIS-BA_ssMH_1921	829	MH-GIS-BA_ssMH_1933	829.47	61.7	-0.008	8	PVC	0.01	1	80.2	-0.1	
GM-GIS-BA_ssGM_658	MH-GIS-BA_ssMH_1933	829.47	MH-GIS-BA_ssMH_1934	829	90.8	0.005	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-BA_ssGM_659	MH-GIS-BA_ssMH_1920	830.84	MH-GIS-BA_ssMH_1925	830.88	59.2	-7E-04	8	PVC	0.01	1	14.1	-0.6	
GM-GIS-BA_ssGM_660	MH-GIS-BA_ssMH_1918	843.65	MH-GIS-BA_ssMH_1922	842.94	39.7	0.018	8	PVC	0.01	1	65.2	-0.2	
GM-GIS-BA_ssGM_661	MH-GIS-BA_ssMH_1922	842.94	MH-GIS-BA_ssMH_1935	843.62	53.1	-0.013	8	PVC	0.01	3	100	0.5	
GM-GIS-BA_ssGM_662	MH-GIS-BA_ssMH_1940	804.21	MH-GIS-BA_ssMH_1942	788.17	247.1	0.065	8	PVC	0.01	26	16.3	-0.6	
GM-GIS-BA_ssGM_663	MH-GIS-BA_ssMH_1939	818.4	MH-GIS-BA_ssMH_1940	804.21	255.2	0.056	8	PVC	0.01	23	15.5	-0.6	
GM-GIS-BA_ssGM_664	MH-GIS-BA_ssMH_1937	832.81	MH-GIS-BA_ssMH_1938	828.53	82.4	0.052	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-BA_ssGM_665	MH-GIS-BA_ssMH_1934	829	MH-GIS-BA_ssMH_1938	828.53	113.6	0.004	8	PVC	0.01	10	10.4	-0.6	
GM-GIS-BA_ssGM_666	MH-GIS-BA_ssMH_1935	843.62	MH-GIS-BA_ssMH_1936	844	104.4	-0.004	8	PVC	0.01	4	69.7	-0.2	
GM-GIS-BA_ssGM_667	MH-GIS-BA_ssMH_1929	839.27	MH-GIS-BA_ssMH_1937	832.81	135.3	0.048	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-BA_ssGM_668	MH-GIS-BA_ssMH_1923	831.44	MH-GIS-BA_ssMH_1925	830.88	44.1	0.013	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BA_ssGM_669	MH-GIS-BA_ssMH_1942	788.17	MH-GIS-BA_ssMH_1943	785.61	60.7	0.042	8	PVC	0.01	28	17.1	-0.6	
GM-GIS-BA_ssGM_670	MH-GIS-BA_ssMH_1943	785.61	MH-GIS-BA_ssMH_1944	781.15	85.3	0.052	8	PVC	0.01	30	17.5	-0.5	
GM-GIS-BA_ssGM_671	MH-GIS-BA_ssMH_1944	781.15	MH-GIS-BA_ssMH_1945	769.62	120.7	0.096	8	PVC	0.01	31	17.9	-0.5	
GM-GIS-BA_ssGM_672	MH-GIS-BA_ssMH_1927	766.81	MH-GIS-BA_ssMH_1284	764.62	108.8	0.02	8	PVC	0.01	54	23.7	-0.5	
GM-GIS-BA_ssGM_673	MH-GIS-BA_ssMH_1945	769.62	MH-GIS-BA_ssMH_1928	769.11	70.6	0.007	8	PVC	0.01	50	22.9	-0.5	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-BP_ssGM_2	MH-GIS-BP_ssMH_1535	839.22	MH-GIS-BP_ssMH_1536	840.96	86.2	-0.02	8	PVC	0.01	3	100	1.1	
GM-GIS-BP_ssGM_3	MH-GIS-BP_ssMH_1536	840.96	MH-IS-53	830.15	89	0.122	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-BP_ssGM_4	MH-GIS-BP_ssMH_1534	855.03	MH-GIS-BP_ssMH_1535	839.22	259.3	0.061	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_5	MH-GIS-BP_ssMH_1537	828.7	MH-GIS-BP_ssMH_1538	830.07	85	-0.016	8	PVC	0.01	1	100	0.8	
GM-GIS-BP_ssGM_6	MH-GIS-BP_ssMH_1539	828.73	MH-GIS-BP_ssMH_1540	825.06	130.9	0.028	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_7	MH-GIS-BP_ssMH_1540	825.06	MH-IS-49	804.65	232	0.088	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_340	MH-GIS-BP_ssMH_1753	780.94	MH-IS-198	779.52	38.9	0.037	8	Ductile Iron	0.013	514	76.1	-0.2	
GM-GIS-BP_ssGM_341	MH-GIS-BP_ssMH_1538	830.07	MH-IS-58	819.51	38	0.278	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_342	MH-GIS-BP_ssMH_1737	845.7	MH-GIS-BP_ssMH_1738	838.64	302.4	0.023	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_345	MH-GIS-BP_ssMH_1741	809	MH-IS-50	797.44	95.4	0.121	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_347	MH-GIS-MH-44	791.82	MH-IS-MH-210	778.16	30	0.456	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_357(1)	MH-GIS-BP_ssMH_1738	838.64	MH-GIS-MH-90	835.24	264	0.013	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-BP_ssGM_357(2)	MH-GIS-MH-90	835.24	MH-IS-MH-5	825.27	73.1	0.136	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-BP_ssGM_359	MH-GIS-BP_ssMH_1755	801.95	MH-GIS-BP_ssMH_1758	796.09	160.6	0.036	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_360	MH-GIS-BP_ssMH_1754	788.61	MH-GIS-BP_ssMH_1753	780.94	210	0.037	8	Ductile Iron	0.013	513	76	-0.2	
GM-GIS-BP_ssGM_361	MH-GIS-BP_ssMH_1756	807.02	MH-GIS-BP_ssMH_1755	801.95	251.4	0.02	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_362	MH-GIS-BP_ssMH_1757	792.54	MH-GIS-BP_ssMH_1754	788.61	107.5	0.037	8	PVC	0.01	511	75.9	-0.2	
GM-GIS-BP_ssGM_363	MH-GIS-BP_ssMH_1758	796.09	MH-GIS-BP_ssMH_1757	792.54	146.8	0.024	8	PVC	0.01	510	75.8	-0.2	
GM-GIS-BP_ssGM_571	MH-GIS-MH-113	877.1	MH-IS-123	863.89	73.8	0.179	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_572	MH-GIS-MH-171	870.05	MH-IS-123	863.89	147.4	0.042	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_1083	MH-GIS-MH-89	836.77	MH-GIS-MH-90	835.24	56.1	0.027	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-BP_ssGM_1084	MH-GIS-BP_ssMH_2211	840.99	MH-GIS-MH-162	839	182.5	0.011	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_1085	MH-GIS-MH-162	839	MH-GIS-BP_ssMH_2210	838.36	135.2	0.005	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-BP_ssGM_1086	MH-GIS-BP_ssMH_2210	838.36	MH-GIS-BP_ssMH_2209	838.39	119.5	-3E-04	8	PVC	0.01	2	15.7	-0.6	
GM-GIS-BP_ssGM_1087	MH-GIS-BP_ssMH_2209	838.39	MH-GIS-MH-89	836.77	47.3	0.034	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-BP_ssGM_1283	MH-GIS-BP_ssMH_2352	835.22	MH-GIS-BP_ssMH_2354	825.07	150.8	0.067	8	PVC	0.01	206	47.5	-0.3	
GM-GIS-BP_ssGM_1284	MH-GIS-BP_ssMH_2354	825.07	MH-GIS-BP_ssMH_2353	824.9	43.2	0.004	8	PVC	0.01	440	80.1	-0.1	
GM-GIS-BP_ssGM_1298	MH-GIS-BP_ssMH_2362	814.43	MH-GIS-BP_ssMH_2361	808.69	309	0.019	8	PVC	0.01	504	75.4	-0.2	
GM-GIS-BP_ssGM_1299	MH-GIS-BP_ssMH_2353	824.9	MH-GIS-BP_ssMH_2362	814.43	168	0.062	8	PVC	0.01	503	75.3	-0.2	
GM-GIS-BP_ssGM_1300	MH-GIS-BP_ssMH_2361	808.69	MH-GIS-BP_ssMH_2363	800.67	342.5	0.023	8	PVC	0.01	505	75.5	-0.2	
GM-GIS-BP_ssGM_1301	MH-GIS-BP_ssMH_2363	800.67	MH-GIS-BP_ssMH_1758	796.09	385.8	0.012	8	PVC	0.01	506	75.6	-0.2	
GM-GIS-BP_ssGM_1458	MH-GIS-MH-70	809.18	MH-GIS-BP_ssMH_1741	809	44.2	0.004	8	PVC	0.01	1	3.9	-0.6	
GM-GIS-CO-22	MH-GIS-DY_ssMH_2561	721.57	Pump Station N6 Wetwell	717.14	10.7	0.415	8	Glass	0.013	18	13.5	-0.6	
GM-GIS-CO-126	MH-IS-GS_ssMH_1480	408.77	MH-IS-193	407.54	235	0.005	10	Concrete	0.013	245	40.5	-0.5	SM4
GM-GIS-CO_ssGM_109	MH-GIS-CO_ssMH_1372	904.88	MH-GIS-CO_ssMH_1428	902.68	138.3	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_110	MH-GIS-CO_ssMH_1428	902.68	MH-GIS-CO_ssMH_1427	902.11	85.1	0.007	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_111	MH-GIS-CO_ssMH_1371	905.28	MH-GIS-CO_ssMH_1427	902.11	193.4	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_113	MH-GIS-CO_ssMH_1426	899	MH-GIS-CO_ssMH_1419	896.39	127.3	0.021	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_114	MH-GIS-CO_ssMH_1425	904.06	MH-GIS-CO_ssMH_1426	899	134.1	0.038	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_115	MH-GIS-CO_ssMH_1423	887.13	MH-GIS-CO_ssMH_1424	884.92	121.8	0.018	8	PVC	0.01	33	18.5	-0.5	
GM-GIS-CO_ssGM_116	MH-GIS-CO_ssMH_1422	891.5	MH-GIS-CO_ssMH_1423	887.13	123.9	0.035	8	PVC	0.01	31	17.9	-0.5	
GM-GIS-CO_ssGM_117	MH-GIS-CO_ssMH_1429	894	MH-GIS-CO_ssMH_1422	891.5	153	0.016	8	PVC	0.01	29	17.2	-0.6	
GM-GIS-CO_ssGM_118	MH-GIS-CO_ssMH_1421	894	MH-GIS-CO_ssMH_1429	894	82.7	0	8	PVC	0.01	18	25.8	-0.5	
GM-GIS-CO_ssGM_119	MH-GIS-CO_ssMH_1420	896.71	MH-GIS-CO_ssMH_1421	894	96.8	0.028	8	PVC	0.01	15	12.6	-0.6	
GM-GIS-CO_ssGM_120	MH-GIS-CO_ssMH_1419	896.39	MH-GIS-CO_ssMH_1420	896.71	68.2	-0.005	8	PVC	0.01	13	66.8	-0.2	
GM-GIS-CO_ssGM_121	MH-GIS-CO_ssMH_1418	899.03	MH-GIS-CO_ssMH_1419	896.39	177	0.015	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-CO_ssGM_122	MH-GIS-CO_ssMH_1417	899.91	MH-GIS-CO_ssMH_1418	899.03	45.7	0.019	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_123	MH-GIS-CO_ssMH_1416	902.07	MH-GIS-CO_ssMH_1417	899.91	129.1	0.017	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_157	MH-GIS-CO_ssMH_1395	851.41	MH-GIS-SC_ssMH_1409	837.73	140.2	0.098	8	PVC	0.01	38	19.7	-0.5	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CO_ssGM_161	MH-GIS-CO_ssMH_1427	902.11	MH-GIS-CO_ssMH_1429	894	234.2	0.035	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-CO_ssGM_170	MH-GIS-CO_ssMH_1424	884.92	MH-GIS-CO_ssMH_1395	851.41	229.8	0.146	8	PVC	0.01	35	19.1	-0.5	
GM-GIS-CO_ssGM_453	MH-GIS-CO_ssMH_1820	903.4	MH-GIS-CO_ssMH_1831	899	138.2	0.032	8	Ductile Iron	0.013	6	8.1	-0.6	
GM-GIS-CO_ssGM_454	MH-GIS-CO_ssMH_1821	909	MH-GIS-CO_ssMH_1820	903.4	227.7	0.025	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-CO_ssGM_455	MH-GIS-CO_ssMH_1822	900.21	MH-GIS-CO_ssMH_1831	899	115.9	0.01	8	Ductile Iron	0.013	12	11.1	-0.6	
GM-GIS-CO_ssGM_456	MH-GIS-CO_ssMH_1830	902.92	MH-GIS-CO_ssMH_1822	900.21	132	0.021	8	PVC	0.01	11	10.7	-0.6	
GM-GIS-CO_ssGM_457	MH-GIS-CO_ssMH_1823	899	MH-GIS-CO_ssMH_1829	901.61	169.9	-0.015	8	PVC	0.01	1	100	3.4	
GM-GIS-CO_ssGM_458	MH-GIS-CO_ssMH_1824	905.92	MH-GIS-CO_ssMH_1832	907.32	89	-0.016	8	PVC	0.01	2	100	0.8	
GM-GIS-CO_ssGM_459	MH-GIS-CO_ssMH_1825	905.89	MH-GIS-CO_ssMH_1830	902.92	282	0.011	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-CO_ssGM_460	MH-GIS-CO_ssMH_1832	907.32	MH-GIS-CO_ssMH_1825	905.89	145.1	0.01	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-CO_ssGM_461	MH-GIS-CO_ssMH_1826	901.33	MH-GIS-CO_ssMH_1827	901.05	166.8	0.002	8	PVC	0.01	1	100	1	
GM-GIS-CO_ssGM_462	MH-GIS-CO_ssMH_1836	902.92	MH-GIS-CO_ssMH_1828	901.53	175.2	0.008	8	PVC	0.01	3	16.1	-0.6	
GM-GIS-CO_ssGM_463	MH-GIS-MH-163	905.76	MH-GIS-CO_ssMH_1827	901.05	138	0.034	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-CO_ssGM_464	MH-GIS-CO_ssMH_1828	901.53	MH-GIS-CO_ssMH_1829	901.61	126.4	-6E-04	8	PVC	0.01	5	100	0.8	
GM-GIS-CO_ssGM_465	MH-GIS-MH-169	904.03	MH-GIS-CO_ssMH_1828	901.53	147	0.017	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-CO_ssGM_466	MH-GIS-CO_ssMH_1829	901.61	MH-GIS-CO_ssMH_1830	902.92	210.1	-0.006	8	PVC	0.01	6	100	0.8	
GM-GIS-CO_ssGM_467	MH-GIS-CO_ssMH_1831	899	MH-IS-69	876.77	261.2	0.085	8	Ductile Iron	0.013	19	14.1	-0.6	
GM-GIS-CO_ssGM_468	MH-GIS-MH-182	905.23	MH-GIS-CO_ssMH_1833	907.18	156.4	-0.012	8	PVC	0.01	1	100	1.5	
GM-GIS-CO_ssGM_469	MH-GIS-CO_ssMH_1835	909	MH-GIS-CO_ssMH_1821	909	149.3	0	8	PVC	0.01	1	9.1	-0.6	
GM-GIS-CO_ssGM_470	MH-GIS-CO_ssMH_1834	908.47	MH-GIS-CO_ssMH_1818	908.92	68.1	-0.007	8	PVC	0.01	2	95.3	0	
GM-GIS-CO_ssGM_471	MH-GIS-MH-192	905.9	MH-GIS-CO_ssMH_1834	908.47	163.1	-0.016	8	PVC	0.01	1	100	2.5	
GM-GIS-CO_ssGM_472	MH-GIS-CO_ssMH_1833	907.18	MH-GIS-CO_ssMH_1824	905.92	93.4	0.013	8	PVC	0.01	2	31.4	-0.5	
GM-GIS-CO_ssGM_473	MH-GIS-CO_ssMH_1827	901.05	MH-GIS-CO_ssMH_1836	902.92	42	-0.045	8	PVC	0.01	2	100	1.3	
GM-GIS-CO_ssGM_1050	MH-GIS-CO_ssMH_1819	909	MH-GIS-CO_ssMH_1821	909	93.9	0	8	PVC	0.01	4	15	-0.6	
GM-GIS-CO_ssGM_1051	MH-GIS-CO_ssMH_1818	908.92	MH-GIS-CO_ssMH_1819	909	146.6	-6E-04	8	PVC	0.01	3	27.8	-0.5	
GM-GIS-CO_ssGM_1052	MH-GIS-CO_ssMH_1817	909	MH-GIS-CO_ssMH_1818	908.92	112.5	7E-04	8	PVC	0.01	1	15.8	-0.6	
GM-GIS-CR_ssGM_1194	MH-GIS-DP_ssMH_2281	901.58	MH-GIS-DP_ssMH_2302	898.53	183.1	0.017	8	PVC	0.01	221	49.3	-0.3	
GM-GIS-CR_ssGM_1250	MH-GIS-CR_ssMH_2568	970.75	MH-GIS-CR_ssMH_2321	968.83	67	0.029	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-CR_ssGM_1251	MH-GIS-MH-167	916.76	MH-GIS-DP_ssMH_2281	901.58	141.9	0.107	8	PVC	0.01	220	49.1	-0.3	
GM-GIS-CR_ssGM_1252	MH-GIS-DP_ssMH_2328	919	MH-GIS-MH-167	916.76	57.8	0.039	8	PVC	0.01	219	49	-0.3	
GM-GIS-CR_ssGM_1254	MH-GIS-CR_ssMH_2323	955.99	MH-GIS-CR_ssMH_2330	955.7	161.5	0.002	8	PVC	0.01	168	53.6	-0.3	
GM-GIS-CR_ssGM_1256	MH-GIS-CR_ssMH_2331	979.07	MH-GIS-CR_ssMH_2321	968.83	146.8	0.07	8	PVC	0.01	111	34.4	-0.4	
GM-GIS-CR_ssGM_1258	MH-GIS-CR_ssMH_2321	968.83	MH-GIS-CR_ssMH_2332	960.9	145.9	0.054	8	PVC	0.01	164	42.2	-0.4	
GM-GIS-CR_ssGM_1259	MH-GIS-CR_ssMH_2332	960.9	MH-GIS-CR_ssMH_2333	955.94	143.9	0.034	8	PVC	0.01	165	42.3	-0.4	
GM-GIS-CR_ssGM_1260	MH-GIS-CR_ssMH_2333	955.94	MH-GIS-CR_ssMH_2323	955.99	126.1	-4E-04	8	PVC	0.01	167	82.8	-0.1	
GM-GIS-CR_ssGM_1261	MH-GIS-DP_ssMH_2335	934.79	MH-GIS-DP_ssMH_2336	925.87	60.5	0.147	8	PVC	0.01	216	48.7	-0.3	
GM-GIS-CR_ssGM_1262	MH-GIS-DP_ssMH_2336	925.87	MH-GIS-DP_ssMH_2328	919	152.7	0.045	8	PVC	0.01	217	48.8	-0.3	
GM-GIS-CR_ssGM_1263	MH-GIS-CR_ssMH_2334	943.18	MH-GIS-DP_ssMH_2335	934.79	90.3	0.093	8	PVC	0.01	215	48.5	-0.3	
GM-GIS-CR_ssGM_1267	MH-GIS-CR_ssMH_2337	958.27	MH-GIS-CR_ssMH_2338	941.9	203	0.081	8	PVC	0.01	41	20.5	-0.5	
GM-GIS-CR_ssGM_1268	MH-GIS-CR_ssMH_2379	970.91	MH-GIS-CR_ssMH_2337	958.27	101.6	0.124	8	PVC	0.01	33	18.5	-0.5	
GM-GIS-CR_ssGM_1269	MH-GIS-CR_ssMH_2338	941.9	MH-GIS-CR_ssMH_2339	940.05	67.1	0.028	8	PVC	0.01	42	100	1	
GM-GIS-CR_ssGM_1270	MH-GIS-CR_ssMH_2339	940.05	MH-GIS-CR_ssMH_2334	943.18	174.8	-0.018	8	PVC	0.01	43	100	2.8	
GM-GIS-CR_ssGM_1271	MH-GIS-CR_ssMH_2330	955.7	MH-GIS-CR_ssMH_2340	948.55	204.8	0.035	8	PVC	0.01	169	42.8	-0.4	
GM-GIS-CR_ssGM_1272	MH-GIS-CR_ssMH_2340	948.55	MH-GIS-CR_ssMH_2334	943.18	94.8	0.057	8	PVC	0.01	170	43	-0.4	
GM-GIS-CR_ssGM_1877	MH-GIS-CR_ssMH_2978	979.6	MH-GIS-CR_ssMH_2568	970.75	77	0.115	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-CR_ssGM_1878	MH-GIS-CR_ssMH_2979	986.08	MH-GIS-CR_ssMH_2978	979.6	75.6	0.086	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-CR_ssGM_1879	MH-GIS-CR_ssMH_2980	990.89	MH-GIS-CR_ssMH_2979	986.08	75.7	0.064	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CR_ssGM_1880	MH-GIS-CR_ssMH_2990	959.4	MH-GIS-CR_ssMH_2337	958.27	55.5	0.02	8	PVC	0.01	6	8	-0.6	
GM-GIS-CR_ssGM_1881	MH-GIS-CR_ssMH_2981	978.58	MH-GIS-CR_ssMH_2990	959.4	249.3	0.077	8	PVC	0.01	5	7.2	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CR_ssGM_1882	MH-GIS-CR_ssMH_2984	988.74	MH-GIS-CR_ssMH_2982	983.25	226.8	0.024	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-CR_ssGM_1883	MH-GIS-CR_ssMH_2982	983.25	MH-GIS-CR_ssMH_2981	978.58	126.4	0.037	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-CR_ssGM_1884	MH-GIS-CR_ssMH_2983	991.74	MH-GIS-CR_ssMH_2984	988.74	86.3	0.035	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_8	MH-GIS-CT_ssMH_1278	749.62	MH-GIS-MH-36	749.5	23.3	0.005	8	PVC	0.01	81	29.3	-0.5	
GM-GIS-CT_ssGM_9	MH-GIS-MH-93	762.41	MH-GIS-CT_ssMH_1293	750.54	60.1	0.198	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_10	MH-GIS-CT_ssMH_1293	750.54	MH-GIS-CT_ssMH_1277	750.19	56	0.006	8	PVC	0.01	79	28.8	-0.5	
GM-GIS-CT_ssGM_11	MH-GIS-CT_ssMH_1277	750.19	MH-GIS-CT_ssMH_1278	749.62	46.1	0.012	8	PVC	0.01	80	29	-0.5	
GM-GIS-CT_ssGM_12	MH-GIS-CT_ssMH_1291	754.92	MH-GIS-CT_ssMH_1276	754.24	87.6	0.008	8	PVC	0.01	66	26.2	-0.5	
GM-GIS-CT_ssGM_13	MH-GIS-CT_ssMH_1276	754.24	MH-GIS-CT_ssMH_1294	752.33	82.1	0.023	8	PVC	0.01	67	26.5	-0.5	
GM-GIS-CT_ssGM_14	MH-GIS-CT_ssMH_1286	762.24	MH-GIS-CT_ssMH_1287	761.05	151.9	0.008	8	PVC	0.01	58	24.6	-0.5	
GM-GIS-CT_ssGM_15	MH-GIS-MH-116	765.96	MH-GIS-CT_ssMH_1290	756.86	76.6	0.119	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_16	MH-GIS-CT_ssMH_1280	764	MH-GIS-CT_ssMH_1279	763.04	73.8	0.013	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-CT_ssGM_17	MH-GIS-CT_ssMH_1283	769	MH-GIS-CT_ssMH_1282	767.57	230.3	0.006	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_18	MH-GIS-BA_ssMH_1284	764.62	MH-GIS-CT_ssMH_1285	762.94	157.8	0.011	8	PVC	0.01	55	24	-0.5	
GM-GIS-CT_ssGM_19	MH-GIS-CT_ssMH_1290	756.86	MH-GIS-CT_ssMH_1291	754.92	253.1	0.008	8	PVC	0.01	64	26	-0.5	
GM-GIS-CT_ssGM_20	MH-GIS-CT_ssMH_1292	751.73	MH-GIS-CT_ssMH_1293	750.54	197.8	0.006	8	PVC	0.01	76	28.3	-0.5	
GM-GIS-CT_ssGM_21	MH-GIS-CT_ssMH_1294	752.33	MH-GIS-CT_ssMH_1292	751.73	108.9	0.006	8	PVC	0.01	75	28	-0.5	
GM-GIS-CT_ssGM_22	MH-GIS-CT_ssMH_1289	758.1	MH-GIS-CT_ssMH_1290	756.86	167.8	0.007	8	PVC	0.01	62	25.5	-0.5	
GM-GIS-CT_ssGM_23	MH-GIS-CT_ssMH_1288	760.29	MH-GIS-CT_ssMH_1289	758.1	295.1	0.007	8	PVC	0.01	61	25.2	-0.5	
GM-GIS-CT_ssGM_24	MH-GIS-CT_ssMH_1287	761.05	MH-GIS-CT_ssMH_1288	760.29	80	0.01	8	PVC	0.01	59	24.9	-0.5	
GM-GIS-CT_ssGM_25	MH-GIS-CT_ssMH_1285	762.94	MH-GIS-CT_ssMH_1286	762.24	72.1	0.01	8	PVC	0.01	57	24.3	-0.5	
GM-GIS-CT_ssGM_26	MH-GIS-CT_ssMH_1282	767.57	MH-GIS-CT_ssMH_1281	766.46	218.9	0.005	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-CT_ssGM_27	MH-GIS-CT_ssMH_1279	763.04	MH-GIS-CT_ssMH_1294	752.33	59.9	0.179	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-CT_ssGM_28	MH-GIS-CT_ssMH_1281	766.46	MH-GIS-CT_ssMH_1280	764	307.2	0.008	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-CT_ssGM_246	MH-GIS-CT_ssMH_1692	756.63	MH-GIS-MH-77	756.31	49.4	0.006	8	PVC	0.01	54	23.8	-0.5	
GM-GIS-CT_ssGM_247	MH-GIS-CT_ssMH_1693	768.42	MH-GIS-CT_ssMH_1692	756.63	202.7	0.058	8	PVC	0.01	53	23.5	-0.5	
GM-GIS-CT_ssGM_248	MH-GIS-GC_ssMH_1622	773.42	MH-GIS-CT_ssMH_1693	768.42	112.9	0.044	8	Ductile Iron	0.013	52	23.3	-0.5	
GM-GIS-CV_ssGM_201	MH-GIS-CV_ssMH_1587	788.2	MH-GIS-CV_ssMH_1586	779.6	113.2	0.076	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-CV_ssGM_202	MH-GIS-CV_ssMH_1586	779.6	MH-GIS-CV_ssMH_1585	771.51	125.8	0.064	8	PVC	0.01	26	16.3	-0.6	
GM-GIS-CV_ssGM_203	MH-GIS-CV_ssMH_1585	771.51	MH-GIS-CV_ssMH_1584	767.13	180.4	0.024	8	PVC	0.01	27	100	1	
GM-GIS-CV_ssGM_204	MH-GIS-CV_ssMH_1584	767.13	MH-GIS-GC_ssMH_1590	769.6	299	-0.008	8	PVC	0.01	28	100	5.8	
GM-GIS-CV_ssGM_211	MH-GIS-GC_ssMH_1588	794	MH-GIS-CV_ssMH_1587	788.2	176.7	0.033	8	PVC	0.01	23	15.5	-0.6	
GM-GIS-CV_ssGM_212	MH-GIS-CV_ssMH_1598	859.22	MH-GIS-CV_ssMH_1597	850.39	107.1	0.082	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_242	MH-GIS-CV_ssMH_1625	716.37	PSFWW	704	24.3	0.509	8	PVC	0.01	47	22.1	-0.5	
GM-GIS-CV_ssGM_495	MH-GIS-MH-100	732.8	MH-GIS-CV_ssMH_1698	728.76	63.2	0.064	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_496	MH-GIS-CV_ssMH_1699	725.63	MH-GIS-CV_ssMH_1698	728.76	107.6	-0.029	8	PVC	0.01	42	100	2.7	
GM-GIS-CV_ssGM_497	MH-GIS-CV_ssMH_1700	727.16	MH-GIS-CV_ssMH_1699	725.63	103.1	0.015	8	PVC	0.01	40	100	1.2	
GM-GIS-CV_ssGM_498	MH-GIS-CV_ssMH_1701	730.39	MH-GIS-CV_ssMH_1700	727.16	103.7	0.031	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-CV_ssGM_499	MH-GIS-CV_ssMH_1703	742.7	MH-GIS-CV_ssMH_1701	730.39	195.6	0.063	8	PVC	0.01	38	19.8	-0.5	
GM-GIS-CV_ssGM_500	MH-GIS-CV_ssMH_1702	749	MH-GIS-CV_ssMH_1703	742.7	156.5	0.04	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-CV_ssGM_501	MH-GIS-MH-121	752.94	MH-GIS-CV_ssMH_1702	749	81.1	0.049	6	PVC	0.01	1	5.2	-0.5	
GM-GIS-CV_ssGM_502	MH-GIS-CV_ssMH_1705	756.4	MH-GIS-CV_ssMH_1703	742.7	194.6	0.07	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-CV_ssGM_503	MH-GIS-CV_ssMH_1706	767.27	MH-GIS-CV_ssMH_1705	756.4	173.7	0.063	8	Ductile Iron	0.013	33	18.3	-0.5	
GM-GIS-CV_ssGM_504	MH-GIS-CV_ssMH_1707	771.95	MH-GIS-CV_ssMH_1706	767.27	87.8	0.053	8	Ductile Iron	0.013	31	18	-0.5	
GM-GIS-CV_ssGM_505	MH-GIS-CV_ssMH_1704	775.43	MH-GIS-CV_ssMH_1707	771.95	104.4	0.033	8	Ductile Iron	0.013	22	15.1	-0.6	
GM-GIS-CV_ssGM_506	MH-GIS-CV_ssMH_1708	782.07	MH-GIS-CV_ssMH_1704	775.43	102.6	0.065	8	PVC	0.01	21	14.6	-0.6	
GM-GIS-CV_ssGM_507	MH-GIS-CV_ssMH_1711	787.91	MH-GIS-CV_ssMH_1708	782.07	102.2	0.057	8	PVC	0.01	20	14.2	-0.6	
GM-GIS-CV_ssGM_508	MH-GIS-CV_ssMH_1712	795.98	MH-GIS-CV_ssMH_1711	787.91	120.3	0.067	8	Ductile Iron	0.013	18	13.7	-0.6	
GM-GIS-CV_ssGM_509	MH-GIS-CV_ssMH_1715	794	MH-GIS-CV_ssMH_1712	795.98	101.7	-0.019	8	PVC	0.01	4	100	1.4	

City of Snoqualmie
General Sewer Plan
SewerGEMS Results

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CV_ssGM_510	MH-GIS-CV_ssMH_1717	794	MH-GIS-CV_ssMH_1715	794	54.3	0	8	PVC	0.01	3	100	1.4	
GM-GIS-CV_ssGM_511	MH-GIS-CV_ssMH_1718	803.09	MH-GIS-CV_ssMH_1717	794	134.8	0.067	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_512	MH-GIS-CV_ssMH_1721	804.66	MH-GIS-CV_ssMH_1720	794.25	68.3	0.152	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-CV_ssGM_513	MH-GIS-CV_ssMH_1709	772.62	MH-GIS-CV_ssMH_1707	771.95	70.4	0.01	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_514	MH-GIS-CV_ssMH_1720	794.25	MH-GIS-CV_ssMH_1719	779	182.9	0.083	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-CV_ssGM_515	MH-GIS-CV_ssMH_1719	779	MH-GIS-CV_ssMH_1710	774	207.8	0.024	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CV_ssGM_516	MH-GIS-CV_ssMH_1710	774	MH-GIS-CV_ssMH_1709	772.62	179.2	0.008	8	PVC	0.01	7	8.1	-0.6	
GM-GIS-CV_ssGM_517	MH-GIS-CV_ssMH_1731	826.6	MH-GIS-CV_ssMH_1729	831.01	260.2	-0.017	8	Ductile Iron	0.013	4	100	3.9	
GM-GIS-CV_ssGM_518	MH-GIS-MH-128	831.4	MH-GIS-CV_ssMH_1732	827.91	86.2	0.04	8	Ductile Iron	0.013	1	3.6	-0.6	
GM-GIS-CV_ssGM_519	MH-GIS-CV_ssMH_1728	825.39	MH-GIS-GC_ssMH_1591	822.34	141.2	0.022	8	Ductile Iron	0.013	9	9.5	-0.6	
GM-GIS-CV_ssGM_520	MH-GIS-CV_ssMH_1727	827.49	MH-GIS-CV_ssMH_1728	825.39	235.2	0.009	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_521	MH-GIS-CV_ssMH_1726	828.67	MH-GIS-CV_ssMH_1727	827.49	192.3	0.006	8	Ductile Iron	0.013	6	8.6	-0.6	
GM-GIS-CV_ssGM_522	MH-GIS-CV_ssMH_1725	824	MH-GIS-CV_ssMH_1726	828.67	189.6	-0.025	8	Ductile Iron	0.013	5	100	4.1	
GM-GIS-CV_ssGM_523	MH-GIS-CV_ssMH_1724	830.43	MH-GIS-CV_ssMH_1725	824	159.8	0.04	8	Ductile Iron	0.013	4	6.3	-0.6	
GM-GIS-CV_ssGM_524	MH-GIS-CV_ssMH_1723	837.84	MH-GIS-CV_ssMH_1724	830.43	357.5	0.021	8	Ductile Iron	0.013	3	5.1	-0.6	
GM-GIS-CV_ssGM_525	MH-GIS-CV_ssMH_1730	842.76	MH-GIS-CV_ssMH_1723	837.84	248.5	0.02	8	Ductile Iron	0.013	1	3.6	-0.6	
GM-GIS-CV_ssGM_526	MH-GIS-CV_ssMH_1732	827.91	MH-GIS-CV_ssMH_1731	826.6	95.1	0.014	8	Ductile Iron	0.013	3	100	2.5	
GM-GIS-CV_ssGM_527	MH-GIS-MH-139	808.6	MH-GIS-CV_ssMH_1721	804.66	100.2	0.039	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_528	MH-GIS-CV_ssMH_1597	850.39	MH-GIS-CV_ssMH_1729	831.01	193.6	0.1	8	Ductile Iron	0.013	3	5.1	-0.6	
GM-GIS-CV_ssGM_529	MH-GIS-CV_ssMH_1697	722.01	MH-GIS-CV_ssMH_1625	716.37	75.2	0.075	8	PVC	0.01	46	21.8	-0.5	
GM-GIS-CV_ssGM_530	MH-GIS-CV_ssMH_1698	728.76	MH-GIS-CV_ssMH_1697	722.01	216.6	0.031	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-CV_ssGM_1043	MH-GIS-CV_ssMH_1722	826.36	MH-GIS-CV_ssMH_1716	812.89	206.2	0.065	8	Ductile Iron	0.013	9	9.6	-0.6	
GM-GIS-CV_ssGM_1044	MH-GIS-CV_ssMH_1729	831.01	MH-GIS-CV_ssMH_1722	826.36	250.8	0.019	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_1045	MH-GIS-CV_ssMH_1714	807.44	MH-GIS-CV_ssMH_1713	802.34	86.6	0.059	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-CV_ssGM_1046	MH-GIS-CV_ssMH_1713	802.34	MH-GIS-CV_ssMH_1712	795.98	110.1	0.058	8	PVC	0.01	13	11.5	-0.6	
GM-GIS-CV_ssGM_1047	MH-GIS-CV_ssMH_1716	812.89	MH-GIS-CV_ssMH_1714	807.44	87.8	0.062	8	PVC	0.01	10	10.3	-0.6	
GM-GIS-CV_ssGM_1053	MH-GIS-GC_ssMH_1590	769.6	MH-GIS-GC_ssMH_1622	773.42	80	-0.048	8	PVC	0.01	30	100	3.3	
GM-GIS-DH_ssGM_199	MH-GIS-DH_ssMH_1602	809.49	MH-GIS-DH_ssMH_1627	802	228.7	0.033	8	PVC	0.01	19	13.9	-0.6	
GM-GIS-DH_ssGM_200	MH-GIS-MU_ssMH_1805	809.96	MH-GIS-DH_ssMH_1602	809.49	80.7	0.006	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-DH_ssGM_213	MH-GIS-MH-30	818.72	MH-GIS-DH_ssMH_1621	814.69	19.2	0.21	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_214	MH-GIS-DH_ssMH_1601	841.46	MH-GIS-DH_ssMH_1772	828	136.4	0.099	8	PVC	0.01	27	16.8	-0.6	
GM-GIS-DH_ssGM_221	MH-GIS-DH_ssMH_1855	841	MH-GIS-DH_ssMH_1601	841.46	130.8	-0.004	8	PVC	0.01	18	91.8	-0.1	
GM-GIS-DH_ssGM_243	MH-GIS-DH_ssMH_1627	801.7	PSK3-WW	801.5	54.7	0.004	10	PVC	0.01	67	19.9	-0.7	
GM-GIS-DH_ssGM_244	MH-GIS-DH_ssMH_1772	828	MH-GIS-DH_ssMH_1621	814.69	112.1	0.119	8	PVC	0.01	31	17.9	-0.5	
GM-GIS-DH_ssGM_245	MH-GIS-DH_ssMH_1621	814.69	PSK3-WW	793	133.3	0.163	8	PVC	0.01	32	18.3	-0.5	
GM-GIS-DH_ssGM_264	MH-GIS-DH_ssMH_1643	907.41	MH-GIS-DH_ssMH_1642	904	206	0.017	8	PVC	0.01	11	10.7	-0.6	
GM-GIS-DH_ssGM_265	MH-GIS-DH_ssMH_1631	907.59	MH-GIS-DH_ssMH_1633	902.33	166.9	0.032	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-DH_ssGM_266	MH-GIS-DH_ssMH_1630	907.74	MH-GIS-DH_ssMH_1631	907.59	187.5	8E-04	8	PVC	0.01	2	7.8	-0.6	
GM-GIS-DH_ssGM_267	MH-GIS-DH_ssMH_1629	909	MH-GIS-DH_ssMH_1630	907.74	107.7	0.012	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_268	MH-GIS-MH-149	912.36	MH-GIS-DH_ssMH_1640	911.41	115.9	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_269	MH-GIS-DH_ssMH_1640	911.41	MH-GIS-DH_ssMH_1641	907.27	320.9	0.013	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_270	MH-GIS-DH_ssMH_1650	912.29	MH-GIS-DH_ssMH_1644	908.13	203.6	0.02	8	PVC	0.01	7	8.6	-0.6	
GM-GIS-DH_ssGM_271	MH-GIS-DH_ssMH_1633	902.33	MH-GIS-DH_ssMH_1634	900.81	32.8	0.046	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-DH_ssGM_272	MH-GIS-MH-193	912.64	MH-GIS-DH_ssMH_1632	903.43	164.7	0.056	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_273	MH-GIS-DH_ssMH_1645	916.73	MH-GIS-DH_ssMH_1646	917.3	159.3	-0.004	8	PVC	0.01	1	100	0.5	
GM-GIS-DH_ssGM_274	MH-GIS-DH_ssMH_1646	917.3	MH-GIS-DH_ssMH_1647	917.68	140.8	-0.003	8	PVC	0.01	2	86.9	-0.1	
GM-GIS-DH_ssGM_275	MH-GIS-DH_ssMH_1647	917.68	MH-GIS-DH_ssMH_1648	917.81	84.7	-0.002	8	PVC	0.01	2	29.9	-0.5	
GM-GIS-DH_ssGM_276	MH-GIS-DH_ssMH_1648	917.81	MH-GIS-DH_ssMH_1649	914	274.8	0.014	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-DH_ssGM_277	MH-GIS-DH_ssMH_1651	917.06	MH-GIS-DH_ssMH_1650	912.29	201.9	0.024	8	PVC	0.01	2	4.9	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DH_ssGM_278	MH-GIS-DH_ssMH_1652	919	MH-GIS-DH_ssMH_1651	917.06	205.7	0.009	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_279	MH-GIS-DH_ssMH_1653	919	MH-GIS-DH_ssMH_1652	919	268.8	0	8	PVC	0.01	1	9.6	-0.6	
GM-GIS-DH_ssGM_280	MH-GIS-DH_ssMH_1635	884.99	MH-GIS-DH_ssMH_1636	887.23	38.1	-0.059	8	PVC	0.01	7	100	7	
GM-GIS-DH_ssGM_281	MH-GIS-DH_ssMH_1634	900.81	MH-GIS-DH_ssMH_1635	884.99	141.7	0.112	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-DH_ssGM_282	MH-GIS-DH_ssMH_1636	887.23	MH-GIS-DH_ssMH_1637	888.71	122.6	-0.012	8	PVC	0.01	8	100	4.8	
GM-GIS-DH_ssGM_283	MH-GIS-DH_ssMH_1637	888.71	MH-GIS-DH_ssMH_1638	888.98	222	-0.001	8	PVC	0.01	9	100	3.3	
GM-GIS-DH_ssGM_284	MH-GIS-DH_ssMH_1638	888.98	MH-GIS-DH_ssMH_1639	892.53	204.7	-0.017	8	PVC	0.01	10	100	3	
GM-GIS-DH_ssGM_285	MH-GIS-DH_ssMH_1639	892.53	MH-GIS-DH_ssMH_1310	888.97	106.7	0.033	8	PVC	0.01	11	10.3	-0.6	
GM-GIS-DH_ssGM_286	MH-GIS-DH_ssMH_1633	902.33	MH-GIS-DH_ssMH_1632	903.43	21.1	0.052	8	PVC	0.01	2	4.1	0.5	
GM-GIS-DH_ssGM_287	MH-GIS-MH-148	911.26	MH-GIS-DH_ssMH_1629	909	114.6	0.02	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_288	MH-GIS-DH_ssMH_1641	907.27	MH-GIS-DH_ssMH_1643	907.41	221.6	-6E-04	8	PVC	0.01	2	33	-0.4	
GM-GIS-DH_ssGM_289	MH-GIS-DH_ssMH_1649	914	MH-GIS-DH_ssMH_1650	912.29	85.4	0.02	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-DH_ssGM_290	MH-GIS-DH_ssMH_1644	908.13	MH-GIS-DH_ssMH_1643	907.41	104.9	0.007	8	PVC	0.01	8	9	-0.6	
GM-GIS-DH_ssGM_381	MH-GIS-DH_ssMH_1773	832.79	MH-GIS-DH_ssMH_1772	828	28.2	0.17	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-DH_ssGM_383	MH-GIS-DH_ssMH_1796	867.52	MH-GIS-DH_ssMH_1775	858.76	181.9	0.048	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_384	MH-GIS-DH_ssMH_1775	858.76	MH-GIS-DH_ssMH_1795	855.63	126.9	0.025	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_385	MH-GIS-DH_ssMH_1795	855.63	MH-GIS-DH_ssMH_1777	854	91.2	0.018	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_386	MH-GIS-DH_ssMH_1777	854	MH-GIS-DH_ssMH_1776	854	98.8	0	8	PVC	0.01	3	23.4	-0.5	
GM-GIS-DH_ssGM_387	MH-GIS-DH_ssMH_1776	854	MH-GIS-DH_ssMH_1774	854	94.5	0	8	PVC	0.01	4	23.2	-0.5	
GM-GIS-DH_ssGM_388	MH-GIS-DH_ssMH_1774	854	MH-GIS-DH_ssMH_1794	854.06	44.9	-0.001	8	PVC	0.01	4	22.9	-0.5	
GM-GIS-DH_ssGM_389	MH-GIS-DH_ssMH_1778	857.96	MH-GIS-DH_ssMH_1794	854.06	158.5	0.025	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_390	MH-GIS-DH_ssMH_1782	858.36	MH-GIS-DH_ssMH_1778	857.96	122.3	0.003	8	PVC	0.01	1	4.3	-0.6	
GM-GIS-DH_ssGM_391	MH-GIS-DH_ssMH_1780	878.22	MH-GIS-DH_ssMH_1779	874.82	183.8	0.018	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-DH_ssGM_392	MH-GIS-DH_ssMH_1784	879	MH-GIS-DH_ssMH_1780	878.22	103.4	0.008	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-DH_ssGM_393	MH-GIS-DH_ssMH_1781	875.18	MH-GIS-DH_ssMH_1780	878.22	126	-0.024	8	PVC	0.01	2	100	2.4	
GM-GIS-DH_ssGM_394	MH-GIS-DH_ssMH_1788	874	MH-GIS-DH_ssMH_1781	875.18	101.8	-0.012	8	PVC	0.01	1	100	3.6	
GM-GIS-DH_ssGM_395	MH-GIS-DH_ssMH_1779	874.82	MH-GIS-DH_ssMH_1783	862.01	106.7	0.12	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-DH_ssGM_396	MH-GIS-DH_ssMH_1783	862.01	MH-GIS-DH_ssMH_1794	854.06	159.3	0.05	8	PVC	0.01	9	9.7	-0.6	
GM-GIS-DH_ssGM_397	MH-GIS-DH_ssMH_1786	902.52	MH-GIS-DH_ssMH_1785	896.55	131	0.046	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_398	MH-GIS-DH_ssMH_1785	896.55	MH-GIS-DH_ssMH_1784	879	213.2	0.082	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_399	MH-GIS-DH_ssMH_1787	912.62	MH-GIS-DH_ssMH_1786	902.52	116.9	0.086	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_400	MH-GIS-DH_ssMH_1790	872.4	MH-GIS-DH_ssMH_1788	874	77.4	-0.021	8	PVC	0.01	1	100	5.2	
GM-GIS-DH_ssGM_401	MH-GIS-DH_ssMH_1789	879	MH-GIS-DH_ssMH_1780	878.22	160.3	0.005	8	PVC	0.01	2	4.8	-0.6	
GM-GIS-DH_ssGM_402	MH-GIS-DH_ssMH_1791	880.21	MH-GIS-DH_ssMH_1789	879	193.5	0.006	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_403	MH-GIS-DH_ssMH_1792	888.54	MH-GIS-DH_ssMH_1791	880.21	144.5	0.058	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_404	MH-GIS-DH_ssMH_1793	860.37	MH-GIS-DH_ssMH_1782	858.36	108.8	0.018	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_405	MH-GIS-DH_ssMH_1794	854.06	MH-GIS-DH_ssMH_1854	847.07	184	0.038	8	PVC	0.01	17	13	-0.6	
GM-GIS-DH_ssGM_478	MH-GIS-DH_ssMH_1840	904.51	MH-GIS-DH_ssMH_1841	902.08	121.4	0.02	8	PVC	0.01	16	12.9	-0.6	
GM-GIS-DH_ssGM_479	MH-GIS-DH_ssMH_1642	904	MH-GIS-DH_ssMH_1840	904.51	90.7	-0.006	8	PVC	0.01	12	94.8	0	
GM-GIS-DH_ssGM_482	MH-GIS-DH_ssMH_1845	914	MH-GIS-DH_ssMH_1844	908.63	274.7	0.02	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_483	MH-GIS-DH_ssMH_1844	908.63	MH-GIS-DH_ssMH_1843	905.71	251.5	0.012	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-DH_ssGM_484	MH-GIS-DH_ssMH_1843	905.71	MH-GIS-DH_ssMH_1840	904.51	277.1	0.004	8	PVC	0.01	3	6	-0.6	
GM-GIS-DH_ssGM_485	MH-GIS-DH_ssMH_1846	915.61	MH-GIS-DH_ssMH_1845	914	277.6	0.006	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_494	MH-GIS-DH_ssMH_1854	847.07	MH-GIS-DH_ssMH_1855	841	218.6	0.028	8	PVC	0.01	17	13.3	-0.6	
GM-GIS-DP_ssGM_1141	MH-GIS-DP_ssMH_2226	886.37	MH-GIS-DP_ssMH_2225	875.46	339.3	0.032	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1142	MH-GIS-DP_ssMH_2232	854.82	MH-GIS-DP_ssMH_2231	852.15	45.5	0.059	8	PVC	0.01	30	17.7	-0.5	
GM-GIS-DP_ssGM_1143	MH-GIS-DP_ssMH_2235	900.74	MH-GIS-DP_ssMH_2234	891.07	142.3	0.068	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1144	MH-GIS-DP_ssMH_2234	891.07	MH-GIS-MH-81	886.96	62.1	0.066	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1145	MH-GIS-DP_ssMH_2236	854	MH-GIS-DP_ssMH_2227	854	78.9	0	8	PVC	0.01	6	100	5.3	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1146	MH-GIS-DP_ssMH_2237	884.29	MH-GIS-DP_ssMH_2271	886.47	90.5	-0.024	8	PVC	0.01	1	100	1.6	
GM-GIS-DP_ssGM_1147	MH-GIS-DP_ssMH_2271	886.47	MH-GIS-DP_ssMH_2226	886.37	51.9	0.002	8	PVC	0.01	3	6.5	-0.6	
GM-GIS-DP_ssGM_1148	MH-GIS-DP_ssMH_2267	857.19	MH-GIS-DP_ssMH_2262	860.27	79.6	-0.039	8	PVC	0.01	10	100	8.4	
GM-GIS-DP_ssGM_1149	MH-GIS-DP_ssMH_2238	873.56	MH-GIS-DP_ssMH_2263	872.16	41.6	0.034	8	PVC	0.01	3	39.5	-0.4	
GM-GIS-DP_ssGM_1150	MH-GIS-DP_ssMH_2231	852.15	MH-GIS-MH-32	848.68	70.2	0.049	8	PVC	0.01	32	18.1	-0.5	
GM-GIS-DP_ssGM_1151	MH-GIS-DP_ssMH_2265	857.32	MH-GIS-DP_ssMH_2230	832.03	264.5	0.096	8	PVC	0.01	230	50.3	-0.3	
GM-GIS-DP_ssGM_1152	MH-GIS-DP_ssMH_2270	872.05	MH-GIS-DP_ssMH_2228	859.78	247.7	0.05	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1153(1)	MH-GIS-DP_ssMH_2239	840	MH-GIS-DP_ssMH_2572	839	113.7	0.009	8	PVC	0.01	14	11.9	-0.6	
GM-GIS-DP_ssGM_1153(2)	MH-GIS-DP_ssMH_2572	839	MH-GIS-DP_ssMH_2351	839	25.5	0	8	PVC	0.01	15	70.5	-0.2	
GM-GIS-DP_ssGM_1154	MH-GIS-DP_ssMH_2230	832.03	MH-GIS-DP_ssMH_2573	826.42	113.2	0.05	8	PVC	0.01	231	50.5	-0.3	
GM-GIS-DP_ssGM_1154(1)	MH-GIS-DP_ssMH_2573	826.42	MH-GIS-BP_ssMH_2354	825.07	25	0.054	8	PVC	0.01	233	50.6	-0.3	
GM-GIS-DP_ssGM_1155	MH-GIS-DP_ssMH_2240	826.56	MH-GIS-DP_ssMH_2574	824.46	144.6	0.015	8	PVC	0.01	19	14	-0.6	
GM-GIS-DP_ssGM_1156	MH-GIS-DP_ssMH_2243	857.36	MH-GIS-DP_ssMH_2239	840	212.3	0.082	8	PVC	0.01	13	11.3	-0.6	
GM-GIS-DP_ssGM_1157	MH-GIS-DP_ssMH_2241	896.36	MH-GIS-DP_ssMH_2242	889.46	115.1	0.06	8	PVC	0.01	224	49.6	-0.3	
GM-GIS-DP_ssGM_1158	MH-GIS-MH-48	881.7	MH-GIS-DP_ssMH_2244	879.62	32.6	0.064	8	PVC	0.01	8	8.8	-0.6	
GM-GIS-DP_ssGM_1159	MH-GIS-DP_ssMH_2244	879.62	MH-GIS-DP_ssMH_2246	862.14	195.4	0.089	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-DP_ssGM_1160	MH-GIS-DP_ssMH_2251	866.38	MH-GIS-DP_ssMH_2250	853.91	149.5	0.083	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-DP_ssGM_1161	MH-GIS-DP_ssMH_2250	853.91	MH-GIS-DP_ssMH_2249	853.17	59.9	0.012	8	PVC	0.01	19	100	4.6	
GM-GIS-DP_ssGM_1162	MH-GIS-MH-26	894.4	MH-GIS-DP_ssMH_2253	893.86	15	0.036	8	PVC	0.01	14	11.9	-0.6	
GM-GIS-DP_ssGM_1163	MH-GIS-DP_ssMH_2253	893.86	MH-GIS-DP_ssMH_2252	878.79	161.1	0.094	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-DP_ssGM_1164	MH-GIS-DP_ssMH_2252	878.79	MH-GIS-DP_ssMH_2251	866.38	138.5	0.09	8	PVC	0.01	17	13	-0.6	
GM-GIS-DP_ssGM_1165	MH-GIS-DP_ssMH_2248	853.14	MH-GIS-DP_ssMH_2247	853.34	85	-0.002	8	PVC	0.01	22	100	5.5	
GM-GIS-DP_ssGM_1166	MH-GIS-DP_ssMH_2249	853.17	MH-GIS-DP_ssMH_2248	853.14	63.8	5E-04	8	PVC	0.01	20	100	5.3	
GM-GIS-DP_ssGM_1167	MH-GIS-DP_ssMH_2233	901.08	MH-GIS-MH-132	897.42	98	0.037	8	PVC	0.01	11	10.8	-0.6	
GM-GIS-DP_ssGM_1168	MH-GIS-DP_ssMH_2257	903.51	MH-GIS-DP_ssMH_2233	901.08	84.4	0.029	8	PVC	0.01	6	8	-0.6	
GM-GIS-DP_ssGM_1169	MH-GIS-DP_ssMH_2256	906.73	MH-GIS-DP_ssMH_2257	903.51	96	0.034	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-DP_ssGM_1170	MH-GIS-DP_ssMH_2255	908.98	MH-GIS-DP_ssMH_2256	906.73	136.8	0.016	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1171	MH-GIS-DP_ssMH_2254	912.48	MH-GIS-DP_ssMH_2255	908.98	48.2	0.073	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1172	MH-GIS-DP_ssMH_2258	869	MH-GIS-DP_ssMH_2243	857.36	200.7	0.058	8	PVC	0.01	11	10.8	-0.6	
GM-GIS-DP_ssGM_1173	MH-GIS-DP_ssMH_2259	874.02	MH-GIS-DP_ssMH_2258	869	123.1	0.041	8	PVC	0.01	10	10.2	-0.6	
GM-GIS-DP_ssGM_1174	MH-GIS-DP_ssMH_2261	899.74	MH-GIS-DP_ssMH_2260	879.52	245.2	0.082	8	PVC	0.01	8	8.8	-0.6	
GM-GIS-DP_ssGM_1175	MH-GIS-DP_ssMH_2260	879.52	MH-GIS-DP_ssMH_2259	874.02	56.4	0.098	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-DP_ssGM_1176	MH-GIS-MH-27	900.33	MH-GIS-DP_ssMH_2261	899.74	17.1	0.035	8	PVC	0.01	6	8	-0.6	
GM-GIS-DP_ssGM_1177	MH-GIS-DP_ssMH_2266	855.35	MH-GIS-DP_ssMH_2267	857.19	83.1	-0.022	8	PVC	0.01	9	100	7.2	
GM-GIS-DP_ssGM_1179	MH-GIS-DP_ssMH_2227	854	MH-GIS-DP_ssMH_2266	855.35	130	-0.01	8	PVC	0.01	8	100	6.7	
GM-GIS-DP_ssGM_1180	MH-GIS-DP_ssMH_2268	875.98	MH-GIS-DP_ssMH_2269	875.13	92.9	0.009	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1181	MH-GIS-DP_ssMH_2269	875.13	MH-GIS-DP_ssMH_2270	872.05	54.9	0.056	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1182	MH-GIS-DP_ssMH_2273	871.91	MH-GIS-DP_ssMH_2272	870.72	84.4	0.014	8	PVC	0.01	8	8.8	-0.6	
GM-GIS-DP_ssGM_1183	MH-GIS-DP_ssMH_2274	877.11	MH-GIS-DP_ssMH_2273	871.91	233.8	0.022	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1184	MH-GIS-DP_ssMH_2298	866.27	MH-GIS-DP_ssMH_2232	854.82	205	0.056	8	PVC	0.01	29	17.4	-0.6	
GM-GIS-DP_ssGM_1185	MH-GIS-DP_ssMH_2272	870.72	MH-GIS-DP_ssMH_2298	866.27	77.7	0.057	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-DP_ssGM_1186	MH-GIS-DP_ssMH_2225	875.46	MH-GIS-DP_ssMH_2273	871.91	126.2	0.028	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-DP_ssGM_1187	MH-GIS-DP_ssMH_2275	877.45	MH-GIS-DP_ssMH_2238	873.56	59.9	0.065	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1188	MH-GIS-DP_ssMH_2228	859.78	MH-GIS-DP_ssMH_2236	854	256.6	0.023	8	PVC	0.01	5	33	-0.4	
GM-GIS-DP_ssGM_1189	MH-GIS-DP_ssMH_2277	852.62	MH-GIS-DP_ssMH_2276	849.27	106.1	0.032	8	PVC	0.01	14	11.9	-0.6	
GM-GIS-DP_ssGM_1190	MH-GIS-DP_ssMH_2290	828.38	MH-GIS-DP_ssMH_2240	826.56	70.6	0.026	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-DP_ssGM_1191	MH-GIS-MH-106	902.27	MH-GIS-DP_ssMH_2233	901.08	71.4	0.017	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1192	MH-GIS-MH-135	906.59	MH-GIS-MH-106	902.27	117.5	0.037	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1193	MH-GIS-DP_ssMH_2280	909.09	MH-GIS-MH-135	906.59	99.1	0.025	8	PVC	0.01	1	3.6	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1195	MH-GIS-DP_ssMH_2284	857.2	MH-GIS-DP_ssMH_2282	857.41	123.6	-0.002	8	PVC	0.01	37	64	-0.2	
GM-GIS-DP_ssGM_1196	MH-GIS-DP_ssMH_2283	843.58	MH-GIS-MH-38	840.28	35.7	0.093	8	PVC	0.01	39	20.2	-0.5	
GM-GIS-DP_ssGM_1197	MH-GIS-DP_ssMH_2247	853.34	MH-GIS-DP_ssMH_2245	856.11	77.7	-0.036	8	PVC	0.01	23	100	8.1	
GM-GIS-DP_ssGM_1197(1)	MH-GIS-DP_ssMH_2245	856.11	MH-GIS-DP_ssMH_2246	862.14	69.1	-0.087	8	PVC	0.01	24	100	5.5	
GM-GIS-DP_ssGM_1198	MH-GIS-DP_ssMH_2246	862.14	MH-GIS-DP_ssMH_2285	857.88	117.2	0.036	8	PVC	0.01	34	18.9	-0.5	
GM-GIS-DP_ssGM_1199	MH-GIS-DP_ssMH_2285	857.88	MH-GIS-DP_ssMH_2284	857.2	42.8	0.016	8	PVC	0.01	36	19.2	-0.5	
GM-GIS-DP_ssGM_1200	MH-GIS-DP_ssMH_2282	857.41	MH-GIS-DP_ssMH_2283	843.58	131.9	0.105	8	PVC	0.01	38	19.9	-0.5	
GM-GIS-DP_ssGM_1201	MH-GIS-DP_ssMH_2278	868.39	MH-GIS-DP_ssMH_2289	854	258.7	0.056	8	PVC	0.01	11	10.8	-0.6	
GM-GIS-DP_ssGM_1202	MH-GIS-DP_ssMH_2289	854	MH-GIS-DP_ssMH_2277	852.62	88.6	0.016	8	PVC	0.01	13	11.3	-0.6	
GM-GIS-DP_ssGM_1203	MH-GIS-MH-104	874.4	MH-GIS-DP_ssMH_2278	868.39	66.6	0.09	8	PVC	0.01	10	10.2	-0.6	
GM-GIS-DP_ssGM_1204	MH-GIS-DP_ssMH_2276	849.27	MH-GIS-DP_ssMH_2291	826.74	92.4	0.244	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-DP_ssGM_1205	MH-GIS-DP_ssMH_2291	826.74	MH-GIS-DP_ssMH_2290	828.38	66.6	-0.025	8	PVC	0.01	17	100	1.1	
GM-GIS-DP_ssGM_1206	MH-GIS-DP_ssMH_2294	876.38	MH-GIS-DP_ssMH_2293	847.37	200.4	0.145	8	PVC	0.01	125	36.6	-0.4	
GM-GIS-DP_ssGM_1207	MH-GIS-MH-34	843.8	MH-GIS-DP_ssMH_2292	844.23	23	0.019	8	PVC	0.01	130	37.4	0	
GM-GIS-DP_ssGM_1208	MH-GIS-MH-19	877.92	MH-GIS-DP_ssMH_2294	876.38	10	0.154	8	PVC	0.01	124	36.4	-0.4	
GM-GIS-DP_ssGM_1209	MH-GIS-DP_ssMH_2295	904.7	MH-GIS-MH-52	902.93	37	0.048	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1210	MH-GIS-DP_ssMH_2279	927.21	MH-GIS-DP_ssMH_2254	912.48	208.3	0.071	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1211	MH-GIS-DP_ssMH_2296	867.82	MH-GIS-DP_ssMH_2297	872.58	109.2	-0.044	8	PVC	0.01	17	100	6	
GM-GIS-DP_ssGM_1212	MH-GIS-DP_ssMH_2263	872.16	MH-GIS-DP_ssMH_2296	867.82	94.4	0.046	8	PVC	0.01	4	100	1	
GM-GIS-DP_ssGM_1213	MH-GIS-DP_ssMH_2262	860.27	MH-GIS-DP_ssMH_2296	867.82	155.3	-0.049	8	PVC	0.01	11	100	12.9	
GM-GIS-DP_ssGM_1214	MH-GIS-DP_ssMH_2299	874.3	MH-GIS-DP_ssMH_2298	866.27	247.5	0.032	8	PVC	0.01	19	14	-0.6	
GM-GIS-DP_ssGM_1215	MH-GIS-DP_ssMH_2297	872.58	MH-GIS-DP_ssMH_2299	874.3	94.5	-0.018	8	PVC	0.01	18	100	1.2	
GM-GIS-DP_ssGM_1216	MH-GIS-DP_ssMH_2293	847.37	MH-GIS-DP_ssMH_2292	844.23	200	0.016	8	PVC	0.01	129	37.2	-0.4	
GM-GIS-DP_ssGM_1217	MH-GIS-DP_ssMH_2300	849.15	MH-GIS-DP_ssMH_2293	847.37	69.5	0.026	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1218	MH-GIS-DP_ssMH_2300	849.15	MH-GIS-MH-33	853.18	20	0.202	8	PVC	0.01	1	3.6	3.4	
GM-GIS-DP_ssGM_1219	MH-GIS-DP_ssMH_2242	889.46	MH-GIS-DP_ssMH_2301	875.07	181.8	0.079	8	PVC	0.01	225	49.7	-0.3	
GM-GIS-DP_ssGM_1220	MH-GIS-DP_ssMH_2264	864	MH-GIS-DP_ssMH_2265	857.32	144.6	0.046	8	PVC	0.01	229	50.2	-0.3	
GM-GIS-DP_ssGM_1221	MH-GIS-DP_ssMH_2301	875.07	MH-GIS-DP_ssMH_2229	867.69	99.1	0.074	8	PVC	0.01	226	49.9	-0.3	
GM-GIS-DP_ssGM_1222	MH-GIS-DP_ssMH_2229	867.69	MH-GIS-DP_ssMH_2264	864	111.8	0.033	8	PVC	0.01	228	50	-0.3	
GM-GIS-DP_ssGM_1223	MH-GIS-MH-81	886.96	MH-GIS-DP_ssMH_2303	886.09	50	0.017	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1225	MH-GIS-DP_ssMH_2304	893.01	MH-GIS-DP_ssMH_2303	886.09	200.5	0.035	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1226	MH-GIS-DP_ssMH_2308	901.14	MH-GIS-DP_ssMH_2309	902.8	137	-0.012	8	PVC	0.01	4	100	1.1	
GM-GIS-DP_ssGM_1227	MH-GIS-MH-52	902.93	MH-GIS-DP_ssMH_2308	901.14	50	0.036	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1228	MH-GIS-DP_ssMH_2306	886.34	MH-GIS-DP_ssMH_2307	876.14	271.1	0.038	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-DP_ssGM_1229	MH-GIS-DP_ssMH_2303	886.09	MH-GIS-MH-48	881.7	78	0.056	8	PVC	0.01	6	8	-0.6	
GM-GIS-DP_ssGM_1230	MH-GIS-MH-132	897.42	MH-GIS-MH-26	894.4	110	0.027	8	PVC	0.01	13	11.3	-0.6	
GM-GIS-DP_ssGM_1231	MH-GIS-DP_ssMH_2309	902.8	MH-GIS-MH-27	900.33	70	0.035	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-DP_ssGM_1232	MH-GIS-DP_ssMH_2302	898.53	MH-GIS-DP_ssMH_2241	896.36	79.8	0.027	8	PVC	0.01	222	49.4	-0.3	
GM-GIS-DP_ssGM_1233	MH-GIS-DP_ssMH_2310	880.97	MH-GIS-MH-50	882.1	35	0.032	8	PVC	0.01	1	3.6	0.5	
GM-GIS-DP_ssGM_1234	MH-GIS-DP_ssMH_2313	874	MH-GIS-DP_ssMH_2312	876.61	124.7	-0.021	8	PVC	0.01	8	100	2.1	
GM-GIS-DP_ssGM_1235	MH-GIS-DP_ssMH_2307	876.14	MH-GIS-DP_ssMH_2313	874	151.3	0.014	8	PVC	0.01	6	88	-0.1	
GM-GIS-DP_ssGM_1236	MH-GIS-DP_ssMH_2312	876.61	MH-GIS-MH-104	874.4	75	0.029	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-DP_ssGM_1237	MH-GIS-DP_ssMH_2310	880.97	MH-GIS-MH-19	877.92	46.6	0.065	8	PVC	0.01	123	36.2	-0.4	
GM-GIS-DP_ssGM_1238	MH-GIS-DP_ssMH_2305	891.12	MH-GIS-DP_ssMH_2314	887.98	54.9	0.057	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-DP_ssGM_1239	MH-GIS-DP_ssMH_2314	887.98	MH-GIS-DP_ssMH_2306	886.34	59.5	0.028	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1240	MH-GIS-DP_ssMH_2311	896.03	MH-GIS-DP_ssMH_2305	891.12	123.7	0.04	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-DP_ssGM_1241	MH-GIS-DP_ssMH_2315	882.04	MH-GIS-DP_ssMH_2310	880.97	126.6	0.008	8	PVC	0.01	120	35.8	-0.4	
GM-GIS-DP_ssGM_1242	MH-GIS-DP_ssMH_2316	889	MH-GIS-DP_ssMH_2315	882.04	400	0.017	8	PVC	0.01	119	35.6	-0.4	
GM-GIS-DP_ssGM_1243	MH-GIS-NJ_ssMH_2565	895.08	MH-GIS-DP_ssMH_2316	889	211	0.029	8	PVC	0.01	117	35.4	-0.4	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1274	MH-GIS-DP_ssMH_2360	836.89	MH-GIS-DP_ssMH_2347	827.82	148.1	0.061	8	PVC	0.01	36	19.2	-0.5	
GM-GIS-DP_ssGM_1275	MH-GIS-MH-173	852.82	MH-GIS-DP_ssMH_2341	849.09	64.9	0.057	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-DP_ssGM_1276	MH-GIS-DP_ssMH_2341	849.09	MH-GIS-DP_ssMH_2348	849	251	4E-04	8	Glass	0.013	5	15.1	-0.6	
GM-GIS-DP_ssGM_1277	MH-GIS-DP_ssMH_2355	840.68	MH-GIS-DP_ssMH_2343	837.64	115	0.026	8	PVC	0.01	140	38.9	-0.4	
GM-GIS-DP_ssGM_1278	MH-GIS-DP_ssMH_2351	839	MH-GIS-DP_ssMH_2344	838.9	112.8	9E-04	8	PVC	0.01	204	70.5	-0.2	
GM-GIS-DP_ssGM_1279	MH-GIS-DP_ssMH_2348	849	MH-GIS-DP_ssMH_2342	844	400	0.013	8	Glass	0.013	6	8	-0.6	
GM-GIS-DP_ssGM_1280	MH-GIS-DP_ssMH_2358	834	MH-GIS-DP_ssMH_2349	839	260	-0.019	8	PVC	0.01	186	100	5.2	
GM-GIS-DP_ssGM_1281	MH-GIS-DP_ssMH_2349	839	MH-GIS-DP_ssMH_2351	839	291.8	0	8	PVC	0.01	187	100	0	
GM-GIS-DP_ssGM_1282	MH-GIS-DP_ssMH_2344	838.9	MH-GIS-BP_ssMH_2352	835.22	94.5	0.039	8	PVC	0.01	205	47.4	-0.4	
GM-GIS-DP_ssGM_1285	MH-GIS-DP_ssMH_2350	824	MH-GIS-BP_ssMH_2353	824.9	116.1	-0.008	8	PVC	0.01	61	100	0.7	
GM-GIS-DP_ssGM_1286	MH-GIS-DP_ssMH_2345	824	MH-GIS-DP_ssMH_2350	824	119.4	0	8	PVC	0.01	39	100	0.7	
GM-GIS-DP_ssGM_1287	MH-GIS-DP_ssMH_2346	824	MH-GIS-DP_ssMH_2345	824	79.5	0	8	PVC	0.01	38	100	0.8	
GM-GIS-DP_ssGM_1288	MH-GIS-DP_ssMH_2347	827.82	MH-GIS-DP_ssMH_2346	824	139.4	0.027	8	PVC	0.01	37	19.5	-0.5	
GM-GIS-DP_ssGM_1289	MH-GIS-MH-34	843.8	MH-GIS-DP_ssMH_2355	840.68	25	0.125	8	PVC	0.01	131	37.5	-0.4	
GM-GIS-DP_ssGM_1290	MH-GIS-DP_ssMH_2342	844	MH-GIS-DP_ssMH_2355	840.68	71.3	0.047	8	Glass	0.013	8	8.8	-0.6	
GM-GIS-DP_ssGM_1291	MH-GIS-DP_ssMH_2574	824.46	MH-GIS-DP_ssMH_2350	824	25	0.018	8	PVC	0.01	20	100	0.3	
GM-GIS-DP_ssGM_1292	MH-GIS-MH-38	840.28	MH-GIS-DP_ssMH_2343	837.64	25	0.106	8	PVC	0.01	41	20.5	-0.5	
GM-GIS-DP_ssGM_1293	MH-GIS-DP_ssMH_2357	834	MH-GIS-DP_ssMH_2358	834	111.1	0	8	PVC	0.01	185	100	5.3	
GM-GIS-DP_ssGM_1294	MH-GIS-DP_ssMH_2356	834	MH-GIS-DP_ssMH_2357	834	140.9	0	8	PVC	0.01	183	100	5.4	
GM-GIS-DP_ssGM_1295	MH-GIS-DP_ssMH_2343	837.64	MH-GIS-DP_ssMH_2356	834	99.5	0.037	8	PVC	0.01	182	100	1.8	
GM-GIS-DP_ssGM_1296	MH-GIS-MH-32	848.68	MH-GIS-DP_ssMH_2359	847.39	20	0.065	8	PVC	0.01	33	18.5	-0.5	
GM-GIS-DP_ssGM_1297	MH-GIS-DP_ssMH_2359	847.39	MH-GIS-DP_ssMH_2360	836.89	187.4	0.056	8	PVC	0.01	34	18.9	-0.5	
GM-GIS-DT_ssGM_760	MH-GIS-MH-196	418.86	MH-GIS-RW_ssMH_1506	417.71	175	0.007	8	Concrete	0.013	9	9.8	-0.6	SM4
GM-GIS-DT_ssGM_761	MH-GIS-MH-186	419.33	MH-GIS-RW_ssMH_1506	417.71	404.2	0.004	8	Concrete	0.013	17	15.3	-0.6	
GM-GIS-DT_ssGM_762	MH-GIS-MH-185	419.96	MH-GIS-MH-186	419.33	158	0.004	8	Concrete	0.013	9	11	-0.6	
GM-GIS-DT_ssGM_763	MH-IS-277	413.81	MH-IS-96	412.74	166.6	0.006	10	Concrete	0.013	35	14.4	-0.7	
GM-GIS-DT_ssGM_770	MH-GIS-DT_ssMH_2022	415.16	MH-GIS-DT_ssMH_2021	414	290.8	0.004	8	Concrete	0.013	9	11	-0.6	
GM-GIS-DT_ssGM_771	MH-GIS-DT_ssMH_2021	414	MH-IS-271	410.4	323.6	0.011	8	Concrete	0.013	17	13.4	-0.6	
GM-GIS-DT_ssGM_782	MH-GIS-DT_ssMH_1492	416.47	MH-GIS-DT_ssMH_2026	415.29	296.2	0.004	8	Concrete	0.013	3	6.8	-0.6	
GM-GIS-DT_ssGM_783	MH-GIS-DT_ssMH_2026	415.29	MH-IS-136	409.7	368.5	0.015	8	Concrete	0.013	6	8	-0.6	
GM-GIS-DT_ssGM_788	MH-GIS-DT_ssMH_1483	415.09	MH-IS-138	409.59	399.9	0.014	8	Concrete	0.013	3	5.6	-0.6	SM4
GM-GIS-DT_ssGM_791	MH-GIS-RW_ssMH_1485	415.75	MH-IS-139	410.69	189.6	0.027	8	Concrete	0.013	60	25	-0.5	
GM-GIS-DT_ssGM_802	MH-GIS-RW_ssMH_1498	414	MH-IS-277	413.81	297	7E-04	8	Glass	0.013	17	23.9	-0.5	
GM-GIS-DT_ssGM_804	MH-GIS-MH-198	414.78	MH-GIS-MH-15	414.08	182.5	0.004	8	Concrete	0.013	3	100	1.9	
GM-GIS-DT_ssGM_805	MH-GIS-DT_ssMH_2029	415.39	MH-IS-139	410.69	316.4	0.015	8	Concrete	0.013	6	8	-0.6	
GM-GIS-DT_ssGM_806	MH-GIS-MH-168	416.02	MH-GIS-DT_ssMH_2029	415.39	144	0.004	8	Glass	0.013	3	6.7	-0.6	
GM-GIS-DT_ssGM_807	MH-GIS-MH-179	416.76	MH-GIS-DT_ssMH_1472	416.37	150.1	0.003	8	Concrete	0.013	3	45.3	-0.4	
GM-GIS-DT_ssGM_808	MH-GIS-DT_ssMH_2031	412.24	MH-IS-139	410.69	171.5	0.009	8	Concrete	0.013	41	20.6	-0.5	
GM-GIS-DT_ssGM_809	MH-GIS-DT_ssMH_1472	416.37	MH-GIS-DT_ssMH_2030	416.92	184.3	-0.003	8	Concrete	0.013	9	100	0	
GM-GIS-DT_ssGM_810	MH-GIS-DT_ssMH_2030	416.92	MH-GIS-DT_ssMH_2031	412.24	297	0.016	8	Concrete	0.013	13	11.3	-0.6	
GM-GIS-DT_ssGM_813	MH-GIS-RW_ssMH_2034	414	MH-GIS-DT_ssMH_2031	412.24	228.8	0.008	8	Concrete	0.013	25	16.1	-0.6	
GM-GIS-DT_ssGM_920	MH-GIS-DT_ssMH_2107	418.03	MH-GIS-DT_ssMH_1472	416.37	433.8	0.004	8	Concrete	0.013	3	6.9	-0.6	
GM-GIS-DT_ssGM_972	MH-GIS-GS_ssMH_2154	416.74	MH-IS-137	411.83	318.3	0.015	8	Concrete	0.013	6	8	-0.6	
GM-GIS-DT_ssGM_1011	MH-GIS-RW_ssMH_2095	415.61	MH-IS-140	409.52	115.2	0.053	8	Concrete	0.013	26	16.4	-0.6	
GM-GIS-DT_ssGM_1013	MH-GIS-MH-160	418.62	MH-GIS-RW_ssMH_2094	417.87	130.7	0.006	8	Concrete	0.013	9	10.1	-0.6	
GM-GIS-DT_ssGM_1456	MH-GIS-MH-53	414	MH-IS-192	405.19	64	0.138	15	Concrete	0.013	17	6	-1.2	
GM-GIS-DT_ssGM_1457	MH-GIS-MH-54	414	MH-GIS-MH-53	414	37.2	0	15	Concrete	0.013	9	8.6	-1.1	
GM-GIS-DY_ssGM_1459	MH-GIS-DY_ssMH_2562	754	MH-GIS-DY_ssMH_2548	754.07	240.5	-3E-04	8	Glass	0.013	1	20.6	-0.5	
GM-GIS-DY_ssGM_1460	MH-GIS-DY_ssMH_2551	737.26	MH-GIS-DY_ssMH_2549	743.29	74.9	0.081	8	Glass	0.013	9	9.8	5.4	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DY_ssGM_1461	MH-GIS-DY_ssMH_2548	754.07	MH-GIS-DY_ssMH_2550	745.64	122.1	0.069	8	Glass	0.013	2	4.8	-0.6	
GM-GIS-DY_ssGM_1462	MH-GIS-DY_ssMH_2550	745.64	MH-GIS-DY_ssMH_2549	743.29	37.9	0.062	8	Glass	0.013	4	6	-0.6	
GM-GIS-DY_ssGM_1463	MH-GIS-DY_ssMH_2561	721.57	MH-GIS-DY_ssMH_2551	737.26	171.8	0.091	8	Glass	0.013	11	10.4	15.1	
GM-GIS-DY_ssGM_1464	MH-GIS-DY_ssMH_2555	717.93	MH-GIS-DY_ssMH_2556	716.86	51.1	-0.021	8	Glass	0.013	4	100	3.1	
GM-GIS-DY_ssGM_1465	MH-GIS-DY_ssMH_2555	717.93	MH-GIS-DY_ssMH_2552	718.95	69.9	-0.015	8	Glass	0.013	5	100	3.1	
GM-GIS-DY_ssGM_1466	MH-GIS-DY_ssMH_2561	721.57	MH-GIS-DY_ssMH_2552	718.95	43.5	-0.06	8	Glass	0.013	6	100	-0.6	
GM-GIS-DY_ssGM_1467	MH-GIS-DY_ssMH_2557	739	MH-GIS-DY_ssMH_2558	739	68.4	0	8	Glass	0.013	4	100	3.7	
GM-GIS-DY_ssGM_1468	MH-GIS-DY_ssMH_2560	734	MH-GIS-DY_ssMH_2559	734	83.1	0	8	Glass	0.013	1	100	5.3	
GM-GIS-DY_ssGM_1469	MH-GIS-DY_ssMH_2549	743.29	MH-GIS-DY_ssMH_2557	739	79.3	-0.054	8	Glass	0.013	5	100	-0.6	
GM-GIS-DY_ssGM_1470	MH-GIS-DY_ssMH_2559	734	MH-GIS-DY_ssMH_2558	739	296.5	-0.017	8	Glass	0.013	2	100	8.7	
GM-GIS-DY_ssGM_1471	MH-GIS-DY_ssMH_2553	711.51	MH-GIS-DY_ssMH_2554	713.53	58.5	-0.035	8	Glass	0.013	1	100	7.4	
GM-GIS-DY_ssGM_1472	MH-GIS-DY_ssMH_2556	716.86	MH-GIS-DY_ssMH_2554	713.53	106.5	-0.031	8	Glass	0.013	2	100	4.1	
GM-GIS-EL_ssGM_1	MH-GIS-GC_ssMH_2036	775.66	MH-GIS-GC_ssMH_1622	773.42	52.2	0.043	8	PVC	0.01	21	14.5	-0.6	
GM-GIS-EL_ssGM_825	MH-GIS-EL_ssMH_2037	786.68	MH-GIS-GC_ssMH_2036	775.66	133	0.083	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-EL_ssGM_826	MH-GIS-EL_ssMH_2045	822.1	MH-GIS-EL_ssMH_2039	813.97	63.2	0.129	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-EL_ssGM_827	MH-GIS-EL_ssMH_2052	807.93	MH-GIS-EL_ssMH_2040	802.37	48.4	0.115	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-EL_ssGM_828	MH-GIS-EL_ssMH_2053	820.51	MH-GIS-EL_ssMH_2052	807.93	272.9	0.046	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-EL_ssGM_829	MH-GIS-EL_ssMH_2040	802.37	MH-GIS-EL_ssMH_2051	797.05	55.5	0.096	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-EL_ssGM_830	MH-GIS-EL_ssMH_2050	793.43	MH-GIS-EL_ssMH_2051	797.05	53.2	-0.068	8	PVC	0.01	8	100	3.1	
GM-GIS-EL_ssGM_831	MH-GIS-EL_ssMH_2044	793.41	MH-GIS-EL_ssMH_2050	793.43	66.5	-3E-04	8	PVC	0.01	6	100	3.1	
GM-GIS-EL_ssGM_832	MH-GIS-EL_ssMH_2043	804.53	MH-GIS-EL_ssMH_2057	797.97	68	0.096	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-EL_ssGM_833	MH-GIS-EL_ssMH_2057	797.97	MH-GIS-EL_ssMH_2044	793.41	211.4	0.022	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-EL_ssGM_834	MH-GIS-EL_ssMH_2039	813.97	MH-GIS-EL_ssMH_2043	804.53	69.3	0.136	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-EL_ssGM_835	MH-GIS-EL_ssMH_2051	797.05	MH-GIS-EL_ssMH_2049	793.26	67.6	0.056	8	PVC	0.01	16	12.6	-0.6	
GM-GIS-EL_ssGM_836	MH-GIS-EL_ssMH_2049	793.26	MH-GIS-EL_ssMH_2058	788.67	54.5	0.084	8	PVC	0.01	17	13.1	-0.6	
GM-GIS-EL_ssGM_837	MH-GIS-EL_ssMH_2055	834.28	MH-GIS-EL_ssMH_2054	829.37	73.6	0.067	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-EL_ssGM_838	MH-GIS-EL_ssMH_2058	788.67	MH-GIS-EL_ssMH_2037	786.68	129.2	0.015	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-EL_ssGM_839	MH-GIS-EL_ssMH_2054	829.37	MH-GIS-EL_ssMH_2053	820.51	150.8	0.059	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-EN_ssGM_329	MH-GIS-EN_ssMH_1694	700	MH-GIS-IR_ssMH_1695	661.78	331	0.115	8	PVC	0.01	26	16.3	-0.6	
GM-GIS-EN_ssGM_330	MH-GIS-EN_ssMH_1366	703.34	MH-GIS-EN_ssMH_1694	700	29.9	0.112	8	PVC	0.01	25	16.1	-0.6	
GM-GIS-EN_ssGM_588	MH-GIS-EN_ssMH_1350	786.65	MH-GIS-EN_ssMH_1351	786.96	97.8	-0.003	8	Glass	0.013	2	100	0.4	
GM-GIS-EN_ssGM_589	MH-GIS-EN_ssMH_1351	786.96	MH-GIS-EN_ssMH_1352	787.67	99.2	-0.007	8	Glass	0.013	3	100	0.1	
GM-GIS-EN_ssGM_590	MH-GIS-EN_ssMH_1354	762.16	MH-GIS-EN_ssMH_1353	762.07	120.2	8E-04	8	Glass	0.013	2	8.9	-0.6	
GM-GIS-EN_ssGM_591	MH-GIS-EN_ssMH_1355	763	MH-GIS-EN_ssMH_1354	762.16	101.1	0.008	8	Glass	0.013	2	4.2	-0.6	
GM-GIS-EN_ssGM_592	MH-GIS-EN_ssMH_1353	762.07	MH-GIS-EN_ssMH_1365	751.94	130.6	0.078	8	Glass	0.013	20	14.4	-0.6	
GM-GIS-EN_ssGM_593	MH-GIS-EN_ssMH_1365	751.94	MH-GIS-EN_ssMH_1356	739.92	120.6	0.1	8	Glass	0.013	21	14.7	-0.6	
GM-GIS-EN_ssGM_594	MH-GIS-EN_ssMH_1356	739.92	MH-GIS-EN_ssMH_1357	727.9	120.8	0.1	8	Glass	0.013	22	15	-0.6	
GM-GIS-EN_ssGM_595	MH-GIS-EN_ssMH_1357	727.9	MH-GIS-EN_ssMH_1358	723.94	90	0.044	8	Glass	0.013	23	15.3	-0.6	
GM-GIS-EN_ssGM_596	MH-GIS-EN_ssMH_1358	723.94	MH-GIS-EN_ssMH_1359	703.73	187.4	0.108	8	Glass	0.013	24	15.6	-0.6	
GM-GIS-EN_ssGM_597	MH-GIS-EN_ssMH_1352	787.67	MH-GIS-EN_ssMH_1370	777.86	233.3	0.042	8	Glass	0.013	4	6.4	-0.6	
GM-GIS-EN_ssGM_598	MH-GIS-EN_ssMH_1370	777.86	MH-GIS-EN_ssMH_1369	774.89	78.7	0.038	8	Glass	0.013	5	7	-0.6	
GM-GIS-EN_ssGM_599	MH-GIS-EN_ssMH_1369	774.89	MH-GIS-EN_ssMH_1360	769.1	95.6	0.061	8	Glass	0.013	6	7.6	-0.6	
GM-GIS-EN_ssGM_600	MH-GIS-EN_ssMH_1360	769.1	MH-GIS-EN_ssMH_1361	762.16	107.5	0.065	8	Glass	0.013	16	12.9	-0.6	
GM-GIS-EN_ssGM_601	MH-GIS-EN_ssMH_1361	762.16	MH-GIS-EN_ssMH_1353	762.07	98.2	9E-04	8	Glass	0.013	17	21.8	-0.5	
GM-GIS-EN_ssGM_602	MH-GIS-EN_ssMH_1362	770.19	MH-GIS-EN_ssMH_1360	769.1	41.2	0.026	8	Glass	0.013	10	9.9	-0.6	
GM-GIS-EN_ssGM_603	MH-GIS-EN_ssMH_1364	779.77	MH-GIS-EN_ssMH_1362	770.19	104	0.092	8	Glass	0.013	9	9.5	-0.6	
GM-GIS-EN_ssGM_604	MH-GIS-EN_ssMH_1363	787.35	MH-GIS-EN_ssMH_1364	779.77	74.3	0.102	8	Glass	0.013	8	9	-0.6	
GM-GIS-EN_ssGM_605	MH-GIS-MH-97	794	MH-GIS-EN_ssMH_1363	787.35	61	0.109	8	Glass	0.013	7	8.6	-0.6	
GM-GIS-EN_ssGM_606	MH-GIS-EN_ssMH_1359	703.73	MH-GIS-EN_ssMH_1366	703.34	41.7	0.009	8	Glass	0.013	24	15.8	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-EN_ssGM_607	MH-GIS-MH-101	784	MH-GIS-EN_ssMH_1367	784	63.2	0	8	Glass	0.013	1	100	3.1	
GM-GIS-EN_ssGM_608	MH-GIS-EN_ssMH_1367	784	MH-GIS-EN_ssMH_1350	786.65	124.1	-0.021	8	Glass	0.013	2	100	3.1	
GM-GIS-EN_ssGM_609	MH-GIS-EN_ssMH_1368	763.36	MH-GIS-EN_ssMH_1355	763	42.8	0.008	8	Glass	0.013	1	3	-0.6	
GM-GIS-EP_ssGM_1253	MH-GIS-EP_ssMH_2571	1,044.00	MH-GIS-EP_ssMH_2317	1,044.00	20	0	8	PVC	0.01	78	100	0.5	
GM-GIS-EP_ssGM_1477	MH-GIS-EP_ssMH_2579	1,063.97	MH-GIS-EP_ssMH_2590	1,059.65	112.1	0.039	8	Glass	0.013	13	11.3	-0.6	
GM-GIS-EP_ssGM_1478	MH-GIS-EP_ssMH_2585	1,067.19	MH-GIS-EP_ssMH_2584	1,074.61	115.1	0.064	8	Glass	0.013	11	10.8	6.8	
GM-GIS-EP_ssGM_1479	MH-GIS-EP_ssMH_2587	1,053.88	MH-GIS-EP_ssMH_2585	1,067.19	204.1	0.065	8	Glass	0.013	13	11.3	12.7	
GM-GIS-EP_ssGM_1480	MH-GIS-EP_ssMH_2600	1,085.09	MH-GIS-EP_ssMH_2583	1,079.32	59.4	0.097	8	Glass	0.013	10	10.2	-0.6	
GM-GIS-EP_ssGM_1481	MH-GIS-EP_ssMH_2590	1,059.65	MH-GIS-EP_ssMH_2594	1,058.00	129.4	0.013	8	Glass	0.013	41	100	2.9	
GM-GIS-EP_ssGM_1482	MH-GIS-EP_ssMH_2578	1,064.51	MH-GIS-EP_ssMH_2601	1,069.76	160.9	0.033	8	Glass	0.013	1	3.6	4.6	
GM-GIS-EP_ssGM_1483	MH-GIS-EP_ssMH_2592	1,062.35	MH-GIS-EP_ssMH_2594	1,058.00	186	0.023	8	Glass	0.013	3	100	0.2	
GM-GIS-EP_ssGM_1484	MH-GIS-EP_ssMH_2581	1,107.73	MH-GIS-EP_ssMH_2604	1,097.53	171.2	0.06	8	Glass	0.013	6	8	-0.6	
GM-GIS-EP_ssGM_1485	MH-GIS-EP_ssMH_2607	1,058.36	MH-GIS-EP_ssMH_2606	1,061.67	281.4	-0.012	8	Glass	0.013	48	100	4.9	
GM-GIS-EP_ssGM_1486	MH-GIS-EP_ssMH_2591	1,057.24	MH-GIS-EP_ssMH_2608	1,057.37	48	-0.003	8	Glass	0.013	46	100	5.5	
GM-GIS-EP_ssGM_1487	MH-GIS-EP_ssMH_2603	1,063.73	MH-GIS-EP_ssMH_2589	1,057.65	176.2	0.035	8	Glass	0.013	18	13.5	-0.6	
GM-GIS-EP_ssGM_1488	MH-GIS-EP_ssMH_2602	1,070.56	MH-GIS-EP_ssMH_2603	1,063.73	63.7	0.107	8	Glass	0.013	17	13	-0.6	
GM-GIS-EP_ssGM_1489	MH-GIS-EP_ssMH_2595	1,086.22	MH-GIS-EP_ssMH_2596	1,082.11	177.6	0.023	8	Glass	0.013	14	11.9	-0.6	
GM-GIS-EP_ssGM_1490	MH-GIS-MH-197	1,071.22	MH-GIS-EP_ssMH_2578	1,064.51	216.3	0.031	8	Glass	0.013	6	8	-0.6	
GM-GIS-EP_ssGM_1491	MH-GIS-EP_ssMH_2608	1,057.37	MH-GIS-EP_ssMH_2607	1,058.36	169.8	-0.006	8	Glass	0.013	47	100	5.9	
GM-GIS-EP_ssGM_1492	MH-GIS-EP_ssMH_2582	1,062.05	MH-GIS-EP_ssMH_2606	1,061.67	40.7	-0.009	8	Glass	0.013	50	100	1.2	
GM-GIS-EP_ssGM_1493	MH-GIS-EP_ssMH_2605	1,063.65	MH-GIS-EP_ssMH_2587	1,053.88	263.1	0.037	8	Glass	0.013	61	25.3	-0.5	
GM-GIS-EP_ssGM_1494	MH-GIS-EP_ssMH_2605	1,063.65	MH-GIS-EP_ssMH_2582	1,062.05	56	-0.029	8	Glass	0.013	60	100	-0.4	
GM-GIS-EP_ssGM_1495	MH-GIS-EP_ssMH_2586	1,087.41	MH-GIS-EP_ssMH_2597	1,087.13	50.8	0.005	8	Glass	0.013	10	11	-0.6	
GM-GIS-EP_ssGM_1496	MH-GIS-EP_ssMH_2604	1,097.53	MH-GIS-EP_ssMH_2588	1,087.69	169.8	0.058	8	Glass	0.013	8	8.8	-0.6	
GM-GIS-EP_ssGM_1497	MH-GIS-EP_ssMH_2596	1,082.11	MH-GIS-EP_ssMH_2602	1,070.56	268	0.043	8	Glass	0.013	15	12.5	-0.6	
GM-GIS-EP_ssGM_1498	MH-GIS-EP_ssMH_2580	1,092.25	MH-GIS-EP_ssMH_2600	1,085.09	109.6	0.065	8	Glass	0.013	9	9.5	-0.6	
GM-GIS-EP_ssGM_1499	MH-GIS-EP_ssMH_2599	1,091.67	MH-GIS-EP_ssMH_2595	1,086.22	202.2	0.027	8	Glass	0.013	1	3.6	-0.6	
GM-GIS-EP_ssGM_1500	MH-GIS-MH-99	1,100.90	MH-GIS-EP_ssMH_2598	1,099.00	153.2	0.012	8	Glass	0.013	6	8	-0.6	
GM-GIS-EP_ssGM_1501	MH-GIS-EP_ssMH_2597	1,087.13	MH-GIS-EP_ssMH_2595	1,086.22	167.4	0.005	8	Glass	0.013	11	11.6	-0.6	
GM-GIS-EP_ssGM_1502	MH-GIS-EP_ssMH_2588	1,087.69	MH-GIS-EP_ssMH_2586	1,087.41	51.6	0.005	8	Glass	0.013	9	10.3	-0.6	
GM-GIS-EP_ssGM_1503	MH-GIS-EP_ssMH_2581	1,107.73	MH-GIS-MH-75	1,110.99	48.3	0.067	8	Glass	0.013	5	7.2	2.6	
GM-GIS-EP_ssGM_1504	MH-GIS-EP_ssMH_2594	1,058.00	MH-GIS-EP_ssMH_2591	1,057.24	96.7	0.008	8	Glass	0.013	45	100	4.6	
GM-GIS-EP_ssGM_1505	MH-GIS-EP_ssMH_2593	1,066.04	MH-GIS-EP_ssMH_2592	1,062.35	170.6	0.022	8	Glass	0.013	1	3.6	-0.6	
GM-GIS-EP_ssGM_1506	MH-GIS-EP_ssMH_2589	1,057.65	MH-GIS-EP_ssMH_2590	1,059.65	134	-0.015	8	Glass	0.013	27	100	4.9	
GM-GIS-EP_ssGM_1507	MH-GIS-EP_ssMH_2598	1,099.00	MH-GIS-EP_ssMH_2580	1,092.25	300	0.023	8	Glass	0.013	8	8.8	-0.6	
GM-GIS-EP_ssGM_1508	MH-GIS-EP_ssMH_2578	1,064.51	MH-GIS-EP_ssMH_2582	1,062.05	102.8	0.024	8	Glass	0.013	9	9.5	-0.6	
GM-GIS-EP_ssGM_1509	MH-GIS-EP_ssMH_2583	1,079.32	MH-GIS-EP_ssMH_2579	1,063.97	155	0.099	8	Glass	0.013	11	10.8	-0.6	
GM-GIS-EP_ssGM_1510	MH-GIS-EP_ssMH_2609	1,046.79	MH-GIS-EP_ssMH_2587	1,053.88	157	0.045	8	Glass	0.013	75	28.1	6.6	
GM-GIS-EP_ssGM_1511	MH-GIS-EP_ssMH_2571	1,044.00	MH-GIS-EP_ssMH_2609	1,046.79	131.3	0.021	8	Glass	0.013	76	28.4	2.3	
GM-GIS-FW_ssGM_189	MH-GIS-FW_ssMH_1607	894	MH-GIS-FW_ssMH_1606	891.15	175.4	0.016	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_208	MH-GIS-FW_ssMH_1603	862.78	MH-GIS-NE_ssMH_1604	868.35	299.1	0.019	8	PVC	0.01	10	9.9	5	
GM-GIS-FW_ssGM_209	MH-IS-39	847.91	MH-GIS-FW_ssMH_1603	862.78	345.5	0.043	8	PVC	0.01	11	10.3	14.3	
GM-GIS-FW_ssGM_215	MH-GIS-FW_ssMH_1595	881.15	MH-GIS-FW_ssMH_1596	871.76	240.9	0.039	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-FW_ssGM_216	MH-GIS-FW_ssMH_1593	890.23	MH-GIS-FW_ssMH_1594	885.7	170.8	0.027	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-FW_ssGM_217	MH-GIS-FW_ssMH_1594	885.7	MH-GIS-FW_ssMH_1595	881.15	150.1	0.03	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-FW_ssGM_223	MH-GIS-FW_ssMH_1606	891.15	MH-GIS-FW_ssMH_1608	884.67	299.5	0.022	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_228	MH-GIS-FW_ssMH_1592	894	MH-GIS-FW_ssMH_1593	890.23	150.8	0.025	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-FW_ssGM_291	MH-GIS-FW_ssMH_1664	844	MH-GIS-FW_ssMH_1661	843.39	111.7	0.005	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-FW_ssGM_292	MH-GIS-FW_ssMH_1661	843.39	MH-GIS-FW_ssMH_1660	841.89	222.3	0.007	8	PVC	0.01	5	7	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-FW_ssGM_293	MH-GIS-FW_ssMH_1663	844.21	MH-GIS-FW_ssMH_1664	844	48.7	0.004	8	PVC	0.01	2	5.2	-0.6	
GM-GIS-FW_ssGM_294	MH-GIS-FW_ssMH_1662	848.3	MH-GIS-FW_ssMH_1664	844	201.1	0.021	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_295	MH-GIS-FW_ssMH_1908	837.79	MH-GIS-FW_ssMH_1659	831.2	153	0.043	8	PVC	0.01	7	8.6	-0.6	
GM-GIS-FW_ssGM_296	MH-GIS-FW_ssMH_1658	813.49	MH-GIS-GC_ssMH_1612	813.35	165.1	9E-04	8	PVC	0.01	13	17	-0.6	
GM-GIS-FW_ssGM_297	MH-GIS-FW_ssMH_1659	831.2	MH-GIS-FW_ssMH_1658	813.49	343.4	0.052	8	PVC	0.01	8	9	-0.6	
GM-GIS-FW_ssGM_298	MH-GIS-FW_ssMH_1660	841.89	MH-GIS-FW_ssMH_1908	837.79	155.5	0.026	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-FW_ssGM_299	MH-GIS-FW_ssMH_1666	864.43	MH-GIS-FW_ssMH_1665	860.56	113.6	0.034	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_300	MH-GIS-FW_ssMH_1656	827.21	MH-GIS-FW_ssMH_1657	815.87	190.5	0.06	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-FW_ssGM_301	MH-GIS-MH-145	834.18	MH-GIS-FW_ssMH_1656	827.21	106.8	0.065	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_302	MH-GIS-FW_ssMH_1655	846.35	MH-GIS-FW_ssMH_1656	827.21	365	0.052	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_303	MH-GIS-FW_ssMH_1654	855.98	MH-GIS-FW_ssMH_1655	846.35	162.5	0.059	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_304	MH-GIS-FW_ssMH_1657	815.87	MH-GIS-FW_ssMH_1658	813.49	143.4	0.017	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-FW_ssGM_305	MH-GIS-FW_ssMH_1665	860.56	MH-GIS-FW_ssMH_1663	844.21	222	0.074	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_306	MH-GIS-MH-147	842.69	MH-GIS-FW_ssMH_1908	837.79	114.4	0.043	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_307	MH-GIS-FW_ssMH_1676	876.82	MH-GIS-FW_ssMH_1675	875	235.7	0.008	8	PVC	0.01	455	71.7	-0.2	
GM-GIS-FW_ssGM_308	MH-GIS-FW_ssMH_1675	875	MH-IS-MH-4	873	401.1	0.005	8	PVC	0.01	456	75.3	-0.2	
GM-GIS-FW_ssGM_309	MH-GIS-FW_ssMH_1667	887.28	MH-GIS-FW_ssMH_1668	884	391	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_313	MH-GIS-FW_ssMH_1669	875.37	MH-GIS-FW_ssMH_1670	872.88	75.7	0.033	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-FW_ssGM_314	MH-GIS-FW_ssMH_1670	872.88	MH-IS-43	861.48	302.9	0.038	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-FW_ssGM_315	MH-GIS-MH-187	877.48	MH-GIS-FW_ssMH_1670	872.88	158.3	0.029	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_316	MH-GIS-FW_ssMH_1668	884	MH-GIS-FW_ssMH_1669	875.37	351.6	0.025	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-GC_ssGM_192	MH-GIS-MH-29	797.76	MH-GIS-GC_ssMH_1578	798	18.4	-0.013	8	Glass	0.013	1	100	5.4	
GM-GIS-GC_ssGM_193	MH-GIS-MH-65	798.64	MH-GIS-GC_ssMH_1578	798	43.3	0.015	8	Glass	0.013	1	100	4.5	
GM-GIS-GC_ssGM_194	MH-GIS-GC_ssMH_1578	798	MH-GIS-GC_ssMH_1579	799.91	132.6	-0.014	8	PVC	0.01	4	100	5.2	
GM-GIS-GC_ssGM_195	MH-GIS-GC_ssMH_1579	799.91	MH-GIS-GC_ssMH_1580	803.06	194.9	-0.016	8	PVC	0.01	5	100	3.3	
GM-GIS-GC_ssGM_196	MH-GIS-GC_ssMH_1580	803.06	MH-GIS-GC_ssMH_1581	803.72	261.4	-0.003	8	PVC	0.01	6	100	0.1	
GM-GIS-GC_ssGM_197	MH-GIS-GC_ssMH_1581	803.72	MH-GIS-GC_ssMH_1582	792.63	287.3	0.039	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-GC_ssGM_198	MH-GIS-GC_ssMH_1582	792.63	MH-GIS-GC_ssMH_1583	794	172.4	-0.008	8	PVC	0.01	9	100	0.8	
GM-GIS-GC_ssGM_205	MH-GIS-GC_ssMH_1583	794	MH-GIS-GC_ssMH_1588	794	57.2	0	8	PVC	0.01	10	19.9	-0.5	
GM-GIS-GC_ssGM_206	MH-GIS-GC_ssMH_1591	822.34	MH-GIS-GC_ssMH_1589	804.13	208.7	0.087	8	PVC	0.01	10	10.3	-0.6	
GM-GIS-GC_ssGM_210	MH-GIS-GC_ssMH_1589	804.13	MH-GIS-GC_ssMH_1588	794	233.8	0.043	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-GC_ssGM_232	MH-GIS-GC_ssMH_1612	813.35	MH-IS-40	811.95	77.2	0.018	8	PVC	0.01	14	11.9	-0.6	
GM-GIS-GC_ssGM_1080	MH-GIS-GC_ssMH_2208	780.56	MH-IS-38	767.46	246.4	0.053	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-GS_ssGM_779	MH-GIS-GS_ssMH_1470	411.77	MH-IS-193	407.54	62.7	0.067	8	Concrete	0.013	9	9.8	-0.6	
GM-GIS-GS_ssGM_780	MH-GIS-GS_ssMH_1493	414	MH-IS-134	408.52	284.5	0.019	8	Concrete	0.013	3	5.6	-0.6	
GM-GIS-GS_ssGM_883	MH-GIS-GS_ssMH_2090	414.88	MH-GIS-GS_ssMH_2091	415.82	47.9	-0.02	8	Concrete	0.013	22	100	3	SM4
GM-GIS-GS_ssGM_884	MH-GIS-GS_ssMH_1528	416.02	MH-GIS-GS_ssMH_2090	414.88	196.2	0.006	8	PVC	0.01	3	100	1.9	
GM-GIS-GS_ssGM_885	MH-GIS-MH-206	419	MH-GIS-GS_ssMH_2091	415.82	258.5	0.012	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-GS_ssGM_886	MH-GIS-GS_ssMH_2091	415.82	MH-GIS-GS_ssMH_1476	418.34	176.4	-0.014	8	Concrete	0.013	28	100	2.1	SM4
GM-GIS-GS_ssGM_887	MH-GIS-GS_ssMH_1476	418.34	MH-IS-257	414.64	242.3	0.015	8	Concrete	0.013	31	18	-0.5	SM4
GM-GIS-GS_ssGM_888	MH-GIS-GS_ssMH_2092	417.72	MH-IS-266	415.38	344.4	0.007	8	Concrete	0.013	3	6	-0.6	
GM-GIS-GS_ssGM_909	MH-GIS-MB_ssMH_1461	416	MH-GIS-GS_ssMH_1468	415.12	249.2	0.004	8	Concrete	0.013	132	44.6	-0.4	
GM-GIS-GS_ssGM_910	MH-GIS-GS_ssMH_1468	415.12	MH-GIS-GS_ssMH_1467	414.38	299.4	0.002	8	Concrete	0.013	135	50	-0.3	
GM-GIS-GS_ssGM_911	MH-GIS-GS_ssMH_1477	412.88	MH-GIS-GS_ssMH_1478	412.68	30.6	0.007	8	Concrete	0.013	144	39.5	-0.4	
GM-GIS-GS_ssGM_913	MH-GIS-GS_ssMH_1478	412.68	MH-GIS-GS_ssMH_2101	411.66	353.3	0.003	8	Concrete	0.013	148	50.4	-0.3	
GM-GIS-GS_ssGM_914	MH-GIS-GS_ssMH_2101	411.66	MH-IS-GS_ssMH_1480	408.77	302.7	0.01	8	Concrete	0.013	151	40.3	-0.4	
GM-GIS-GS_ssGM_918	MH-GIS-GS_ssMH_2106	414.79	MH-GIS-GS_ssMH_2105	414.08	177.7	0.004	8	Concrete	0.013	3	6.8	-0.6	
GM-GIS-GS_ssGM_919	MH-GIS-GS_ssMH_2105	414.08	MH-IS-GS_ssMH_1480	408.77	152.8	0.035	8	Concrete	0.013	6	8	-0.6	
GM-GIS-GS_ssGM_973	MH-GIS-GS_ssMH_2104	418.06	MH-GIS-GS_ssMH_2154	416.74	329.4	0.004	8	Concrete	0.013	3	6.8	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-GS_ssGM_979	MH-GIS-GS_ssMH_2089	415.97	MH-GIS-GS_ssMH_2090	414.88	302.3	0.004	8	PVC	0.01	9	100	1.9	
GM-GIS-GS_ssGM_980	MH-GIS-MC_ssMH_2159	417.2	MH-GIS-GS_ssMH_2089	415.97	267	0.005	8	Ductile Iron	0.013	6	100	0.7	
GM-GIS-GS_ssGM_981	MH-GIS-MH-21	417.4	MH-GIS-MC_ssMH_2159	417.2	11.7	0.017	8	Ductile Iron	0.013	3	100	0.5	
GM-GIS-GS_ssGM_982	MH-GIS-GS_ssMH_2153	414.94	MH-IS-135	409.66	297.3	0.018	8	Concrete	0.013	6	8	-0.6	
GM-GIS-GS_ssGM_983	MH-GIS-GS_ssMH_2103	416.1	MH-GIS-GS_ssMH_2153	414.94	291	0.004	8	Concrete	0.013	3	6.8	-0.6	
GM-GIS-GS_ssGM_1000	MH-GIS-GS_ssMH_1467	414.38	MH-GIS-GS_ssMH_2172	413.45	139.3	0.007	8	Concrete	0.013	138	38.5	-0.4	
GM-GIS-GS_ssGM_1001	MH-GIS-GS_ssMH_2172	413.45	MH-GIS-GS_ssMH_1477	412.88	163.6	0.003	8	Concrete	0.013	141	46.6	-0.4	
GM-GIS-GS_ssGM_1004	MH-GIS-GS_ssMH_2102	414	MH-GIS-GS_ssMH_1470	411.77	363.2	0.006	8	Concrete	0.013	6	8.5	-0.6	
GM-GIS-GS_ssGM_1005	MH-GIS-MH-176	414.6	MH-GIS-GS_ssMH_2102	414	148.8	0.004	8	Concrete	0.013	3	6.8	-0.6	
GM-GIS-GS_ssGM_1021	MH-GIS-MH-79	415.21	MH-GIS-GS_ssMH_2090	414.88	83.3	0.004	8	Concrete	0.013	6	100	2.7	
GM-GIS-GS_ssGM_1022	MH-GIS-MH-78	416.02	MH-GIS-MH-79	415.21	49.5	0.016	8	PVC	0.01	3	100	1.9	
GM-GIS-IR_ssGM_249	MH-GIS-MH-14	605.02	MH-GIS-MH-41	593.77	28.2	0.399	6	Glass	0.013	11	15.5	-0.4	
GM-GIS-IR_ssGM_250	MH-GIS-MH-13	605.89	MH-GIS-MH-14	605.02	4	0.219	6	Glass	0.013	11	14.9	-0.4	
GM-GIS-IR_ssGM_251	MH-GIS-MH-51	606.69	MH-GIS-MH-13	605.89	97.2	0.008	6	Glass	0.013	10	14.3	-0.4	
GM-GIS-IR_ssGM_252	MH-GIS-IR_ssMH_1623	608.04	MH-GIS-MH-51	606.69	36.1	0.037	6	Glass	0.013	9	13.7	-0.4	
GM-GIS-IR_ssGM_253	MH-GIS-MH-133	618.69	MH-GIS-IR_ssMH_1623	608.04	98	0.109	6	Glass	0.013	8	13.1	-0.4	
GM-GIS-IR_ssGM_254	MH-GIS-MH-137	631.94	MH-GIS-MH-133	618.69	101.2	0.131	6	Glass	0.013	7	12.4	-0.4	
GM-GIS-IR_ssGM_255	MH-GIS-MH-136	641.15	MH-GIS-MH-137	631.94	100	0.092	6	Glass	0.013	6	11.7	-0.4	
GM-GIS-IR_ssGM_256	MH-GIS-MH-138	649.38	MH-GIS-MH-136	641.15	100	0.082	6	Glass	0.013	6	10.9	-0.4	
GM-GIS-IR_ssGM_257	MH-GIS-MH-61	657.01	MH-GIS-MH-138	649.38	100	0.076	6	Glass	0.013	5	10	-0.5	
GM-GIS-IR_ssGM_258	MH-GIS-IR_ssMH_1624	662.95	MH-GIS-MH-61	657.01	41	0.145	6	Glass	0.013	4	9.2	-0.5	
GM-GIS-IR_ssGM_259	MH-GIS-MH-111	676.44	MH-GIS-IR_ssMH_1624	662.95	83.4	0.162	6	Glass	0.013	3	8.2	-0.5	
GM-GIS-IR_ssGM_260	MH-GIS-MH-110	685.5	MH-GIS-MH-111	676.44	73.4	0.123	6	Glass	0.013	2	7.2	-0.5	
GM-GIS-IR_ssGM_261	MH-GIS-MH-23	684.07	MH-GIS-MH-110	685.5	82.7	-0.017	6	Glass	0.013	2	100	1	
GM-GIS-IR_ssGM_262	MH-GIS-MH-22	685.57	MH-GIS-MH-23	684.07	12.3	0.122	6	Glass	0.013	1	4.1	-0.5	
GM-GIS-IR_ssGM_674	MH-GIS-IR_ssMH_1695	661.78	MH-GIS-IR_ssMH_1946	658.6	73.5	0.043	8	Glass	0.013	27	16.6	-0.6	
GM-GIS-IR_ssGM_675	MH-GIS-IR_ssMH_1954	720.01	MH-GIS-IR_ssMH_1948	718.96	30.1	0.035	8	Glass	0.013	2	4.9	-0.6	
GM-GIS-IR_ssGM_676	MH-GIS-IR_ssMH_1973	674.31	MH-GIS-IR_ssMH_1977	664.88	122.9	0.077	8	Glass	0.013	6	8.1	-0.6	
GM-GIS-IR_ssGM_677	MH-GIS-IR_ssMH_1946	658.6	MH-GIS-IR_ssMH_1979	644.64	157.8	0.088	8	Glass	0.013	28	16.9	-0.6	
GM-GIS-IR_ssGM_678	MH-GIS-IR_ssMH_1949	685.69	MH-GIS-IR_ssMH_1976	677.81	118.5	0.066	8	Glass	0.013	16	12.9	-0.6	
GM-GIS-IR_ssGM_679	MH-GIS-IR_ssMH_1952	723.4	MH-GIS-IR_ssMH_1954	720.01	183.1	0.019	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_680	MH-GIS-IR_ssMH_1953	717.36	MH-GIS-IR_ssMH_1954	720.01	224.3	-0.012	8	Glass	0.013	1	100	2	
GM-GIS-IR_ssGM_681	MH-GIS-IR_ssMH_1980	639	MH-GIS-IR_ssMH_1981	641.5	151.6	-0.016	8	Glass	0.013	37	100	2.1	
GM-GIS-IR_ssGM_682	MH-GIS-IR_ssMH_1979	644.64	MH-GIS-IR_ssMH_1980	639	160	0.035	8	Glass	0.013	37	19.4	-0.5	
GM-GIS-IR_ssGM_683	MH-GIS-IR_ssMH_1978	655.71	MH-GIS-IR_ssMH_1979	644.64	169.4	0.065	8	Glass	0.013	8	9	-0.6	
GM-GIS-IR_ssGM_684	MH-GIS-IR_ssMH_1977	664.88	MH-GIS-IR_ssMH_1978	655.71	171	0.054	8	Glass	0.013	7	8.6	-0.6	
GM-GIS-IR_ssGM_685	MH-GIS-IR_ssMH_1955	707.87	MH-GIS-IR_ssMH_1956	701.78	99	0.062	8	Glass	0.013	4	6.4	-0.6	
GM-GIS-IR_ssGM_686	MH-GIS-IR_ssMH_1948	718.96	MH-GIS-IR_ssMH_1955	707.87	140.9	0.079	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_687	MH-GIS-IR_ssMH_1958	705.64	MH-GIS-IR_ssMH_1959	693	126.7	0.1	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-IR_ssGM_688	MH-GIS-IR_ssMH_1957	730.49	MH-GIS-IR_ssMH_1958	705.64	262.3	0.095	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_689	MH-GIS-IR_ssMH_1959	693	MH-GIS-IR_ssMH_1968	689.98	121.5	0.025	8	Glass	0.013	2	4.9	-0.6	
GM-GIS-IR_ssGM_690	MH-GIS-IR_ssMH_1962	747.5	MH-GIS-IR_ssMH_1963	734.42	162.3	0.081	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_691	MH-GIS-IR_ssMH_1961	767.17	MH-GIS-IR_ssMH_1962	747.5	255.4	0.077	8	Glass	0.013	2	4.9	-0.6	
GM-GIS-IR_ssGM_692	MH-GIS-IR_ssMH_1960	766.86	MH-GIS-IR_ssMH_1961	767.17	73.7	-0.004	8	Glass	0.013	2	56.6	-0.3	
GM-GIS-IR_ssGM_693	MH-GIS-MH-114	770.66	MH-GIS-IR_ssMH_1960	766.86	75.3	0.05	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_694	MH-GIS-IR_ssMH_1947	757.4	MH-GIS-IR_ssMH_1969	741.39	147.1	0.109	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_695	MH-GIS-IR_ssMH_1963	734.42	MH-GIS-IR_ssMH_1964	717.96	217.8	0.076	8	Glass	0.013	4	6.4	-0.6	
GM-GIS-IR_ssGM_696	MH-GIS-IR_ssMH_1964	717.96	MH-GIS-IR_ssMH_1965	709.36	93.4	0.092	8	Glass	0.013	5	7	-0.6	
GM-GIS-IR_ssGM_697	MH-GIS-IR_ssMH_1965	709.36	MH-GIS-IR_ssMH_1966	701.3	85.6	0.094	8	Glass	0.013	6	7.6	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-IR_ssGM_698	MH-GIS-IR_ssMH_1966	701.3	MH-GIS-IR_ssMH_1967	695.27	91.3	0.066	8	Glass	0.013	11	10.7	-0.6	
GM-GIS-IR_ssGM_699	MH-GIS-IR_ssMH_1956	701.78	MH-GIS-IR_ssMH_1966	701.3	64.4	0.007	8	Glass	0.013	5	7.2	-0.6	
GM-GIS-IR_ssGM_700	MH-GIS-IR_ssMH_1967	695.27	MH-GIS-IR_ssMH_1968	689.98	197.5	0.027	8	Glass	0.013	12	11.1	-0.6	
GM-GIS-IR_ssGM_701	MH-GIS-IR_ssMH_1968	689.98	MH-GIS-IR_ssMH_1949	685.69	158.1	0.027	8	Glass	0.013	15	12.6	-0.6	
GM-GIS-IR_ssGM_702	MH-GIS-IR_ssMH_1969	741.39	MH-GIS-IR_ssMH_1970	713.33	255.2	0.11	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-IR_ssGM_703	MH-GIS-IR_ssMH_1970	713.33	MH-GIS-IR_ssMH_1971	692.5	189.8	0.11	8	Glass	0.013	2	4.9	-0.6	
GM-GIS-IR_ssGM_704	MH-GIS-IR_ssMH_1971	692.5	MH-GIS-IR_ssMH_1972	677.86	142.1	0.103	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_705	MH-GIS-IR_ssMH_1972	677.86	MH-GIS-IR_ssMH_1973	674.31	55.7	0.064	8	Glass	0.013	4	6.4	-0.6	
GM-GIS-IR_ssGM_706	MH-GIS-IR_ssMH_1974	674	MH-GIS-IR_ssMH_1973	674.31	76.9	-0.004	8	Glass	0.013	2	55.4	-0.3	
GM-GIS-IR_ssGM_707	MH-GIS-IR_ssMH_1975	677.11	MH-GIS-IR_ssMH_1974	674	145.1	0.021	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_708	MH-GIS-IR_ssMH_1981	641.5	MH-GIS-IR_ssMH_1982	609.69	301.6	0.105	8	Glass	0.013	38	19.9	-0.5	
GM-GIS-IR_ssGM_709	MH-GIS-IR_ssMH_1976	677.81	MH-GIS-IR_ssMH_1951	667.09	127.6	0.084	8	Glass	0.013	17	13.2	-0.6	
GM-GIS-IR_ssGM_710	MH-GIS-IR_ssMH_1951	667.09	MH-IS-129	645.79	117.2	0.182	8	Glass	0.013	18	13.5	-0.6	
GM-GIS-IR_ssGM_735	MH-GIS-IR_ssMH_1982	609.69	MH-IS-48	588.13	104.8	0.206	8	Glass	0.013	39	20.1	-0.5	
GM-GIS-JH_ssGM_1102	MH-GIS-MH-74	466.99	MH-IS-16	465.97	48.5	0.021	8	Ductile Iron	0.013	220	49.1	-0.3	
GM-GIS-KC_ssGM_747	MH-GIS-MH-188	418.46	MH-GIS-MH-189	417.83	158.6	0.004	8	PVC	0.01	3	5.5	-0.6	
GM-GIS-KC_ssGM_748	MH-GIS-MH-189	417.83	MH-GIS-KC_ssMH_2009	417.17	163.9	0.004	8	PVC	0.01	5	7.7	-0.6	
GM-GIS-KC_ssGM_749	MH-GIS-KC_ssMH_2009	417.17	MH-GIS-MH-155	416.67	125.3	0.004	8	PVC	0.01	8	9.3	-0.6	
GM-GIS-KC_ssGM_750	MH-GIS-MH-155	416.67	Pump Station No. 6 Wetwell	415	213.3	0.008	8	PVC	0.01	11	49.5	-0.3	
GM-GIS-KC_ssGM_857	MH-GIS-MH-209	418.15	MH-IS-30	415.36	355.8	0.008	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_860	MH-GIS-MH-76	418.62	MH-GIS-KC_ssMH_1509	417.94	49.3	0.014	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_861	MH-GIS-KC_ssMH_1509	417.94	MH-IS-24	416.67	281.1	0.005	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-KC_ssGM_870	MH-GIS-KC_ssMH_2084	482.14	MH-GIS-KC_ssMH_2083	463.1	295.4	0.064	8	PVC	0.01	331	60.9	-0.3	
GM-GIS-KC_ssGM_871	MH-GIS-KC_ssMH_2083	463.1	MH-GIS-KC_ssMH_2082	440.53	345.7	0.065	8	PVC	0.01	340	61.7	-0.3	
GM-GIS-KC_ssGM_872	MH-GIS-KC_ssMH_2082	440.53	MH-IS-57	425.87	240.2	0.061	8	PVC	0.01	349	62.5	-0.2	
GM-GIS-KC_ssGM_891	MH-GIS-MH-195	522.26	MH-GIS-KC_ssMH_2084	482.14	281.4	0.143	8	PVC	0.01	44	21.3	-0.5	
GM-GIS-KC_ssGM_892	MH-GIS-MH-199	557.17	MH-GIS-MH-195	522.26	183	0.191	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-KC_ssGM_893	MH-GIS-MH-165	569.29	MH-GIS-MH-199	557.17	203.7	0.06	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-KC_ssGM_894	MH-GIS-MH-164	577.65	MH-GIS-MH-165	569.29	138.8	0.06	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_895	MH-GIS-MH-194	561.05	MH-GIS-MH-195	522.26	173.8	0.223	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_922	MH-GIS-KC_ssMH_2108	1,027.84	MH-GIS-KC_ssMH_2109	1,006.90	270.9	0.077	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_923	MH-GIS-KC_ssMH_2109	1,006.90	MH-GIS-KC_ssMH_2111	970.9	297.5	0.121	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-KC_ssGM_924	MH-GIS-KC_ssMH_2111	970.9	MH-GIS-KC_ssMH_2110	961.14	117.7	0.083	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-KC_ssGM_925	MH-GIS-KC_ssMH_2110	961.14	MH-GIS-KC_ssMH_2112	946.39	98.7	0.149	8	PVC	0.01	35	18.9	-0.5	
GM-GIS-KC_ssGM_926	MH-GIS-KC_ssMH_2112	946.39	MH-GIS-KC_ssMH_2113	926.05	298.9	0.068	8	PVC	0.01	44	21.3	-0.5	
GM-GIS-KC_ssGM_927	MH-GIS-KC_ssMH_2113	926.05	MH-GIS-MH-123	906.59	236.2	0.082	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-KC_ssGM_928	MH-GIS-MH-123	906.59	MH-GIS-KC_ssMH_2115	900.25	83.5	0.076	8	PVC	0.01	61	25.3	-0.5	
GM-GIS-KC_ssGM_929	MH-GIS-KC_ssMH_2115	900.25	MH-GIS-KC_ssMH_2116	887.69	229.2	0.055	8	PVC	0.01	70	27	-0.5	
GM-GIS-KC_ssGM_930	MH-GIS-KC_ssMH_2116	887.69	MH-GIS-KC_ssMH_2117	874.03	141.2	0.097	8	PVC	0.01	78	28.8	-0.5	
GM-GIS-KC_ssGM_931	MH-GIS-KC_ssMH_2117	874.03	MH-GIS-KC_ssMH_2118	847.41	300.1	0.089	8	PVC	0.01	87	30.4	-0.5	
GM-GIS-KC_ssGM_932	MH-GIS-KC_ssMH_2118	847.41	MH-GIS-KC_ssMH_2119	790.79	349.9	0.162	8	PVC	0.01	96	31.9	-0.5	
GM-GIS-KC_ssGM_933	MH-GIS-KC_ssMH_2119	790.79	MH-GIS-KC_ssMH_2122	729.26	389.2	0.158	8	PVC	0.01	105	33.4	-0.4	
GM-GIS-KC_ssGM_934	MH-GIS-KC_ssMH_2122	729.26	MH-GIS-KC_ssMH_2196	707.3	203.5	0.108	8	PVC	0.01	113	34.8	-0.4	
GM-GIS-KC_ssGM_935	MH-GIS-KC_ssMH_2196	707.3	MH-GIS-KC_ssMH_2197	701.32	62.5	0.096	8	PVC	0.01	122	36.2	-0.4	
GM-GIS-KC_ssGM_936	MH-GIS-KC_ssMH_2197	701.32	MH-GIS-KC_ssMH_2123	691.09	106.9	0.096	8	PVC	0.01	131	37.5	-0.4	
GM-GIS-KC_ssGM_937	MH-GIS-KC_ssMH_2123	691.09	MH-GIS-KC_ssMH_2124	686.29	81	0.059	8	PVC	0.01	139	38.7	-0.4	
GM-GIS-KC_ssGM_938	MH-GIS-KC_ssMH_2124	686.29	MH-GIS-KC_ssMH_2125	653.86	85.6	0.379	8	Ductile Iron	0.013	148	40	-0.4	
GM-GIS-KC_ssGM_939	MH-GIS-KC_ssMH_2125	653.86	MH-GIS-KC_ssMH_2126	651.73	144	0.015	8	PVC	0.01	157	41.2	-0.4	
GM-GIS-KC_ssGM_940	MH-GIS-KC_ssMH_2126	651.73	MH-GIS-KC_ssMH_2168	644.03	103.7	0.074	8	PVC	0.01	166	42.4	-0.4	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-KC_ssGM_941	MH-GIS-KC_ssMH_2168	644.03	MH-GIS-KC_ssMH_2127	641.46	315.3	0.008	8	PVC	0.01	174	43.5	-0.4	
GM-GIS-KC_ssGM_942	MH-GIS-KC_ssMH_2127	641.46	MH-GIS-KC_ssMH_2128	634.26	66.3	0.109	8	PVC	0.01	183	44.6	-0.4	
GM-GIS-KC_ssGM_943	MH-GIS-KC_ssMH_2128	634.26	MH-GIS-KC_ssMH_2129	611.91	210.3	0.106	8	PVC	0.01	192	45.8	-0.4	
GM-GIS-KC_ssGM_944	MH-GIS-KC_ssMH_2129	611.91	MH-GIS-KC_ssMH_2130	603.73	76.9	0.106	8	PVC	0.01	201	46.8	-0.4	
GM-GIS-KC_ssGM_945	MH-GIS-KC_ssMH_2130	603.73	MH-GIS-KC_ssMH_2131	592.15	108.9	0.106	8	PVC	0.01	209	47.9	-0.3	
GM-GIS-KC_ssGM_946	MH-GIS-KC_ssMH_2131	592.15	MH-GIS-KC_ssMH_2132	561.7	286.5	0.106	8	PVC	0.01	218	48.9	-0.3	
GM-GIS-KC_ssGM_947	MH-GIS-KC_ssMH_2132	561.7	MH-GIS-KC_ssMH_2133	549	131.6	0.096	8	PVC	0.01	227	49.9	-0.3	
GM-GIS-KC_ssGM_948	MH-GIS-KC_ssMH_2133	549	MH-GIS-KC_ssMH_2134	535.47	176.1	0.077	8	PVC	0.01	235	50.9	-0.3	
GM-GIS-KC_ssGM_949	MH-GIS-KC_ssMH_2134	535.47	MH-GIS-KC_ssMH_2135	534.13	43.6	0.031	8	PVC	0.01	244	51.9	-0.3	
GM-GIS-KC_ssGM_950	MH-GIS-KC_ssMH_2135	534.13	MH-GIS-KC_ssMH_2120	521.21	135.8	0.095	8	PVC	0.01	253	52.8	-0.3	
GM-GIS-KC_ssGM_984	MH-GIS-KC_ssMH_2084	482.14	MH-GIS-KC_ssMH_2160	482.58	9.6	0.046	8	PVC	0.01	279	55.6	0.1	
GM-GIS-KC_ssGM_987	MH-GIS-KC_ssMH_2121	507.3	MH-GIS-KC_ssMH_2160	482.58	373.8	0.066	8	PVC	0.01	270	54.7	-0.3	
GM-GIS-KC_ssGM_988	MH-GIS-KC_ssMH_2120	521.21	MH-GIS-KC_ssMH_2121	507.3	184.9	0.075	8	PVC	0.01	262	53.8	-0.3	
GM-GIS-KR_ssGM_29	MH-GIS-KR_ssMH_1445	579.09	MH-GIS-KR_ssMH_1442	570.02	120.4	0.075	8	PVC	0.01	13	11.5	-0.6	
GM-GIS-KR_ssGM_34	MH-GIS-KR_ssMH_1442	570.02	MH-GIS-KR_ssMH_1441	558.99	117.6	0.094	8	PVC	0.01	15	12.6	-0.6	
GM-GIS-KR_ssGM_35	MH-GIS-KR_ssMH_1441	558.99	MH-GIS-KR_ssMH_1439	565.63	153.6	-0.043	8	PVC	0.01	16	100	6.1	
GM-GIS-KR_ssGM_36	MH-GIS-KR_ssMH_1439	565.63	MH-GIS-KR_ssMH_1431	552.59	70.1	0.186	8	PVC	0.01	19	13.8	-0.6	
GM-GIS-KR_ssGM_554	MH-GIS-MH-88	587.38	MH-IS-89	577.39	54.9	0.182	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_557	MH-GIS-MH-41	593.77	MH-IS-89	577.39	124.3	0.132	6	PVC	0.01	12	16	-0.4	
GM-GIS-KR_ssGM_610	MH-GIS-MH-43	553.07	MH-GIS-KR_ssMH_1900	546.6	29.5	0.219	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-KR_ssGM_611	MH-GIS-KR_ssMH_1899	550.74	MH-GIS-KR_ssMH_1898	549.33	161.7	0.009	8	PVC	0.01	53	23.6	-0.5	
GM-GIS-KR_ssGM_612	MH-GIS-KR_ssMH_1431	552.59	MH-GIS-KR_ssMH_1899	550.74	181.5	0.01	8	PVC	0.01	53	23.4	-0.5	
GM-GIS-KR_ssGM_613	MH-GIS-KR_ssMH_1898	549.33	MH-GIS-KR_ssMH_1901	548.1	163.4	0.008	8	PVC	0.01	54	23.8	-0.5	
GM-GIS-KR_ssGM_614	MH-GIS-KR_ssMH_1901	548.1	MH-GIS-KR_ssMH_1900	546.6	141.6	0.011	8	PVC	0.01	55	24	-0.5	
GM-GIS-KR_ssGM_615	MH-GIS-KR_ssMH_1900	546.6	MH-GIS-KR_ssMH_1897	535.33	181.1	0.062	8	PVC	0.01	57	24.3	-0.5	
GM-GIS-KR_ssGM_616	MH-GIS-KR_ssMH_1897	535.33	MH-GIS-KR_ssMH_1896	518.29	184.2	0.093	8	PVC	0.01	57	24.5	-0.5	
GM-GIS-KR_ssGM_617	MH-GIS-KR_ssMH_1896	518.29	MH-GIS-KR_ssMH_1902	515.25	160.9	0.019	8	PVC	0.01	59	24.8	-0.5	
GM-GIS-KR_ssGM_618	MH-GIS-KR_ssMH_1902	515.25	MH-GIS-KR_ssMH_1903	513.28	230.4	0.009	8	PVC	0.01	60	25	-0.5	
GM-GIS-KR_ssGM_619	MH-GIS-KR_ssMH_1903	513.28	MH-GIS-KR_ssMH_1904	511.5	192.5	0.009	8	PVC	0.01	61	25.2	-0.5	
GM-GIS-KR_ssGM_620	MH-GIS-KR_ssMH_1904	511.5	MH-IS-128	510.28	158.6	0.008	8	PVC	0.01	62	25.4	-0.5	
GM-GIS-KR_ssGM_621	MH-GIS-MH-31	528.89	MH-GIS-KR_ssMH_1896	518.29	19.3	0.55	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_642	MH-GIS-MH-20	570.83	MH-GIS-KR_ssMH_1442	570.02	10.2	0.08	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-KR_ssGM_643	MH-GIS-MH-151	579.54	MH-GIS-MH-20	570.83	118.6	0.073	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_644	MH-GIS-KR_ssMH_1916	559.83	MH-GIS-KR_ssMH_1439	565.63	104.6	-0.055	8	PVC	0.01	1	100	5.2	
GM-GIS-KR_ssGM_645	MH-GIS-KR_ssMH_1917	585.29	MH-GIS-KR_ssMH_1439	565.63	256.8	0.077	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_536	MH-IS-MH-2	408.8	MH-GIS-KV_ssMH_1913	417.96	20.6	0.444	8	PVC	0.01	2	4.9	8.5	
GM-GIS-KV_ssGM_539	MH-GIS-KV_ssMH_2205	458.37	MH-IS-82	448.73	44.8	0.215	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_558	MH-GIS-MH-108	504.12	MH-IS-121	498.94	71.9	0.072	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_752	MH-GIS-AR_ssMH_2017	517.96	MH-IS-154	499.58	185.3	0.099	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-KV_ssGM_970	MH-GIS-KV_ssMH_2150	418.31	MH-GIS-KV_ssMH_1913	417.96	87.6	0.004	8	PVC	0.01	2	4.4	-0.6	
GM-GIS-KV_ssGM_971	MH-GIS-KV_ssMH_2151	419.18	MH-GIS-KV_ssMH_2150	418.31	217.1	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-KV_ssGM_1063	MH-GIS-KV_ssMH_2190	449.99	MH-IS-81	438.64	73.2	0.155	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-KV_ssGM_1064	MH-GIS-KV_ssMH_2191	450.77	MH-GIS-KV_ssMH_2190	449.99	196.2	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-KV_ssGM_1088	MH-GIS-KV_ssMH_2186	457	MH-IS-82	448.73	154.5	0.054	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-MB_ssGM_842	MH-GIS-MB_ssMH_2062	417.89	MH-GIS-MB_ssMH_1459	415.85	296.9	0.007	8	Glass	0.013	12	11.3	-0.6	
GM-GIS-MB_ssGM_843	MH-GIS-MB_ssMH_1459	415.85	MH-GIS-MB_ssMH_1460	414.21	235.7	0.007	8	Concrete	0.013	36	19.3	-0.5	
GM-GIS-MB_ssGM_844	MH-GIS-MB_ssMH_1458	415.48	MH-GIS-MB_ssMH_1459	415.85	258.2	-0.001	8	Glass	0.013	12	79.3	-0.1	
GM-GIS-MB_ssGM_845	MH-GIS-MB_ssMH_1457	416.2	MH-GIS-MB_ssMH_1458	415.48	257.9	0.003	8	Glass	0.013	8	11.5	-0.6	
GM-GIS-MB_ssGM_846	MH-GIS-MB_ssMH_1460	414.21	MH-GIS-MB_ssMH_2063	415.06	147.3	-0.006	8	Glass	0.013	44	100	0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-MB_ssGM_847	MH-GIS-MB_ssMH_2063	415.06	MH-GIS-MB_ssMH_2064	415.09	272.7	-1E-04	8	Concrete	0.013	52	59.6	-0.3	
GM-GIS-MB_ssGM_848	MH-GIS-MB_ssMH_2064	415.09	MH-GIS-MB_ssMH_2066	412.31	270.3	0.01	8	Concrete	0.013	56	24.2	-0.5	
GM-GIS-MB_ssGM_849	MH-GIS-MB_ssMH_2066	412.31	MH-GIS-MB_ssMH_2065	405.51	52.5	0.129	8	Concrete	0.013	60	25.1	-0.5	SM2
GM-GIS-MB_ssGM_850	MH-GIS-MB_ssMH_2065	405.51	MH-GIS-MB_ssMH_2067	408.72	220.6	-0.015	8	Concrete	0.013	64	100	5.6	SM2
GM-GIS-MB_ssGM_851	MH-GIS-MB_ssMH_2068	416.46	MH-GIS-MB_ssMH_2063	415.06	293	0.005	8	Concrete	0.013	4	7.3	-0.6	
GM-GIS-MB_ssGM_852	MH-GIS-MB_ssMH_2070	414	MH-GIS-MB_ssMH_2069	416.57	297.5	-0.009	8	Concrete	0.013	20	100	2.9	
GM-GIS-MB_ssGM_853	MH-GIS-MB_ssMH_2071	414.51	MH-GIS-MB_ssMH_2070	414	236.3	0.002	8	Concrete	0.013	4	100	2.4	
GM-GIS-MB_ssGM_854	MH-GIS-MB_ssMH_2072	417.27	MH-GIS-MB_ssMH_2073	409.91	101.6	0.072	8	Concrete	0.013	52	23.4	-0.5	
GM-GIS-MB_ssGM_896	MH-GIS-MB_ssMH_2073	409.91	MH-GIS-MB_ssMH_2096	411.42	87.3	-0.017	8	PVC	0.01	56	100	1.1	
GM-GIS-MB_ssGM_897	MH-GIS-MB_ssMH_2097	415.13	MH-GIS-MB_ssMH_1460	414.21	432.2	0.002	8	Concrete	0.013	4	51.1	-0.3	
GM-GIS-MB_ssGM_898	MH-GIS-MH-150	418.93	MH-GIS-MB_ssMH_2098	418.47	117	0.004	8	Glass	0.013	4	7.6	-0.6	
GM-GIS-MB_ssGM_899	MH-GIS-MB_ssMH_2098	418.47	MH-GIS-MB_ssMH_2062	417.89	143.9	0.004	8	Vitrified Clay	0.013	8	10.6	-0.6	
GM-GIS-MB_ssGM_902	MH-GIS-MB_ssMH_1456	414	MH-GIS-MB_ssMH_1455	414	185.5	0	8	Concrete	0.013	4	100	2.9	
GM-GIS-MB_ssGM_903	MH-GIS-MB_ssMH_1455	414	MH-GIS-MB_ssMH_2070	414	256.9	0	8	Concrete	0.013	12	100	2.9	
GM-GIS-MB_ssGM_904	MH-GIS-MB_ssMH_2069	416.57	MH-GIS-MB_ssMH_1463	415.51	204.1	0.005	8	Concrete	0.013	32	100	0.3	
GM-GIS-MB_ssGM_905	MH-GIS-MB_ssMH_1463	415.51	MH-GIS-MB_ssMH_1462	414	146.3	0.01	8	Concrete	0.013	36	100	1.4	
GM-GIS-MB_ssGM_906	MH-GIS-MB_ssMH_1462	414	MH-GIS-MB_ssMH_2099	414	152.2	0	8	Concrete	0.013	40	100	2.9	
GM-GIS-MB_ssGM_907	MH-GIS-MB_ssMH_2099	414	MH-GIS-MB_ssMH_2100	412.94	189.2	0.006	8	Concrete	0.013	44	100	2.9	
GM-GIS-MB_ssGM_908	MH-GIS-MB_ssMH_2100	412.94	MH-GIS-MB_ssMH_2072	417.27	140.4	-0.031	8	Concrete	0.013	48	100	3.9	
GM-GIS-MB_ssGM_912	MH-GIS-MH-180	414	MH-GIS-MB_ssMH_1455	414	154	0	8	Concrete	0.013	4	100	2.9	
GM-GIS-MB_ssGM_921	MH-GIS-MB_ssMH_2152	416.16	MH-GIS-MB_ssMH_2069	416.57	399	-0.001	8	Concrete	0.013	8	100	0.8	
GM-GIS-MB_ssGM_997	MH-GIS-MB_ssMH_2170	417.01	MH-GIS-MB_ssMH_1459	415.85	163.5	0.007	8	Concrete	0.013	8	9.2	-0.6	
GM-GIS-MB_ssGM_998	MH-GIS-MB_ssMH_2171	417.99	MH-GIS-MB_ssMH_2170	417.01	263	0.004	8	Concrete	0.013	4	7.8	-0.6	
GM-GIS-MB_ssGM_999	MH-GIS-MH-141	416.19	MH-GIS-MB_ssMH_1457	416.2	101	-1E-04	8	Concrete	0.013	4	17.4	-0.6	
GM-GIS-MB_ssGM_1014	MH-GIS-MB_ssMH_2096	411.42	PS4WW	399.83	3.1	3.713	8	Cast iron	0.013	129	37.1	-0.4	
GM-GIS-MB_ssGM_1017	MH-GIS-MB_ssMH_2067	408.72	MH-GIS-MB_ssMH_2096	411.42	21.2	-0.127	8	Concrete	0.013	68	100	2.3	SM2
GM-GIS-MB_ssGM_1089	MH-GIS-MH-143	417.14	MH-GIS-MB_ssMH_2152	416.16	103.1	0.01	8	Concrete	0.013	4	66.8	-0.2	
GM-GIS-MU_ssGM_332	MH-GIS-MH-130	824.65	MH-GIS-MH-28	822.32	100	0.023	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_333	MH-GIS-MH-129	830.87	MH-GIS-MH-130	824.65	90	0.069	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_334	MH-GIS-MH-201	814.99	MH-GIS-MH-80	819.26	202.5	-0.021	8	PVC	0.01	1	100	6	
GM-GIS-MU_ssGM_335	MH-GIS-MH-204	820.15	MH-GIS-MH-201	814.99	221.1	0.023	8	PVC	0.01	1	100	0.2	
GM-GIS-MU_ssGM_336	MH-GIS-MH-80	819.26	MH-GIS-MU_ssMH_1810	821.61	50	-0.047	8	PVC	0.01	2	100	1.8	
GM-GIS-MU_ssGM_406	MH-GIS-MU_ssMH_1797	844.97	MH-GIS-MU_ssMH_1798	840.84	109.8	0.038	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_407	MH-GIS-MU_ssMH_1798	840.84	MH-GIS-MU_ssMH_1799	841.52	151.2	-0.005	8	PVC	0.01	2	100	0.1	
GM-GIS-MU_ssGM_408	MH-GIS-MU_ssMH_1799	841.52	MH-GIS-MU_ssMH_1809	832.29	149	0.062	8	PVC	0.01	4	6.6	-0.6	
GM-GIS-MU_ssGM_409	MH-GIS-MU_ssMH_1801	839	MH-GIS-MU_ssMH_1800	831.63	206.8	0.036	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_410	MH-GIS-MU_ssMH_1800	831.63	MH-GIS-MU_ssMH_1802	829	42.5	0.062	8	PVC	0.01	1	100	0.1	
GM-GIS-MU_ssGM_411	MH-GIS-MU_ssMH_1803	828.62	MH-GIS-MU_ssMH_1809	832.29	198.9	-0.018	8	PVC	0.01	4	100	3.1	
GM-GIS-MU_ssGM_412	MH-GIS-MU_ssMH_1802	829	MH-GIS-MU_ssMH_1804	827.72	137.6	0.009	8	PVC	0.01	2	100	2.7	
GM-GIS-MU_ssGM_413	MH-GIS-MU_ssMH_1804	827.72	MH-GIS-MU_ssMH_1803	828.62	93.8	-0.01	8	PVC	0.01	3	100	4	
GM-GIS-MU_ssGM_414	MH-GIS-MU_ssMH_1806	845.55	MH-GIS-MU_ssMH_1807	837.51	116.7	0.069	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_415	MH-GIS-MU_ssMH_1807	837.51	MH-GIS-MU_ssMH_1808	836.34	107.4	0.011	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_416	MH-GIS-MU_ssMH_1808	836.34	MH-GIS-MU_ssMH_1809	832.29	160.6	0.025	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-MU_ssGM_417	MH-GIS-MU_ssMH_1811	818.4	MH-GIS-MU_ssMH_1805	809.96	80.2	0.105	8	PVC	0.01	17	13.3	-0.6	
GM-GIS-MU_ssGM_418	MH-GIS-MU_ssMH_1811	818.4	MH-GIS-MH-28	822.32	17.9	0.219	8	PVC	0.01	2	4.7	3.3	
GM-GIS-MU_ssGM_419	MH-GIS-MU_ssMH_1812	841.15	MH-GIS-MU_ssMH_1799	841.52	68.1	-0.005	8	PVC	0.01	1	62.9	-0.2	
GM-GIS-MU_ssGM_420	MH-GIS-MH-146	844.16	MH-GIS-MU_ssMH_1812	841.15	109.6	0.027	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_421	MH-GIS-MH-131	847.51	MH-GIS-MU_ssMH_1797	844.97	94.4	0.027	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_422	MH-GIS-MU_ssMH_1810	821.61	MH-GIS-MU_ssMH_1811	818.4	327.2	0.01	8	PVC	0.01	14	12.1	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-MU_ssGM_423	MH-GIS-MU_ssMH_1813	831.08	MH-GIS-MU_ssMH_1810	821.61	160.2	0.059	8	PVC	0.01	12	10.8	-0.6	
GM-GIS-MU_ssGM_424	MH-GIS-MU_ssMH_1809	832.29	MH-GIS-MU_ssMH_1813	831.08	32.4	0.037	8	PVC	0.01	11	10.5	-0.6	
GM-GIS-NC_ssGM_713	MH-GIS-MH-159	411.85	MH-GIS-NC_ssMH_1983	411.33	129.6	0.004	8	Glass	0.013	2	5.9	-0.6	
GM-GIS-NC_ssGM_714	MH-GIS-NC_ssMH_1983	411.33	MH-IS-188	407.79	180.3	0.02	8	Glass	0.013	5	6.9	-0.6	
GM-GIS-NC_ssGM_715	MH-GIS-NC_ssMH_1984	411.05	MH-IS-148	404.7	271.6	0.023	8	Concrete	0.013	40	20.4	-0.5	
GM-GIS-NC_ssGM_716	MH-GIS-NC_ssMH_1985	413.81	MH-GIS-NC_ssMH_1984	411.05	237.1	0.012	8	Concrete	0.013	38	19.8	-0.5	
GM-GIS-NC_ssGM_717	MH-GIS-NC_ssMH_1987	414	MH-GIS-NC_ssMH_1990	414	75	0	8	Concrete	0.013	31	35.1	-0.4	
GM-GIS-NC_ssGM_718	MH-GIS-NC_ssMH_1990	414	MH-GIS-NC_ssMH_1991	413.35	127.3	0.005	8	Concrete	0.013	33	19.7	-0.5	
GM-GIS-NC_ssGM_719	MH-GIS-NC_ssMH_1991	413.35	MH-GIS-NC_ssMH_1985	413.81	73	-0.006	8	Concrete	0.013	35	99.7	0	SM4
GM-GIS-NC_ssGM_720	MH-GIS-NC_ssMH_1986	413.35	MH-GIS-NC_ssMH_1987	414	143.2	-0.005	8	Concrete	0.013	5	100	0.2	
GM-GIS-NC_ssGM_721	MH-GIS-MH-156	410.7	MH-GIS-NC_ssMH_1986	413.35	127.2	-0.021	8	Concrete	0.013	2	100	2.9	
GM-GIS-NC_ssGM_722	MH-GIS-NC_ssMH_1988	414	MH-GIS-NC_ssMH_1987	414	14.9	0	8	Concrete	0.013	24	35.7	-0.4	
GM-GIS-NC_ssGM_723	MH-GIS-NC_ssMH_1989	414	MH-GIS-NC_ssMH_1988	414	49.7	0	8	Concrete	0.013	21	37.2	-0.4	
GM-GIS-NC_ssGM_724	MH-GIS-NC_ssMH_1993	414	MH-GIS-NC_ssMH_1992	414	15.9	0	8	Concrete	0.013	17	40.5	-0.4	
GM-GIS-NC_ssGM_725	MH-GIS-NC_ssMH_1992	414	MH-GIS-NC_ssMH_1989	414	172	0	8	Concrete	0.013	19	40.3	-0.4	
GM-GIS-NC_ssGM_726	MH-GIS-NC_ssMH_1995	412.09	MH-GIS-NC_ssMH_1996	413.4	161.4	-0.008	8	Concrete	0.013	7	100	1.5	
GM-GIS-NC_ssGM_727	MH-GIS-MH-109	412.69	MH-GIS-NC_ssMH_1996	413.4	72.4	-0.01	8	Concrete	0.013	2	100	0.9	
GM-GIS-NC_ssGM_728	MH-GIS-NC_ssMH_1996	413.4	MH-GIS-NC_ssMH_1994	413.99	123.2	-0.005	8	Concrete	0.013	12	100	0.2	
GM-GIS-NC_ssGM_729	MH-GIS-NC_ssMH_1994	413.99	MH-GIS-NC_ssMH_1993	414	192.4	-5E-05	8	Concrete	0.013	14	43.5	-0.4	
GM-GIS-NC_ssGM_730	MH-GIS-NC_ssMH_1998	411.16	MH-IS-248	408.21	455.2	0.006	8	Concrete	0.013	9	9.8	-0.6	
GM-GIS-NC_ssGM_732	MH-GIS-NC_ssMH_2001	414	MH-GIS-NC_ssMH_2000	410.94	267.5	0.011	8	Concrete	0.013	2	4.8	-0.6	
GM-GIS-NC_ssGM_733	MH-GIS-NC_ssMH_2000	410.94	MH-IS-214	408.1	148	0.019	8	Concrete	0.013	5	6.9	-0.6	SM4
GM-GIS-NC_ssGM_739	MH-GIS-NC_ssMH_2004	409.85	MH-GIS-NC_ssMH_1522	409.08	192.1	0.004	8	PVC	0.01	2	5.2	-0.6	
GM-GIS-NC_ssGM_740	MH-GIS-NC_ssMH_1522	409.08	MH-GIS-NC_ssMH_1521	409	164.1	5E-04	8	PVC	0.01	5	12	-0.6	
GM-GIS-NC_ssGM_741	MH-GIS-NC_ssMH_1521	409	MH-IS-144	403.08	174	0.034	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-NC_ssGM_840	MH-GIS-NC_ssMH_2061	411.3	MH-GIS-NC_ssMH_1995	412.09	441.2	-0.002	8	PVC	0.01	2	100	2.3	
GM-GIS-NC_ssGM_841	MH-GIS-MH-56	411.79	MH-GIS-NC_ssMH_1995	412.09	38.2	-0.008	8	PVC	0.01	2	100	1.8	
GM-GIS-NE_ssGM_48	MH-GIS-NE_ssMH_1315	856.39	MH-GIS-NE_ssMH_1297	857.74	45.9	0.029	8	PVC	0.01	4	6.4	0.7	
GM-GIS-NE_ssGM_49	MH-GIS-NE_ssMH_1298	854.31	MH-IS-205	845.9	55	0.153	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-NE_ssGM_50	MH-GIS-NE_ssMH_1295	854.07	MH-IS-205	845.9	36.8	0.222	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_51	MH-GIS-NE_ssMH_1304	862.69	MH-GIS-NE_ssMH_1297	857.74	190.1	0.026	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_52	MH-GIS-NE_ssMH_1303	862.09	MH-GIS-NE_ssMH_1304	862.69	116.7	-0.005	8	PVC	0.01	2	100	0	
GM-GIS-NE_ssGM_53	MH-GIS-NE_ssMH_1296	860.61	MH-GIS-NE_ssMH_1303	862.09	47	-0.031	8	PVC	0.01	2	100	1.5	
GM-GIS-NE_ssGM_54	MH-GIS-NE_ssMH_1300	858.22	MH-GIS-NE_ssMH_1299	857.7	102.5	0.005	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_55	MH-GIS-NE_ssMH_1301	858.5	MH-GIS-NE_ssMH_1300	858.22	148.1	0.002	8	PVC	0.01	2	5.2	-0.6	
GM-GIS-NE_ssGM_56	MH-GIS-NE_ssMH_1299	857.7	MH-GIS-NE_ssMH_1298	854.31	131	0.026	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_57	MH-GIS-MH-57	859.16	MH-GIS-NE_ssMH_1301	858.5	38.4	0.017	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_58	MH-GIS-NE_ssMH_1302	857.22	MH-GIS-NE_ssMH_1295	854.07	114.7	0.027	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_59	MH-GIS-MH-124	859	MH-GIS-NE_ssMH_1302	857.22	84.3	0.021	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_60	MH-GIS-NE_ssMH_1296	860.61	MH-GIS-MH-60	857.92	40.2	-0.067	8	PVC	0.01	1	100	1.5	
GM-GIS-NE_ssGM_61	MH-GIS-NE_ssMH_1677	863	MH-GIS-NE_ssMH_1335	861.87	36.8	0.031	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_62	MH-GIS-NE_ssMH_1315	856.39	MH-GIS-NE_ssMH_1339	851.06	154.4	0.035	8	PVC	0.01	5	7	-0.6	
GM-GIS-NE_ssGM_63	MH-GIS-MH-105	852.15	MH-GIS-NE_ssMH_1317	854.61	68.4	-0.036	8	PVC	0.01	1	100	1.8	
GM-GIS-NE_ssGM_64	MH-GIS-NE_ssMH_1339	851.06	MH-GIS-NE_ssMH_1316	851.91	177.9	-0.005	8	PVC	0.01	7	100	0.3	
GM-GIS-NE_ssGM_66	MH-GIS-MH-125	891.48	MH-GIS-NE_ssMH_1308	889	85.6	0.029	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_67	MH-GIS-NE_ssMH_1343	869	MH-GIS-NE_ssMH_1324	871.3	226.4	-0.01	8	PVC	0.01	5	100	1.7	
GM-GIS-NE_ssGM_68	MH-GIS-NE_ssMH_1312	876.87	MH-GIS-NE_ssMH_1328	865.28	261.4	0.044	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_69	MH-GIS-MH-126	877.34	MH-GIS-NE_ssMH_1312	876.87	85.7	0.005	8	PVC	0.01	1	3	-0.6	
GM-GIS-NE_ssGM_70	MH-GIS-NE_ssMH_1309	882.54	MH-GIS-NE_ssMH_1348	879.07	155.5	0.022	8	PVC	0.01	12	11.1	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-NE_ssGM_71	MH-GIS-DH_ssMH_1310	888.97	MH-GIS-NE_ssMH_1309	882.54	356.7	0.018	8	PVC	0.01	11	10.7	-0.6	
GM-GIS-NE_ssGM_72	MH-GIS-NE_ssMH_1319	869	MH-GIS-NE_ssMH_1343	869	78.2	0	8	PVC	0.01	3	100	1.7	
GM-GIS-NE_ssGM_73	MH-GIS-NE_ssMH_1307	878.68	MH-GIS-NE_ssMH_1324	871.3	225.9	0.033	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_74	MH-GIS-NE_ssMH_1308	889	MH-GIS-NE_ssMH_1307	878.68	292.2	0.035	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_79	MH-GIS-NE_ssMH_1348	879.07	MH-GIS-NE_ssMH_1334	862.57	346.2	0.048	8	PVC	0.01	13	11.5	-0.6	
GM-GIS-NE_ssGM_86	MH-GIS-NE_ssMH_1317	854.61	MH-GIS-NE_ssMH_1339	851.06	191.8	0.019	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_87	MH-GIS-NE_ssMH_1316	851.91	MH-GIS-NE_ssMH_1318	851.7	190.7	0.001	8	PVC	0.01	8	12.7	-0.6	
GM-GIS-NE_ssGM_88	MH-GIS-NE_ssMH_1336	867.41	MH-GIS-NE_ssMH_1335	861.87	386.3	0.014	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_89	MH-GIS-NE_ssMH_1335	861.87	MH-GIS-NE_ssMH_1334	862.57	149.3	-0.005	8	PVC	0.01	7	100	0.1	
GM-GIS-NE_ssGM_90	MH-GIS-NE_ssMH_1334	862.57	MH-GIS-NE_ssMH_1333	860.25	235.6	0.01	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-NE_ssGM_91	MH-GIS-NE_ssMH_1333	860.25	MH-IS-276	849.3	252.6	0.043	8	PVC	0.01	22	15	-0.6	
GM-GIS-NE_ssGM_94	MH-GIS-NE_ssMH_1318	851.7	MH-IS-203	843.68	198.7	0.04	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-NE_ssGM_95	MH-GIS-NE_ssMH_1328	865.28	MH-GIS-NE_ssMH_1329	863.49	157	0.011	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-NE_ssGM_97	MH-GIS-NE_ssMH_1330	859	MH-IS-201	841.44	191.5	0.092	8	PVC	0.01	20	14.4	-0.6	
GM-GIS-NE_ssGM_98	MH-GIS-NE_ssMH_1329	863.49	MH-GIS-NE_ssMH_1330	859	175.2	0.026	8	PVC	0.01	19	13.8	-0.6	
GM-GIS-NE_ssGM_99	MH-GIS-NE_ssMH_1346	864	MH-GIS-NE_ssMH_1328	865.28	168.9	-0.008	8	PVC	0.01	15	100	0.8	
GM-GIS-NE_ssGM_100	MH-GIS-NE_ssMH_1324	871.3	MH-GIS-NE_ssMH_1325	868.22	155.7	0.02	8	PVC	0.01	8	9	-0.6	
GM-GIS-NE_ssGM_101	MH-GIS-NE_ssMH_1327	864	MH-GIS-NE_ssMH_1346	864	158.8	0	8	PVC	0.01	14	100	0.8	
GM-GIS-NE_ssGM_102	MH-GIS-NE_ssMH_1326	865.7	MH-GIS-NE_ssMH_1327	864	117.8	0.014	8	PVC	0.01	10	9.9	-0.6	
GM-GIS-NE_ssGM_103	MH-GIS-NE_ssMH_1325	868.22	MH-GIS-NE_ssMH_1326	865.7	150.3	0.017	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-NE_ssGM_171	MH-GIS-NE_ssMH_1313	868.11	MH-GIS-NE_ssMH_1343	869	96.8	-0.009	8	PVC	0.01	1	100	2.6	
GM-GIS-NE_ssGM_173	MH-GIS-NE_ssMH_1562	831.9	MH-GIS-NE_ssMH_1563	826	111.8	0.053	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_174	MH-GIS-NE_ssMH_1563	826	MH-GIS-NE_ssMH_1564	823	53	0.057	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_175	MH-GIS-NE_ssMH_1565	822.14	MH-GIS-NE_ssMH_1567	819.88	83.3	0.027	8	PVC	0.01	5	7	-0.6	
GM-GIS-NE_ssGM_176	MH-GIS-NE_ssMH_1566	828.75	MH-GIS-NE_ssMH_1565	822.14	180.5	0.037	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_177	MH-GIS-NE_ssMH_1569	831.92	MH-GIS-NE_ssMH_1566	828.75	57.8	0.055	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_178	MH-GIS-NE_ssMH_1567	819.88	MH-IS-3	797.17	107.5	0.211	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_179	MH-GIS-NE_ssMH_1564	823	MH-GIS-NE_ssMH_1565	822.14	167.6	0.005	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_222	MH-GIS-FW_ssMH_1608	884.67	MH-GIS-NE_ssMH_1605	875.6	205.1	0.044	8	PVC	0.01	8	9	-0.6	
GM-GIS-NE_ssGM_224	MH-GIS-MH-115	840.44	MH-IS-249	830.76	75.7	0.128	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_227	MH-GIS-NE_ssMH_1610	840.34	MH-IS-249	830.76	207.6	0.046	8	PVC	0.01	8	9	-0.6	
GM-GIS-NE_ssGM_229	MH-GIS-NE_ssMH_1611	835.16	MH-GIS-NE_ssMH_1610	840.34	206.8	-0.025	8	PVC	0.01	7	100	4.7	
GM-GIS-NE_ssGM_230	MH-GIS-NE_ssMH_2184	836.06	MH-GIS-NE_ssMH_1611	835.16	43.8	0.021	8	PVC	0.01	6	100	3.8	
GM-GIS-NE_ssGM_231	MH-GIS-NE_ssMH_1605	875.6	MH-GIS-NE_ssMH_1604	868.35	211.3	0.034	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-NE_ssGM_318	MH-GIS-NE_ssMH_1679	872.8	MH-GIS-NE_ssMH_1678	871.46	225.6	0.006	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_319	MH-GIS-NE_ssMH_1680	882.57	MH-GIS-NE_ssMH_1679	872.8	205.6	0.048	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_320	MH-GIS-NE_ssMH_1683	879	MH-GIS-NE_ssMH_1682	877.35	185.7	0.009	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_321	MH-GIS-NE_ssMH_1682	877.35	MH-GIS-NE_ssMH_1681	866.6	200.5	0.054	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_322	MH-GIS-NE_ssMH_1678	871.46	MH-GIS-NE_ssMH_1681	866.6	245.7	0.02	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_323	MH-GIS-NE_ssMH_1681	866.6	MH-GIS-NE_ssMH_1677	863	87.3	0.041	8	PVC	0.01	5	7	-0.6	
GM-GIS-NE_ssGM_324	MH-GIS-NE_ssMH_1689	863.6	MH-GIS-NE_ssMH_1690	859	78	0.059	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NE_ssGM_325	MH-GIS-NE_ssMH_1684	865.93	MH-GIS-NE_ssMH_1327	864	131.7	0.015	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_326	MH-GIS-NE_ssMH_1687	868.98	MH-GIS-NE_ssMH_1684	865.93	100.2	0.03	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_327	MH-GIS-NE_ssMH_1686	869.89	MH-GIS-NE_ssMH_1687	868.98	125.7	0.007	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_328	MH-GIS-NE_ssMH_1685	875.58	MH-GIS-NE_ssMH_1686	869.89	120.2	0.047	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_450	MH-GIS-NE_ssMH_1816	878.47	MH-GIS-NE_ssMH_1319	869	175.5	0.054	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_451	MH-GIS-NE_ssMH_1814	882.73	MH-GIS-NE_ssMH_1816	878.47	76.5	0.056	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_452	MH-GIS-NE_ssMH_1815	880.36	MH-GIS-NE_ssMH_1814	882.73	104.7	-0.023	8	PVC	0.01	1	100	1.7	
GM-GIS-NE_ssGM_476	MH-GIS-ST_ssMH_1541	863.36	MH-IS-70	866.12	62.4	-0.044	8	Ductile Iron	0.013	33	100	2.3	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-NE_ssGM_480	MH-GIS-NE_ssMH_1690	859	MH-IS-71	858.15	143.8	0.006	8	Ductile Iron	0.013	3	5.6	-0.6	
GM-GIS-NE_ssGM_481	MH-GIS-MH-98	858	MH-IS-71	858.15	62.3	-0.002	8	Ductile Iron	0.013	1	43.3	-0.4	
GM-GIS-NE_ssGM_486	MH-GIS-NE_ssMH_1847	871.21	MH-IS-70	866.12	168.5	0.03	8	Ductile Iron	0.013	8	8.8	-0.6	
GM-GIS-NE_ssGM_487	MH-GIS-NE_ssMH_1849	881.09	MH-GIS-NE_ssMH_1848	875.96	197.5	0.026	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_488	MH-GIS-NE_ssMH_1851	886.82	MH-GIS-NE_ssMH_1849	881.09	122.4	0.047	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-NE_ssGM_489	MH-GIS-NE_ssMH_1852	891.98	MH-GIS-NE_ssMH_1851	886.82	137.9	0.037	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-NE_ssGM_490	MH-GIS-NE_ssMH_1850	896.68	MH-GIS-NE_ssMH_1852	891.98	192.4	0.024	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NE_ssGM_491	MH-GIS-NE_ssMH_1848	875.96	MH-GIS-NE_ssMH_1847	871.21	211.2	0.022	8	PVC	0.01	6	8	-0.6	
GM-GIS-NE_ssGM_492	MH-GIS-NE_ssMH_1853	894	MH-IS-69	876.77	174.8	0.099	8	Ductile Iron	0.013	1	2.9	-0.6	
GM-GIS-NE_ssGM_587	MH-GIS-NE_ssMH_1688	874	MH-GIS-NE_ssMH_1312	876.87	130.5	-0.022	8	PVC	0.01	1	100	2.2	
GM-GIS-NE_ssGM_1035	MH-GIS-NE_ssMH_2177	838.01	MH-GIS-NE_ssMH_2184	836.06	62.9	0.031	8	PVC	0.01	6	100	1.8	
GM-GIS-NE_ssGM_1036	MH-GIS-NE_ssMH_2179	840.41	MH-GIS-NE_ssMH_2177	838.01	169.7	0.014	8	PVC	0.01	5	11.7	-0.6	
GM-GIS-NE_ssGM_1037	MH-GIS-NE_ssMH_2181	842.94	MH-GIS-NE_ssMH_2178	842.59	125.8	0.003	8	PVC	0.01	2	5.8	-0.6	
GM-GIS-NE_ssGM_1038	MH-GIS-NE_ssMH_2178	842.59	MH-GIS-NE_ssMH_2179	840.41	30.9	0.071	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-NE_ssGM_1039	MH-GIS-NE_ssMH_2183	844	MH-GIS-NE_ssMH_2181	842.94	122.6	0.009	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_1040	MH-GIS-NE_ssMH_2180	843.16	MH-GIS-NE_ssMH_2178	842.59	145.7	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-NE_ssGM_1041	MH-GIS-NE_ssMH_2182	846.38	MH-GIS-NE_ssMH_2183	844	123	0.019	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_1048	MH-GIS-DH_ssMH_1841	902.08	MH-GIS-NE_ssMH_1839	898.53	148.7	0.024	8	PVC	0.01	17	13.2	-0.6	
GM-GIS-NE_ssGM_1049	MH-GIS-NE_ssMH_1839	898.53	MH-IS-69	876.77	141	0.154	8	Ductile Iron	0.013	18	13.5	-0.6	
GM-GIS-NE_ssGM_1068	MH-GIS-NE_ssMH_2195	863.72	MH-GIS-NE_ssMH_1330	859	60.5	0.078	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_1071	MH-GIS-NE_ssMH_2198	844	MH-IS-233	831.11	105.7	0.122	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_1072	MH-GIS-NE_ssMH_2199	846.87	MH-GIS-NE_ssMH_2198	844	114	0.025	8	PVC	0.01	5	7	-0.6	
GM-GIS-NE_ssGM_1073	MH-GIS-NE_ssMH_2200	849	MH-GIS-NE_ssMH_2199	846.87	43	0.05	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-NE_ssGM_1074	MH-GIS-NE_ssMH_2201	853.71	MH-GIS-NE_ssMH_2200	849	114.1	0.041	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_1075	MH-GIS-NE_ssMH_2203	854	MH-GIS-NE_ssMH_2201	853.71	44.2	0.007	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-NE_ssGM_1076	MH-GIS-NE_ssMH_2202	854	MH-GIS-NE_ssMH_2203	854	45.5	0	8	PVC	0.01	2	9	-0.6	
GM-GIS-NE_ssGM_1077	MH-GIS-NE_ssMH_2204	854	MH-GIS-NE_ssMH_2202	854	83.8	0	8	PVC	0.01	1	9.6	-0.6	
GM-GIS-NE_ssGM_1081	MH-GIS-NE_ssMH_2176	877.99	MH-GIS-NE_ssMH_1311	872.35	59.6	0.095	6	PVC	0.01	1	4.1	-0.5	
GM-GIS-NE_ssGM_1082	MH-GIS-NE_ssMH_1311	872.35	MH-IS-234	862.31	64.7	0.155	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NJ_ssGM_581	MH-GIS-MH-174	854.94	MH-GIS-MH-173	852.82	148.4	0.014	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NJ_ssGM_582	MH-GIS-MH-172	854.95	MH-GIS-MH-173	852.82	147.7	0.014	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-PA_ssGM_817	MH-GIS-PA_ssMH_2041	819.14	MH-GIS-PA_ssMH_2042	811.79	123.1	0.06	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-PA_ssGM_818	MH-GIS-PA_ssMH_2042	811.79	MH-GIS-PA_ssMH_2038	801.05	124.5	0.086	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-PA_ssGM_819	MH-GIS-PA_ssMH_2048	797.66	MH-GIS-PA_ssMH_2047	802.09	122.8	-0.036	8	Glass	0.013	3	100	3.8	
GM-GIS-PA_ssGM_820	MH-GIS-PA_ssMH_2046	800.91	MH-GIS-PA_ssMH_2060	794.84	112.5	0.054	8	Glass	0.013	5	7	-0.6	
GM-GIS-PA_ssGM_821	MH-GIS-PA_ssMH_2060	794.84	MH-GIS-GC_ssMH_2059	794	187.5	0.004	8	Glass	0.013	6	8.7	-0.6	
GM-GIS-PA_ssGM_822	MH-GIS-PA_ssMH_2038	801.05	MH-GIS-PA_ssMH_2048	797.66	117.6	0.029	8	Glass	0.013	2	100	0.5	
GM-GIS-PA_ssGM_823	MH-GIS-PA_ssMH_2047	802.09	MH-GIS-PA_ssMH_2046	800.91	400.3	0.003	8	Glass	0.013	4	8.2	-0.6	
GM-GIS-PA_ssGM_824	MH-GIS-GC_ssMH_2059	794	MH-GIS-MH-97	794	36.9	0	8	Glass	0.013	6	16.8	-0.6	
GM-GIS-RI_ssGM_1244	MH-GIS-EP_ssMH_2317	1,044.00	MH-GIS-RI_ssMH_2318	1,044.79	392.6	-0.002	8	PVC	0.01	79	100	0.5	
GM-GIS-RI_ssGM_1245	MH-GIS-RI_ssMH_2318	1,044.79	MH-GIS-RI_ssMH_2326	1,044.00	75.5	0.01	8	PVC	0.01	80	29.1	-0.5	
GM-GIS-RI_ssGM_1246	MH-GIS-RI_ssMH_2319	1,043.14	MH-GIS-RI_ssMH_2329	1,034.10	162.8	0.056	8	PVC	0.01	83	29.6	-0.5	
GM-GIS-RI_ssGM_1247	MH-GIS-RI_ssMH_2327	1,009.32	MH-GIS-RI_ssMH_2322	995.97	127.4	0.105	8	PVC	0.01	104	33.3	-0.4	
GM-GIS-RI_ssGM_1248	MH-GIS-RI_ssMH_2322	995.97	MH-GIS-RI_ssMH_2320	987.3	88.6	0.098	8	PVC	0.01	106	33.5	-0.4	
GM-GIS-RI_ssGM_1249	MH-GIS-RI_ssMH_2326	1,044.00	MH-GIS-RI_ssMH_2319	1,043.14	102.7	0.008	8	PVC	0.01	82	29.3	-0.5	
GM-GIS-RI_ssGM_1257	MH-GIS-RI_ssMH_2320	987.3	MH-GIS-CR_ssMH_2331	979.07	98.4	0.084	8	PVC	0.01	109	34.2	-0.4	
GM-GIS-RI_ssGM_1264	MH-GIS-RI_ssMH_2329	1,034.10	MH-GIS-RI_ssMH_2327	1,009.32	233.9	0.106	8	PVC	0.01	103	33.1	-0.4	
GM-GIS-RI_ssGM_1265	MH-GIS-RI_ssMH_2567	1,034.71	MH-GIS-RI_ssMH_2329	1,034.10	75	0.008	8	PVC	0.01	19	14	-0.6	
GM-GIS-RI_ssGM_1302	MH-GIS-RI_ssMH_2376	1,051.81	MH-GIS-RI_ssMH_2389	1,049.11	213.9	0.013	8	PVC	0.01	1	3.6	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-RI_ssGM_1303	MH-GIS-RI_ssMH_2389	1,049.11	MH-GIS-RI_ssMH_2366	1,048.11	52.9	0.019	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-RI_ssGM_1304	MH-GIS-RI_ssMH_2375	1,029.15	MH-GIS-RI_ssMH_2371	1,019.04	178.5	0.057	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-RI_ssGM_1305	MH-GIS-RI_ssMH_2371	1,019.04	MH-GIS-RI_ssMH_2384	1,014.00	142.3	0.035	8	PVC	0.01	6	8	-0.6	
GM-GIS-RI_ssGM_1306	MH-GIS-RI_ssMH_2384	1,014.00	MH-GIS-RI_ssMH_2381	1,010.84	138.8	0.023	8	PVC	0.01	10	10.2	-0.6	
GM-GIS-RI_ssGM_1307	MH-GIS-RI_ssMH_2377	1,003.28	MH-GIS-RI_ssMH_2378	992.3	95.6	0.115	8	PVC	0.01	29	17.4	-0.6	
GM-GIS-RI_ssGM_1308	MH-GIS-RI_ssMH_2373	1,023.44	MH-GIS-RI_ssMH_2371	1,019.04	85	0.052	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-RI_ssGM_1309	MH-GIS-RI_ssMH_2368	1,044.30	MH-GIS-RI_ssMH_2369	1,017.04	363.5	0.075	8	PVC	0.01	6	8	-0.6	
GM-GIS-RI_ssGM_1310	MH-GIS-RI_ssMH_2372	1,028.88	MH-GIS-RI_ssMH_2373	1,023.44	43.3	0.126	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-RI_ssGM_1311	MH-GIS-RI_ssMH_2374	1,040.14	MH-GIS-RI_ssMH_2372	1,028.88	144.1	0.078	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-RI_ssGM_1312	MH-GIS-RI_ssMH_2378	992.3	MH-GIS-RI_ssMH_2380	976.93	128.1	0.12	8	PVC	0.01	30	17.7	-0.5	
GM-GIS-RI_ssGM_1313	MH-GIS-RI_ssMH_2380	976.93	MH-GIS-CR_ssMH_2379	970.91	51.8	0.116	8	PVC	0.01	32	18.1	-0.5	
GM-GIS-RI_ssGM_1314	MH-GIS-RI_ssMH_2381	1,010.84	MH-GIS-RI_ssMH_2390	1,009.47	70.7	0.019	8	PVC	0.01	11	10.8	-0.6	
GM-GIS-RI_ssGM_1315	MH-GIS-RI_ssMH_2390	1,009.47	MH-GIS-RI_ssMH_2377	1,003.28	62.9	0.098	8	PVC	0.01	13	11.3	-0.6	
GM-GIS-RI_ssGM_1316	MH-GIS-RI_ssMH_2382	1,011.10	MH-GIS-RI_ssMH_2370	1,008.28	173.5	0.016	8	PVC	0.01	10	10.2	-0.6	
GM-GIS-RI_ssGM_1317	MH-GIS-RI_ssMH_2369	1,017.04	MH-GIS-RI_ssMH_2386	1,013.87	37.7	0.084	8	PVC	0.01	8	8.8	-0.6	
GM-GIS-RI_ssGM_1318	MH-GIS-RI_ssMH_2370	1,008.28	MH-GIS-RI_ssMH_2383	1,007.11	182	0.006	8	PVC	0.01	11	10.8	-0.6	
GM-GIS-RI_ssGM_1319	MH-GIS-RI_ssMH_2367	1,046.50	MH-GIS-RI_ssMH_2368	1,044.30	81.4	0.027	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-RI_ssGM_1320	MH-GIS-RI_ssMH_2366	1,048.11	MH-GIS-RI_ssMH_2367	1,046.50	162.4	0.01	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-RI_ssGM_1321	MH-GIS-RI_ssMH_2385	1,019.49	MH-GIS-RI_ssMH_2384	1,014.00	81.2	0.068	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-RI_ssGM_1322	MH-GIS-RI_ssMH_2386	1,013.87	MH-GIS-RI_ssMH_2382	1,011.10	71.9	0.039	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-RI_ssGM_1323	MH-GIS-RI_ssMH_2388	1,027.47	MH-GIS-RI_ssMH_2385	1,019.49	58.3	0.137	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-RI_ssGM_1324	MH-GIS-RI_ssMH_2391	1,000.58	MH-GIS-RI_ssMH_2377	1,003.28	88.8	-0.03	8	PVC	0.01	15	100	2.2	
GM-GIS-RI_ssGM_1325	MH-GIS-RI_ssMH_2383	1,007.11	MH-GIS-RI_ssMH_2387	1,000.16	291.1	0.024	8	PVC	0.01	13	11.3	-0.6	
GM-GIS-RI_ssGM_1326	MH-GIS-RI_ssMH_2387	1,000.16	MH-GIS-RI_ssMH_2391	1,000.58	44.8	-0.009	8	PVC	0.01	14	100	2.6	
GM-GIS-RI_ssGM_1327	MH-GIS-RI_ssMH_2392	1,037.74	MH-GIS-RI_ssMH_2396	1,030.17	175.3	0.043	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-RI_ssGM_1328	MH-GIS-RI_ssMH_2394	1,033.48	MH-GIS-RI_ssMH_2393	1,025.56	221	0.036	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-RI_ssGM_1329	MH-GIS-RI_ssMH_2566	1,032.26	MH-GIS-RI_ssMH_2395	1,034.00	142	-0.012	8	PVC	0.01	1	100	1.1	
GM-GIS-RI_ssGM_1330	MH-GIS-RI_ssMH_2395	1,034.00	MH-GIS-RI_ssMH_2394	1,033.48	43.7	0.012	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-RI_ssGM_1331	MH-GIS-RI_ssMH_2400	1,039.67	MH-GIS-RI_ssMH_2392	1,037.74	63	0.031	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-RI_ssGM_1332	MH-GIS-RI_ssMH_2399	1,037.54	MH-GIS-RI_ssMH_2392	1,037.74	77.9	-0.003	8	PVC	0.01	1	37.1	-0.4	
GM-GIS-RI_ssGM_1333	MH-GIS-RI_ssMH_2393	1,025.56	MH-GIS-RI_ssMH_2401	1,025.26	79.7	0.004	8	PVC	0.01	5	100	5	
GM-GIS-RI_ssGM_1334	MH-GIS-RI_ssMH_2401	1,025.26	MH-GIS-RI_ssMH_2404	1,026.47	33.5	-0.036	8	PVC	0.01	6	100	6.5	
GM-GIS-RI_ssGM_1335	MH-GIS-RI_ssMH_2397	1,027.19	MH-GIS-RI_ssMH_2567	1,034.71	256.3	-0.029	8	PVC	0.01	18	100	7.1	
GM-GIS-RI_ssGM_1336	MH-GIS-RI_ssMH_2398	1,033.56	MH-GIS-RI_ssMH_2396	1,030.17	81.7	0.042	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-RI_ssGM_1337	MH-GIS-RI_ssMH_2396	1,030.17	MH-GIS-RI_ssMH_2402	1,028.72	62.6	0.023	8	PVC	0.01	6	100	2.4	
GM-GIS-RI_ssGM_1338	MH-GIS-RI_ssMH_2402	1,028.72	MH-GIS-RI_ssMH_2403	1,028.11	119.1	0.005	8	PVC	0.01	15	100	3.8	
GM-GIS-RI_ssGM_1339	MH-GIS-RI_ssMH_2404	1,026.47	MH-GIS-RI_ssMH_2402	1,028.72	84.5	-0.027	8	PVC	0.01	8	100	6.1	
GM-GIS-RI_ssGM_1340	MH-GIS-RI_ssMH_2403	1,028.11	MH-GIS-RI_ssMH_2397	1,027.19	39.3	0.023	8	PVC	0.01	17	100	4.4	
GM-GIS-RW_ssGM_731	MH-GIS-RW_ssMH_1999	416.83	MH-GIS-RW_ssMH_1527	415.93	225.3	0.004	8	Concrete	0.013	9	11	-0.6	
GM-GIS-RW_ssGM_757	MH-GIS-RW_ssMH_1506	417.71	MH-IS-97	412.47	183	0.029	8	Concrete	0.013	35	18.9	-0.5	SM4
GM-GIS-RW_ssGM_758	MH-GIS-RW_ssMH_2019	417	MH-GIS-RW_ssMH_2018	416.02	278.1	0.004	8	Glass	0.013	2	6.1	-0.6	
GM-GIS-RW_ssGM_759	MH-GIS-RW_ssMH_2018	416.02	MH-IS-245	410.33	46.7	0.122	8	Concrete	0.013	5	6.9	-0.6	
GM-GIS-RW_ssGM_772	MH-GIS-RW_ssMH_1527	415.93	MH-GIS-RW_ssMH_1526	414.56	342.1	0.004	8	Concrete	0.013	17	15.3	-0.6	
GM-GIS-RW_ssGM_773	MH-GIS-RW_ssMH_1526	414.56	MH-IS-267	409.97	102.7	0.045	8	Concrete	0.013	26	16.4	-0.6	
GM-GIS-RW_ssGM_790	MH-GIS-RW_ssMH_1486	417.09	MH-GIS-RW_ssMH_1485	415.75	164.7	0.008	8	Concrete	0.013	53	23.6	-0.5	
GM-GIS-RW_ssGM_792	MH-GIS-RW_ssMH_1469	414.1	MH-GIS-RW_ssMH_1485	415.75	250.1	-0.007	8	Concrete	0.013	3	100	1.2	SM4
GM-GIS-RW_ssGM_793	MH-GIS-RW_ssMH_1502	416.26	MH-GIS-RW_ssMH_1487	416.66	173.4	-0.002	8	Concrete	0.013	41	100	0.4	
GM-GIS-RW_ssGM_794	MH-GIS-RW_ssMH_1487	416.66	MH-GIS-RW_ssMH_1486	417.09	126.5	-0.003	8	Concrete	0.013	50	100	0	
GM-GIS-RW_ssGM_795	MH-GIS-MH-203	418.22	MH-GIS-RW_ssMH_1487	416.66	220.3	0.007	8	Concrete	0.013	3	5.9	-0.6	

City of Snoqualmie
General Sewer Plan
SewerGEMS Results

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-RW_ssGM_796	MH-GIS-RW_ssMH_1488	414.61	MH-GIS-RW_ssMH_1487	416.66	419.1	-0.005	8	Concrete	0.013	3	100	2.1	SM4
GM-GIS-RW_ssGM_797	MH-GIS-RW_ssMH_2027	414.03	MH-GIS-RW_ssMH_2028	415.82	340	-0.005	8	Concrete	0.013	13	100	2.7	
GM-GIS-RW_ssGM_798	MH-GIS-RW_ssMH_2028	415.82	MH-GIS-RW_ssMH_1502	416.26	62.1	-0.007	8	Concrete	0.013	28	100	0.9	
GM-GIS-RW_ssGM_799	MH-GIS-RW_ssMH_1500	415.02	MH-GIS-RW_ssMH_1501	415.3	35.3	-0.008	8	PVC	0.01	9	100	1.7	
GM-GIS-RW_ssGM_800	MH-GIS-RW_ssMH_1501	415.3	MH-GIS-RW_ssMH_2028	415.82	127.5	-0.004	8	PVC	0.01	13	100	1.4	
GM-GIS-RW_ssGM_801	MH-GIS-RW_ssMH_1499	414	MH-GIS-RW_ssMH_1500	415.02	153.5	-0.007	8	PVC	0.01	6	100	2.7	
GM-GIS-RW_ssGM_803	MH-GIS-MH-208	415.42	MH-GIS-RW_ssMH_1498	414	352	0.004	8	Glass	0.013	9	11	-0.6	
GM-GIS-RW_ssGM_811	MH-GIS-RW_ssMH_2032	419	MH-GIS-RW_ssMH_2033	415.4	230.7	0.016	8	Concrete	0.013	13	11.3	-0.6	
GM-GIS-RW_ssGM_812	MH-GIS-RW_ssMH_2033	415.4	MH-GIS-RW_ssMH_2034	414	87.2	0.016	8	Concrete	0.013	22	15	-0.6	
GM-GIS-RW_ssGM_814	MH-GIS-RW_ssMH_2035	417.46	MH-GIS-RW_ssMH_2032	419	228.5	-0.007	8	Concrete	0.013	6	100	1	
GM-GIS-RW_ssGM_815	MH-GIS-MH-153	419	MH-GIS-RW_ssMH_2032	419	123.5	0	8	Concrete	0.013	3	15.5	-0.6	
GM-GIS-RW_ssGM_816	MH-GIS-MH-58	417.61	MH-GIS-RW_ssMH_2035	417.46	39.9	0.004	8	Glass	0.013	3	100	0.8	
GM-GIS-RW_ssGM_873	MH-GIS-RW_ssMH_2085	418.19	MH-GIS-RW_ssMH_2086	416.31	246	0.008	8	PVC	0.01	6	8	-0.6	
GM-GIS-RW_ssGM_874	MH-GIS-RW_ssMH_2086	416.31	MH-GIS-RW_ssMH_1502	416.26	83.6	6E-04	8	PVC	0.01	9	100	0.4	
GM-GIS-RW_ssGM_976	MH-GIS-RW_ssMH_2156	415.17	MH-GIS-RW_ssMH_2033	415.4	20.6	-0.011	8	PVC	0.01	6	50.1	-0.3	
GM-GIS-RW_ssGM_977	MH-GIS-RW_ssMH_2157	417.22	MH-GIS-RW_ssMH_2156	415.17	184.2	0.011	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-RW_ssGM_1006	MH-GIS-MH-181	417.73	MH-GIS-RW_ssMH_2085	418.19	154.4	-0.003	8	PVC	0.01	3	80.2	-0.1	
GM-GIS-RW_ssGM_1012	MH-GIS-RW_ssMH_2094	417.87	MH-GIS-RW_ssMH_2095	415.61	328.5	0.007	8	Concrete	0.013	17	13.4	-0.6	
GM-GIS-RW_ssGM_1032	MH-GIS-MH-35	414	MH-IS-1	413.11	23	0.039	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-RW_ssGM_1033	MH-GIS-RW_ssMH_1514	414.67	MH-GIS-MH-35	414	413.4	0.002	8	Concrete	0.013	9	13.6	-0.6	
GM-GIS-RW_ssGM_1103	MH-GIS-MH-15	414.08	MH-GIS-MH-11	414.05	4.5	0.007	8	PVC	0.01	6	100	2.6	
GM-GIS-RW_ssGM_1104	MH-GIS-RW_ssMH_2027	414.03	MH-GIS-MH-11	414.05	2.8	0.007	8	Concrete	0.013	9	100	2.7	
GM-GIS-RW_ssGM_1105	MH-GIS-MH-82	414	MH-GIS-RW_ssMH_1499	414	51.2	0	8	PVC	0.01	3	100	2.7	
GM-GIS-SC_ssGM_124	MH-GIS-SC_ssMH_1387	832.42	MH-GIS-SC_ssMH_1388	826.75	115.7	0.049	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_125	MH-GIS-SC_ssMH_1393	827.52	MH-GIS-SC_ssMH_1414	821.04	88.4	0.073	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_126	MH-GIS-SC_ssMH_1414	821.04	MH-GIS-SC_ssMH_1415	816.57	117.4	0.038	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_127	MH-GIS-SC_ssMH_1415	816.57	MH-GIS-SC_ssMH_1394	817.44	123.6	-0.007	8	PVC	0.01	7	100	2.5	
GM-GIS-SC_ssGM_128	MH-GIS-MH-64	823.45	MH-GIS-SC_ssMH_1413	818.04	42.7	0.127	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_129	MH-GIS-SC_ssMH_1409	837.73	MH-GIS-SC_ssMH_1410	826.59	124.1	0.09	8	PVC	0.01	40	20.3	-0.5	
GM-GIS-SC_ssGM_130	MH-GIS-SC_ssMH_1408	876.06	MH-GIS-SC_ssMH_1385	868.7	62	0.119	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_131	MH-GIS-SC_ssMH_1407	882.65	MH-GIS-SC_ssMH_1408	876.06	62.9	0.105	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_132	MH-GIS-SC_ssMH_1384	888.26	MH-GIS-SC_ssMH_1407	882.65	62.5	0.09	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-SC_ssGM_133	MH-GIS-SC_ssMH_1406	893.38	MH-GIS-SC_ssMH_1384	888.26	61.8	0.083	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_134	MH-GIS-SC_ssMH_1383	900.79	MH-GIS-SC_ssMH_1406	893.38	105	0.071	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_135	MH-GIS-SC_ssMH_1405	844.7	MH-GIS-SC_ssMH_1382	850.2	58.7	0.094	8	PVC	0.01	20	14.3	4.9	
GM-GIS-SC_ssGM_136	MH-GIS-SC_ssMH_1404	853.62	MH-GIS-SC_ssMH_1382	850.2	57.5	0.059	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_137	MH-GIS-SC_ssMH_1394	817.44	MH-GIS-SC_ssMH_1401	819.51	60.7	-0.034	8	PVC	0.01	33	100	1.6	
GM-GIS-SC_ssGM_138	MH-GIS-SC_ssMH_1412	821.98	MH-GIS-SC_ssMH_1401	819.51	98.4	0.025	8	PVC	0.01	46	22	-0.5	
GM-GIS-SC_ssGM_139	MH-GIS-SC_ssMH_1403	801.9	MH-GIS-SC_ssMH_1386	800.02	89.6	0.021	8	PVC	0.01	86	100	3.5	
GM-GIS-SC_ssGM_140	MH-GIS-SC_ssMH_1402	806.3	MH-GIS-SC_ssMH_1403	801.9	85.7	0.051	8	PVC	0.01	84	29.8	-0.5	
GM-GIS-SC_ssGM_141	MH-GIS-SC_ssMH_1401	819.51	MH-GIS-SC_ssMH_1402	806.3	135.3	0.098	8	PVC	0.01	82	29.4	-0.5	
GM-GIS-SC_ssGM_142	MH-GIS-SC_ssMH_1405	844.7	MH-GIS-SC_ssMH_1400	825.38	130.2	0.148	8	PVC	0.01	22	15.1	-0.6	
GM-GIS-SC_ssGM_143	MH-GIS-SC_ssMH_1400	825.38	MH-GIS-SC_ssMH_1394	817.44	96.3	0.082	8	PVC	0.01	24	15.8	-0.6	
GM-GIS-SC_ssGM_144	MH-GIS-SC_ssMH_1379	808.09	MH-GIS-SC_ssMH_1399	805.62	196.3	0.013	8	PVC	0.01	111	34.3	-0.4	
GM-GIS-SC_ssGM_146	MH-GIS-SC_ssMH_1399	805.62	MH-IS-147	790.4	124.5	0.122	8	PVC	0.01	283	56.1	-0.3	
GM-GIS-SC_ssGM_151	MH-GIS-SC_ssMH_1390	815.09	MH-GIS-SC_ssMH_1391	809	119	0.051	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_152	MH-GIS-SC_ssMH_1391	809	MH-IS-235	798.05	86.9	0.126	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_153	MH-GIS-SC_ssMH_1389	821.1	MH-GIS-SC_ssMH_1390	815.09	101.1	0.059	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-SC_ssGM_154	MH-GIS-SC_ssMH_1388	826.75	MH-GIS-SC_ssMH_1389	821.1	106	0.053	8	PVC	0.01	4	6.7	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-SC_ssGM_155	MH-GIS-SC_ssMH_1411	824	MH-GIS-SC_ssMH_1412	821.98	149.8	0.013	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-SC_ssGM_156	MH-GIS-SC_ssMH_1410	826.59	MH-GIS-SC_ssMH_1411	824	130.1	0.02	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-SC_ssGM_158	MH-GIS-SC_ssMH_1386	800.02	MH-GIS-SC_ssMH_1378	800.92	127.1	-0.007	8	PVC	0.01	88	100	6.3	
GM-GIS-SC_ssGM_159	MH-GIS-SC_ssMH_1385	868.7	MH-GIS-SC_ssMH_1382	850.2	167	0.111	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-SC_ssGM_160	MH-GIS-SC_ssMH_1373	860.98	MH-GIS-SC_ssMH_1404	853.62	158.8	0.046	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_162	MH-GIS-SC_ssMH_1378	800.92	MH-GIS-SC_ssMH_1381	806.03	218.6	-0.023	8	PVC	0.01	91	100	6.9	
GM-GIS-SC_ssGM_163	MH-GIS-SC_ssMH_1381	806.03	MH-GIS-SC_ssMH_1380	805.45	127.1	0.005	8	PVC	0.01	93	100	1.8	
GM-GIS-SC_ssGM_164	MH-GIS-SC_ssMH_1380	805.45	MH-GIS-SC_ssMH_1379	808.09	138.7	-0.019	8	PVC	0.01	95	100	2.3	
GM-GIS-SC_ssGM_165	MH-GIS-SC_ssMH_1377	812.62	MH-GIS-SC_ssMH_1379	808.09	137.7	0.033	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-SC_ssGM_166	MH-GIS-SC_ssMH_1376	817.41	MH-GIS-SC_ssMH_1377	812.62	119.1	0.04	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_167	MH-GIS-SC_ssMH_1375	823.01	MH-GIS-SC_ssMH_1376	817.41	255.8	0.022	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_168	MH-GIS-SC_ssMH_1374	818.18	MH-GIS-SC_ssMH_1375	823.01	220.3	-0.022	8	PVC	0.01	7	100	4.3	
GM-GIS-SC_ssGM_169	MH-GIS-SC_ssMH_1413	818.04	MH-GIS-SC_ssMH_1374	818.18	168.6	-8E-04	8	PVC	0.01	4	100	4.4	
GM-GIS-SF_ssGM_186	MH-GIS-SF_ssMH_2138	441.25	MH-GIS-SF_ssMH_1574	441.02	84.7	0.003	8	Concrete	0.013	93	39.7	-0.4	
GM-GIS-SF_ssGM_187	MH-GIS-SF_ssMH_1574	441.02	MH-GIS-SF_ssMH_1575	438.75	461.7	0.005	8	Concrete	0.013	96	34.3	-0.4	
GM-GIS-SF_ssGM_188	MH-GIS-SF_ssMH_1575	438.75	MH-GIS-SF_ssMH_1576	438.31	233.1	0.002	8	Concrete	0.013	99	44.9	-0.4	
GM-GIS-SF_ssGM_879	MH-GIS-SF_ssMH_1450	417.9	MH-GIS-SF_ssMH_1447	416.32	98.7	0.016	10	Glass	0.013	49	17	-0.7	
GM-GIS-SF_ssGM_880	MH-GIS-SF_ssMH_1449	419.28	MH-GIS-SF_ssMH_1450	417.9	179	0.008	10	Glass	0.013	23	11.6	-0.7	
GM-GIS-SF_ssGM_881	MH-GIS-SF_ssMH_1447	410.46	IPPS Wetwell	400.65	77.2	0.127	14	Glass	0.013	223	24	-0.9	
GM-GIS-SF_ssGM_882	MH-GIS-SF_ssMH_2088	429.06	MH-IS-27	424.37	121.1	0.039	8	PVC	0.01	106	33.6	-0.4	
GM-GIS-SF_ssGM_951	MH-GIS-MH-24	428.63	MH-GIS-SF_ssMH_1449	424.58	13.2	0.307	10	Ductile Iron	0.013	3	3.9	-0.8	
GM-GIS-SF_ssGM_952	MH-GIS-MH-202	430.39	MH-GIS-MH-190	429.57	206.8	0.004	8	PVC	0.01	3	5.5	-0.6	
GM-GIS-SF_ssGM_953	MH-GIS-MH-190	429.57	MH-GIS-MH-83	428.92	162.1	0.004	8	PVC	0.01	5	7.6	-0.6	
GM-GIS-SF_ssGM_954	MH-GIS-MH-83	428.92	MH-GIS-MH-84	428.71	51.9	0.004	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-SF_ssGM_955	MH-GIS-MH-134	429.8	MH-GIS-SF_ssMH_2137	429.41	98.6	0.004	8	PVC	0.01	3	5.5	-0.6	
GM-GIS-SF_ssGM_956	MH-GIS-SF_ssMH_2137	429.41	MH-GIS-MH-84	428.71	174.2	0.004	8	PVC	0.01	5	7.6	-0.6	
GM-GIS-SF_ssGM_957	MH-GIS-MH-84	428.71	MH-GIS-SF_ssMH_2136	424.95	169	0.022	8	PVC	0.01	15	12.6	-0.6	
GM-GIS-SF_ssGM_958	MH-GIS-SF_ssMH_2136	424.95	MH-GIS-SF_ssMH_1449	424.28	139	0.005	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-SF_ssGM_959	MH-GIS-SF_ssMH_2149	477.68	MH-GIS-SF_ssMH_2148	476.43	12.3	0.101	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-SF_ssGM_960	MH-GIS-SF_ssMH_2148	476.43	MH-GIS-SF_ssMH_2147	471.41	67	0.075	8	PVC	0.01	36	19.4	-0.5	
GM-GIS-SF_ssGM_961	MH-GIS-SF_ssMH_2147	471.41	MH-GIS-SF_ssMH_2146	461.32	244.6	0.041	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-SF_ssGM_962	MH-GIS-SF_ssMH_2146	461.32	MH-GIS-SF_ssMH_2145	459.29	35.8	0.057	8	PVC	0.01	42	20.8	-0.5	
GM-GIS-SF_ssGM_963	MH-GIS-SF_ssMH_2145	459.29	MH-GIS-SF_ssMH_2141	457.36	36.5	0.053	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-SF_ssGM_964	MH-GIS-SF_ssMH_2141	457.36	MH-GIS-SF_ssMH_2140	451.88	23.7	0.231	8	PVC	0.01	86	30.1	-0.5	
GM-GIS-SF_ssGM_965	MH-GIS-SF_ssMH_2140	451.88	MH-GIS-SF_ssMH_2139	443.69	35.4	0.231	8	Concrete	0.013	88	30.6	-0.5	
GM-GIS-SF_ssGM_966	MH-GIS-SF_ssMH_2139	443.69	MH-GIS-SF_ssMH_2138	441.25	341.2	0.007	8	Concrete	0.013	91	31	-0.5	
GM-GIS-SF_ssGM_967	MH-GIS-SF_ssMH_2144	458.32	MH-GIS-SF_ssMH_2143	458.08	61.3	0.004	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-SF_ssGM_968	MH-GIS-SF_ssMH_2143	458.08	MH-GIS-SF_ssMH_2142	457.95	32.3	0.004	8	PVC	0.01	36	19.4	-0.5	
GM-GIS-SF_ssGM_969	MH-GIS-SF_ssMH_2142	457.95	MH-GIS-SF_ssMH_2141	457.36	108.4	0.005	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-SF_ssGM_1057(1)	MH-GIS-SF_ssMH_1451	419.29	MH-GIS-MH-69	419.11	31.1	0.006	10	Glass	0.013	8	7.2	-0.8	
GM-GIS-SF_ssGM_1057(2)(1)	MH-GIS-MH-69	419.11	MH-GIS-MH-63	418.7	73.7	0.006	10	Glass	0.013	13	9.2	-0.8	
GM-GIS-SF_ssGM_1057(2)(2)(1)	MH-GIS-MH-63	418.7	MH-GIS-MH-67	418.13	99.4	0.006	10	Glass	0.013	18	10.8	-0.7	
GM-GIS-SF_ssGM_1057(2)(2)(2)	MH-GIS-MH-67	418.13	MH-GIS-SF_ssMH_1450	417.9	41.1	0.006	10	Glass	0.013	23	12.1	-0.7	
GM-GIS-SF_ssGM_1058	MH-GIS-SF_ssMH_1452	423.36	MH-GIS-SF_ssMH_1451	423.29	17	0.004	8	Glass	0.013	5	8.5	-0.6	
GM-GIS-SF_ssGM_1059	MH-GIS-MH-66	419	MH-GIS-MH-67	418.13	44.6	0.019	8	Glass	0.013	3	5.1	-0.6	
GM-GIS-SF_ssGM_1060	MH-GIS-MH-68	419.29	MH-GIS-MH-69	419.11	45.6	0.004	8	Glass	0.013	3	6.2	-0.6	
GM-GIS-SF_ssGM_1061	MH-GIS-MH-62	419	MH-GIS-MH-63	418.7	43	0.007	8	Glass	0.013	3	5.4	-0.6	
GM-GIS-SF_ssGM_1062	MH-GIS-SF_ssMH_1452	423.36	MH-GIS-SF_ssMH_2224	423.37	3	0.004	8	Glass	0.013	3	7.2	-0.6	
GM-GIS-SF_ssGM_1065	MH-GIS-MH-94	427.82	MH-IS-27	424.37	61.4	0.056	8	PVC	0.01	57	24.5	-0.5	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-SF_ssGM_1067	MH-GIS-MH-72	431.47	MH-GIS-SF_ssMH_2088	429.06	47.5	0.051	8	Glass	0.013	3	5.1	-0.6	
GM-GIS-SF_ssGM_1079	MH-GIS-SF_ssMH_1576	438.31	MH-GIS-SF_ssMH_2088	429.06	123.5	0.075	8	Concrete	0.013	101	32.8	-0.4	
GM-GIS-ST_ssGM_425	MH-GIS-MH-183	855.01	MH-GIS-ST_ssMH_1545	857.37	157.3	-0.015	8	PVC	0.01	1	100	7.7	
GM-GIS-ST_ssGM_426	MH-GIS-ST_ssMH_1548	860.52	MH-GIS-ST_ssMH_1546	859	76.6	0.02	8	PVC	0.01	18	100	2.2	
GM-GIS-ST_ssGM_427	MH-GIS-ST_ssMH_1547	856.62	MH-GIS-ST_ssMH_1546	859	136.9	-0.017	8	PVC	0.01	3	100	6.1	
GM-GIS-ST_ssGM_428	MH-GIS-MH-118	855.03	MH-GIS-ST_ssMH_1547	856.62	78.3	-0.02	8	PVC	0.01	1	100	6.9	
GM-GIS-ST_ssGM_429	MH-GIS-ST_ssMH_1546	859	MH-GIS-ST_ssMH_1545	857.37	140.4	0.012	8	PVC	0.01	22	100	3.7	
GM-GIS-ST_ssGM_430	MH-GIS-MH-158	859.17	MH-GIS-ST_ssMH_1545	857.37	129.6	0.014	8	PVC	0.01	1	100	3.5	
GM-GIS-ST_ssGM_431	MH-GIS-ST_ssMH_1545	857.37	MH-GIS-ST_ssMH_1544	859	146	-0.011	8	PVC	0.01	25	100	6.7	
GM-GIS-ST_ssGM_432	MH-GIS-MH-71	857.99	MH-GIS-ST_ssMH_1543	858.72	45	-0.016	8	PVC	0.01	1	100	6.1	
GM-GIS-ST_ssGM_433	MH-GIS-MH-161	854.41	MH-GIS-ST_ssMH_1549	857.28	134.8	-0.021	8	PVC	0.01	1	100	8.2	
GM-GIS-ST_ssGM_434	MH-GIS-ST_ssMH_1549	857.28	MH-GIS-ST_ssMH_1551	859.25	122.2	-0.016	8	PVC	0.01	3	100	5.4	
GM-GIS-ST_ssGM_435	MH-GIS-ST_ssMH_1550	857.16	MH-GIS-ST_ssMH_1551	859.25	176.8	-0.012	8	PVC	0.01	1	100	5.5	
GM-GIS-ST_ssGM_436	MH-GIS-ST_ssMH_1551	859.25	MH-GIS-ST_ssMH_1548	860.52	98.6	-0.013	8	PVC	0.01	5	100	3.5	
GM-GIS-ST_ssGM_437	MH-GIS-ST_ssMH_1556	870.35	MH-GIS-ST_ssMH_1554	865.14	151.1	0.034	8	PVC	0.01	6	8	-0.6	
GM-GIS-ST_ssGM_438	MH-GIS-ST_ssMH_1557	873.32	MH-GIS-ST_ssMH_1556	870.35	103.9	0.029	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-ST_ssGM_439	MH-GIS-ST_ssMH_1558	875.23	MH-GIS-ST_ssMH_1557	873.32	103.4	0.018	8	PVC	0.01	4	6.2	-0.6	
GM-GIS-ST_ssGM_440	MH-GIS-ST_ssMH_1560	882.81	MH-GIS-ST_ssMH_1559	877.89	159.8	0.031	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-ST_ssGM_441	MH-GIS-ST_ssMH_1559	877.89	MH-GIS-ST_ssMH_1558	875.23	106.9	0.025	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-ST_ssGM_442	MH-GIS-ST_ssMH_1555	871.37	MH-GIS-ST_ssMH_1554	865.14	264.7	0.024	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-ST_ssGM_443	MH-GIS-ST_ssMH_1548	860.52	MH-GIS-ST_ssMH_1552	861.96	96.3	0.015	8	PVC	0.01	11	100	2.2	
GM-GIS-ST_ssGM_444	MH-GIS-ST_ssMH_1553	864	MH-GIS-ST_ssMH_1552	861.96	112.2	0.018	8	PVC	0.01	10	10.2	-0.6	
GM-GIS-ST_ssGM_445	MH-GIS-ST_ssMH_1554	865.14	MH-GIS-ST_ssMH_1553	864	141.7	0.008	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-ST_ssGM_446	MH-GIS-ST_ssMH_1542	864	MH-GIS-ST_ssMH_1541	863.36	251.8	0.003	8	PVC	0.01	32	100	1.7	
GM-GIS-ST_ssGM_447	MH-GIS-ST_ssMH_1543	858.72	MH-GIS-ST_ssMH_1542	864	63	-0.084	8	PVC	0.01	30	100	6.9	
GM-GIS-ST_ssGM_448	MH-GIS-MH-157	862.37	MH-GIS-ST_ssMH_1544	859	128.5	0.026	8	PVC	0.01	1	100	1.7	
GM-GIS-ST_ssGM_449	MH-GIS-ST_ssMH_1544	859	MH-GIS-ST_ssMH_1543	858.72	178.5	0.002	8	PVC	0.01	28	100	5.1	
GM-GIS-TH_ssGM_145	MH-GIS-MH-205	810.83	MH-GIS-SC_ssMH_1399	805.62	257.5	0.02	8	PVC	0.01	170	43	-0.4	
GM-GIS-TH_ssGM_1341	MH-GIS-TH_ssMH_2410	832.92	MH-GIS-TH_ssMH_2411	845.81	261.2	-0.049	8	PVC	0.01	4	100	12.5	
GM-GIS-TH_ssGM_1342	MH-GIS-TH_ssMH_2409	831.23	MH-GIS-TH_ssMH_2410	832.92	85.5	-0.02	8	PVC	0.01	2	100	7	
GM-GIS-TH_ssGM_1343	MH-GIS-TH_ssMH_2411	845.81	MH-GIS-TH_ssMH_2427	845.8	117.2	9E-05	8	PVC	0.01	35	35.8	-0.4	
GM-GIS-TH_ssGM_1344	MH-GIS-TH_ssMH_2412	847.58	MH-GIS-TH_ssMH_2411	845.81	36.7	0.048	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-TH_ssGM_1345	MH-GIS-TH_ssMH_2414	827.68	MH-GIS-TH_ssMH_2406	822.5	238.3	0.022	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1346	MH-GIS-TH_ssMH_2405	814	MH-GIS-TH_ssMH_2407	814	129.2	0	8	PVC	0.01	2	100	2.8	
GM-GIS-TH_ssGM_1347	MH-GIS-TH_ssMH_2408	818.97	MH-GIS-TH_ssMH_2407	814	237.6	0.021	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-TH_ssGM_1348	MH-GIS-TH_ssMH_2406	822.5	MH-GIS-TH_ssMH_2408	818.97	219.6	0.016	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1349	MH-GIS-TH_ssMH_2415	824	MH-GIS-TH_ssMH_2416	819	239.9	0.021	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1350	MH-GIS-TH_ssMH_2416	819	MH-GIS-TH_ssMH_2417	819	71.4	0	8	PVC	0.01	4	100	3	
GM-GIS-TH_ssGM_1351	MH-GIS-TH_ssMH_2417	819	MH-GIS-TH_ssMH_2418	816.63	84	0.028	8	PVC	0.01	7	100	3	
GM-GIS-TH_ssGM_1352	MH-GIS-TH_ssMH_2407	814	MH-GIS-TH_ssMH_2419	814	171.7	0	8	PVC	0.01	11	100	2.8	
GM-GIS-TH_ssGM_1353	MH-GIS-TH_ssMH_2450	887.77	MH-GIS-TH_ssMH_2449	883.57	209	0.02	8	PVC	0.01	22	15.1	-0.6	
GM-GIS-TH_ssGM_1354	MH-GIS-TH_ssMH_2423	867.07	MH-GIS-TH_ssMH_2424	862.29	356	0.013	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1355	MH-GIS-TH_ssMH_2424	862.29	MH-GIS-TH_ssMH_2444	861.48	53.6	0.015	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1356	MH-GIS-TH_ssMH_2426	851.47	MH-GIS-TH_ssMH_2509	829	339.7	0.066	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1357	MH-GIS-TH_ssMH_2419	814	MH-GIS-TH_ssMH_2420	812.28	95.3	0.018	8	PVC	0.01	13	100	2.8	
GM-GIS-TH_ssGM_1358	MH-GIS-TH_ssMH_2418	816.63	MH-GIS-TH_ssMH_2421	817.85	62.8	-0.019	8	PVC	0.01	31	100	6.5	
GM-GIS-TH_ssGM_1359	MH-GIS-TH_ssMH_2421	817.85	MH-GIS-TH_ssMH_2429	817.77	109.3	7E-04	8	PVC	0.01	33	100	5.3	
GM-GIS-TH_ssGM_1360	MH-GIS-TH_ssMH_2429	817.77	MH-GIS-MH-127	824	199.8	-0.031	8	PVC	0.01	35	100	7.6	
GM-GIS-TH_ssGM_1361	MH-GIS-TH_ssMH_2436	878.25	MH-GIS-MH-122	882.33	165.9	-0.025	8	PVC	0.01	44	100	3.7	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-TH_ssGM_1362	MH-GIS-TH_ssMH_2430	874	MH-GIS-TH_ssMH_2436	878.25	265.8	-0.016	8	PVC	0.01	42	100	7.9	
GM-GIS-TH_ssGM_1363	MH-GIS-TH_ssMH_2431	874	MH-GIS-TH_ssMH_2430	874	62.3	0	8	PVC	0.01	40	100	5.3	
GM-GIS-TH_ssGM_1364	MH-GIS-TH_ssMH_2448	880.86	MH-GIS-TH_ssMH_2431	874	233.9	0.029	8	PVC	0.01	38	19.7	-0.5	
GM-GIS-TH_ssGM_1365	MH-GIS-TH_ssMH_2433	889.23	MH-GIS-TH_ssMH_2432	883.44	165.9	0.035	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-TH_ssGM_1366	MH-GIS-TH_ssMH_2434	891.21	MH-GIS-TH_ssMH_2433	889.23	60.7	0.033	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-TH_ssGM_1367	MH-GIS-TH_ssMH_2447	852.59	MH-GIS-TH_ssMH_2411	845.81	181.1	0.037	8	PVC	0.01	22	15.1	-0.6	
GM-GIS-TH_ssGM_1368	MH-GIS-TH_ssMH_2451	889	MH-GIS-TH_ssMH_2434	891.21	150.2	-0.015	8	PVC	0.01	4	100	1.6	
GM-GIS-TH_ssGM_1369	MH-GIS-TH_ssMH_2413	851.14	MH-GIS-TH_ssMH_2412	847.58	101	0.035	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1370	MH-GIS-TH_ssMH_2420	812.28	MH-GIS-TH_ssMH_2428	811.46	71	0.012	8	PVC	0.01	15	100	4.5	
GM-GIS-TH_ssGM_1371	MH-GIS-TH_ssMH_2428	811.46	MH-GIS-TH_ssMH_2437	813.12	87.5	-0.019	8	PVC	0.01	18	100	7	
GM-GIS-TH_ssGM_1372	MH-GIS-TH_ssMH_2438	814	MH-GIS-TH_ssMH_2418	816.63	164.2	-0.016	8	PVC	0.01	22	100	8	
GM-GIS-TH_ssGM_1373	MH-GIS-TH_ssMH_2437	813.12	MH-GIS-TH_ssMH_2438	814	71.7	-0.012	8	PVC	0.01	20	100	6.2	
GM-GIS-TH_ssGM_1374	MH-GIS-TH_ssMH_2439	851.96	MH-GIS-TH_ssMH_2413	851.14	87.8	0.009	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1375	MH-GIS-TH_ssMH_2442	862.25	MH-GIS-TH_ssMH_2443	859.08	180.9	0.018	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-TH_ssGM_1376	MH-GIS-TH_ssMH_2441	863.07	MH-GIS-TH_ssMH_2442	862.25	48	0.017	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1377	MH-GIS-TH_ssMH_2440	865.19	MH-GIS-TH_ssMH_2441	863.07	53.8	0.039	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1378	MH-GIS-TH_ssMH_2445	862.69	MH-GIS-TH_ssMH_2444	861.48	101.3	0.012	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1379	MH-GIS-TH_ssMH_2446	866.93	MH-GIS-TH_ssMH_2445	862.69	116.3	0.036	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1380	MH-GIS-TH_ssMH_2444	861.48	MH-GIS-TH_ssMH_2443	859.08	57.1	0.042	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-TH_ssGM_1381	MH-GIS-TH_ssMH_2443	859.08	MH-GIS-TH_ssMH_2447	852.59	148.8	0.044	8	PVC	0.01	20	14.3	-0.6	
GM-GIS-TH_ssGM_1382	MH-GIS-TH_ssMH_2449	883.57	MH-GIS-TH_ssMH_2448	880.86	161	0.017	8	PVC	0.01	24	15.8	-0.6	
GM-GIS-TH_ssGM_1383	MH-GIS-TH_ssMH_2432	883.44	MH-GIS-TH_ssMH_2448	880.86	77.1	0.033	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-TH_ssGM_1384	MH-GIS-MH-102	888.77	MH-GIS-TH_ssMH_2450	887.77	125.1	0.008	8	PVC	0.01	20	14.3	-0.6	
GM-GIS-TH_ssGM_1385	MH-GIS-TH_ssMH_2422	818.06	MH-GIS-MH-107	817.34	113.5	0.006	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1386	MH-GIS-TH_ssMH_2425	853.07	MH-GIS-MH-59	852.02	244.7	0.004	8	PVC	0.01	2	5	-0.6	
GM-GIS-TH_ssGM_1387	MH-GIS-TH_ssMH_2435	892.75	MH-GIS-TH_ssMH_2451	889	240.4	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-TH_ssGM_1388	MH-GIS-TH_ssMH_2427	845.8	MH-GIS-MH-119	845.1	150.8	0.005	8	PVC	0.01	38	19.7	-0.5	
GM-GIS-TH_ssGM_1389	MH-GIS-TH_ssMH_2454	822.12	MH-GIS-TH_ssMH_2452	816.34	144.8	0.04	8	PVC	0.01	162	41.9	-0.4	
GM-GIS-TH_ssGM_1390	MH-GIS-TH_ssMH_2457	829	MH-GIS-TH_ssMH_2453	824	231.3	0.022	8	PVC	0.01	117	35.4	-0.4	
GM-GIS-TH_ssGM_1391	MH-GIS-TH_ssMH_2452	816.34	MH-GIS-MH-205	810.83	158.4	0.035	8	PVC	0.01	168	42.7	-0.4	
GM-GIS-TH_ssGM_1392	MH-GIS-TH_ssMH_2458	881.69	MH-GIS-TH_ssMH_2465	867.84	238.2	0.058	8	PVC	0.01	49	22.5	-0.5	
GM-GIS-TH_ssGM_1393	MH-GIS-TH_ssMH_2456	863.88	MH-GIS-TH_ssMH_2459	854.04	157.3	0.063	8	PVC	0.01	53	23.5	-0.5	
GM-GIS-TH_ssGM_1394	MH-GIS-MH-107	817.34	MH-GIS-TH_ssMH_2452	816.34	71.8	0.014	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1395	MH-GIS-MH-59	852.02	MH-GIS-TH_ssMH_2464	851.09	39.9	0.023	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-TH_ssGM_1396	MH-GIS-TH_ssMH_2509	829	MH-GIS-TH_ssMH_2457	829	43.6	0	8	PVC	0.01	4	35.4	-0.4	
GM-GIS-TH_ssGM_1397	MH-GIS-TH_ssMH_2464	851.09	MH-GIS-TH_ssMH_2460	842.8	136.1	0.061	8	PVC	0.01	62	25.5	-0.5	
GM-GIS-TH_ssGM_1398	MH-GIS-MH-119	845.1	MH-GIS-TH_ssMH_2460	842.8	78.7	0.029	8	PVC	0.01	40	20.3	-0.5	
GM-GIS-TH_ssGM_1399	MH-GIS-MH-127	824	MH-GIS-TH_ssMH_2453	824	85.7	0	8	PVC	0.01	38	100	1.4	
GM-GIS-TH_ssGM_1400	MH-GIS-TH_ssMH_2462	829.3	MH-GIS-TH_ssMH_2457	829	204.4	0.001	8	PVC	0.01	111	44.5	-0.4	
GM-GIS-TH_ssGM_1401	MH-GIS-TH_ssMH_2463	829	MH-GIS-TH_ssMH_2462	829.3	152	-0.002	8	PVC	0.01	108	100	0	
GM-GIS-TH_ssGM_1402	MH-GIS-TH_ssMH_2459	854.04	MH-GIS-TH_ssMH_2464	851.09	49.3	0.06	8	PVC	0.01	55	24	-0.5	
GM-GIS-TH_ssGM_1403	MH-GIS-TH_ssMH_2465	867.84	MH-GIS-TH_ssMH_2456	863.88	68.1	0.058	8	PVC	0.01	51	23.1	-0.5	
GM-GIS-TH_ssGM_1404	MH-GIS-MH-122	882.33	MH-GIS-TH_ssMH_2458	881.69	83.1	0.008	8	PVC	0.01	46	22	-0.5	
GM-GIS-TH_ssGM_1405	MH-GIS-TH_ssMH_2466	825.56	MH-GIS-TH_ssMH_2454	822.12	400.2	0.009	8	PVC	0.01	159	41.5	-0.4	
GM-GIS-TH_ssGM_1406	MH-GIS-TH_ssMH_2453	824	MH-GIS-TH_ssMH_2466	825.56	214.6	-0.007	8	PVC	0.01	157	100	1.4	
GM-GIS-TH_ssGM_1407	MH-GIS-TH_ssMH_2460	842.8	MH-GIS-TH_ssMH_2461	837.94	79.3	0.061	8	PVC	0.01	104	33.3	-0.4	
GM-GIS-TH_ssGM_1408	MH-GIS-TH_ssMH_2461	837.94	MH-GIS-TH_ssMH_2463	829	173.6	0.052	8	PVC	0.01	106	33.6	-0.4	
GM-GIS-TH_ssGM_1409	MH-GIS-MH-96	891.26	MH-GIS-TH_ssMH_2467	889.56	60.3	0.028	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-TH_ssGM_1410	MH-GIS-TH_ssMH_2468	886.14	MH-GIS-TH_ssMH_2467	889.56	115.7	-0.03	8	PVC	0.01	2	100	2.8	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-TH_ssGM_1411	MH-GIS-TH_ssMH_2467	889.56	MH-GIS-MH-102	888.77	65.6	0.012	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-TH_ssGM_1412	MH-GIS-MH-39	899.81	MH-GIS-MH-40	899.01	27.4	0.029	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-TH_ssGM_1413	MH-GIS-TH_ssMH_2508	895.72	MH-GIS-MH-96	891.26	227.1	0.02	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-TH_ssGM_1414	MH-GIS-MH-40	899.01	MH-GIS-TH_ssMH_2508	895.72	166.5	0.02	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-TH_ssGM_1415	MH-GIS-TH_ssMH_2469	899.48	MH-GIS-MH-39	899.81	94.7	-0.003	8	PVC	0.01	4	61.7	-0.3	
GM-GIS-TH_ssGM_1416	MH-GIS-TH_ssMH_2470	900.98	MH-GIS-TH_ssMH_2469	899.48	61.6	0.024	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-WC_ssGM_30	MH-GIS-WC_ssMH_1443	584.4	MH-GIS-WC_ssMH_1444	576.86	105.9	0.071	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-WC_ssGM_31	MH-GIS-WC_ssMH_1430	568.76	MH-GIS-WC_ssMH_1444	576.86	119.6	-0.068	8	PVC	0.01	7	100	9.8	
GM-GIS-WC_ssGM_32	MH-GIS-WC_ssMH_1438	586.92	MH-GIS-WC_ssMH_1443	584.4	113	0.022	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-WC_ssGM_33	MH-GIS-WC_ssMH_1444	576.86	MH-GIS-KR_ssMH_1445	579.09	178.7	-0.012	8	PVC	0.01	12	100	1.7	
GM-GIS-WC_ssGM_37	MH-GIS-MH-152	645.99	MH-GIS-WC_ssMH_1433	638.58	120.9	0.061	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_38	MH-GIS-WC_ssMH_1432	627.41	MH-GIS-WC_ssMH_1434	616.89	337.6	0.031	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-WC_ssGM_39	MH-GIS-WC_ssMH_1433	638.58	MH-GIS-WC_ssMH_1432	627.41	257.8	0.043	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-WC_ssGM_40	MH-GIS-WC_ssMH_1437	570.16	MH-GIS-WC_ssMH_1430	568.76	272.9	0.005	8	PVC	0.01	6	100	3.9	
GM-GIS-WC_ssGM_41	MH-GIS-MH-170	634.14	MH-GIS-WC_ssMH_1446	626.21	147.1	0.054	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_42	MH-GIS-WC_ssMH_1446	626.21	MH-GIS-WC_ssMH_1440	607.87	280.7	0.065	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-WC_ssGM_43	MH-GIS-WC_ssMH_1440	607.87	MH-GIS-WC_ssMH_1438	586.92	304	0.069	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-WC_ssGM_44	MH-GIS-WC_ssMH_1436	600.59	MH-GIS-WC_ssMH_1437	570.16	340.3	0.089	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-WC_ssGM_45	MH-GIS-WC_ssMH_1435	611.95	MH-GIS-WC_ssMH_1436	600.59	130.7	0.087	8	PVC	0.01	5	7	-0.6	
GM-GIS-WC_ssGM_46	MH-GIS-WC_ssMH_1434	616.89	MH-GIS-WC_ssMH_1435	611.95	85.2	0.058	8	PVC	0.01	4	6.4	-0.6	
GM-GIS-WC_ssGM_47	MH-GIS-MH-120	629.37	MH-GIS-WC_ssMH_1432	627.41	79.5	0.025	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_108	MH-GIS-WC_ssMH_1561	651.21	MH-IS-107	644.73	77.8	0.083	8	PVC	0.01	1	2.9	-0.6	
GM-IS-2	MH-IS-276	849.3	MH-IS-205	845.9	150.7	0.023	10	PVC	0.01	70	20.4	-0.7	
GM-IS-3	MH-IS-221	840.61	MH-IS-223	839.61	174.8	0.006	10	PVC	0.01	109	25.6	-0.6	
GM-IS-4	MH-IS-201	841.44	MH-IS-221	840.61	69.9	0.012	10	PVC	0.01	108	25.5	-0.6	
GM-IS-5	MH-IS-229	834.38	MH-IS-233	831.11	247	0.013	10	PVC	0.01	112	25.9	-0.6	
GM-IS-6	MH-IS-225	838.58	MH-IS-227	835.69	254.9	0.011	10	PVC	0.01	110	25.8	-0.6	
GM-IS-7	MH-IS-223	839.61	MH-IS-225	838.58	237.4	0.004	10	PVC	0.01	110	25.7	-0.6	
GM-IS-8	MH-IS-234	862.31	MH-IS-243	858.19	164.3	0.025	10	PVC	0.01	44	16.1	-0.7	
GM-IS-9	MH-IS-227	835.69	MH-IS-229	834.38	95.6	0.014	10	PVC	0.01	111	25.9	-0.6	
GM-IS-10	MH-IS-251	855.2	MH-IS-261	853.85	164.5	0.008	10	PVC	0.01	45	16.4	-0.7	
GM-IS-11	MH-IS-243	858.19	MH-IS-251	855.2	188.2	0.016	10	PVC	0.01	45	16.2	-0.7	
GM-IS-12	MH-IS-269	850.48	MH-IS-276	849.3	264.6	0.004	10	PVC	0.01	47	16.6	-0.7	
GM-IS-13	MH-IS-261	853.85	MH-IS-269	850.48	285.6	0.012	10	PVC	0.01	46	16.5	-0.7	
GM-IS-14	MH-IS-203	843.68	MH-IS-201	841.44	159.9	0.014	10	PVC	0.01	87	22.8	-0.6	
GM-IS-15	MH-IS-211	869.29	MH-IS-234	862.31	166	0.042	10	PVC	0.01	41	15.6	-0.7	
GM-IS-16	MH-IS-185	875.33	MH-IS-211	869.29	249.3	0.024	10	PVC	0.01	41	15.5	-0.7	
GM-IS-17	MH-IS-146	876.12	MH-IS-185	875.33	147.9	0.005	10	Ductile Iron	0.013	40	16	-0.7	
GM-IS-18	MH-IS-18	799.57	MH-IS-235	798.05	144.3	0.011	12	PVC	0.01	52	13.9	-0.9	
GM-IS-19	MH-IS-147	790.4	PSLWW	789.9	57.6	0.009	12	PVC	0.01	355	37.2	-0.6	
GM-IS-20	MH-IS-186	794.7	MH-IS-147	790.4	84.3	0.051	12	PVC	0.01	70	16.1	-0.8	
GM-IS-21	MH-IS-212	795.56	MH-IS-186	794.7	81.7	0.011	12	PVC	0.01	67	15.9	-0.8	
GM-IS-22	MH-IS-235	798.05	MH-IS-212	795.56	92	0.027	12	PVC	0.01	65	15.6	-0.8	
GM-IS-23	MH-IS-3	797.17	MH-IS-117	796.57	128.5	0.005	12	PVC	0.01	6	4.9	-1	
GM-IS-28	MH-IS-187	422.69	MH-IS-213	420.51	310.9	0.007	12	PVC	0.01	169	25.3	-0.7	
GM-IS-29	MH-IS-27	424.37	MH-IS-187	422.69	270.5	0.006	12	PVC	0.01	166	25.1	-0.7	
GM-IS-30	MH-IS-39	847.91	MH-IS-290	832.16	182.5	0.086	12	PVC	0.01	613	49.4	-0.5	
GM-IS-31	MH-IS-233	831.11	MH-IS-249	830.76	39.8	0.009	10	PVC	0.01	119	26.7	-0.6	
GM-IS-32	MH-IS-249	830.76	MH-IS-126	830.14	295.5	0.002	10	PVC	0.01	128	31.8	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-33	MH-IS-40	811.95	MH-IS-36	792.15	132.2	0.15	12	PVC	0.01	632	50.2	-0.5	
GM-IS-34	MH-IS-290	832.16	MH-IS-31	830.87	241	0.005	12	PVC	0.01	614	49.5	-0.5	
GM-IS-35	MH-IS-31	830.87	MH-IS-32	829.81	139.4	0.008	12	PVC	0.01	615	49.5	-0.5	
GM-IS-36	MH-IS-32	829.81	MH-IS-33	827.47	336.3	0.007	12	PVC	0.01	616	49.5	-0.5	
GM-IS-37	MH-IS-33	827.47	MH-IS-35	824.02	225.5	0.015	12	PVC	0.01	616	49.6	-0.5	
GM-IS-38	MH-IS-35	824.02	MH-IS-40	811.95	301.4	0.04	12	PVC	0.01	617	49.6	-0.5	
GM-IS-39	MH-IS-36	792.15	MH-IS-37	788.58	65.5	0.054	12	PVC	0.01	633	50.2	-0.5	
GM-IS-40	MH-IS-37	788.58	MH-IS-38	767.46	126.7	0.167	12	PVC	0.01	633	50.3	-0.5	
GM-IS-42	MH-IS-MH-3	801.7	MH-GIS-DH_ssMH_1627	801.8	292	-3E-04	10	PVC	0.01	48	45.5	-0.5	
GM-IS-43	MH-IS-MH-4	873	MH-IS-46	869.81	399.4	0.008	12	PVC	0.01	457	42.4	-0.6	
GM-IS-44	MH-IS-43	861.48	MH-IS-44	849.46	145.7	0.083	12	PVC	0.01	463	42.7	-0.6	
GM-IS-45	MH-IS-44	849.46	MH-IS-39	847.91	70.6	0.022	12	PVC	0.01	464	42.7	-0.6	
GM-IS-46	MH-IS-46	869.81	MH-IS-43	861.48	366.7	0.023	12	PVC	0.01	458	42.4	-0.6	
GM-IS-47(1)	MH-IS-198	779.52	MH-IS-MH-210	778.16	18.4	0.074	10	PVC	0.01	586	61.3	-0.3	
GM-IS-47(2)	MH-IS-MH-210	778.16	MH-IS-195	775.63	34.1	0.074	10	PVC	0.01	589	61.4	-0.3	
GM-IS-48	MH-IS-MH-5	825.27	MH-IS-54	819.68	193.9	0.029	10	PVC	0.01	597	61.9	-0.3	
GM-IS-49	MH-IS-49	804.65	MH-IS-51	801.25	273	0.012	10	PVC	0.01	66	19.8	-0.7	
GM-IS-50	MH-IS-51	801.25	MH-IS-50	797.44	305.3	0.012	10	PVC	0.01	67	20	-0.7	
GM-IS-51	MH-IS-54	819.68	MH-IS-61	800.77	221.8	0.085	10	PVC	0.01	598	62	-0.3	
GM-IS-52	MH-IS-50	797.44	MH-IS-198	779.52	269.6	0.066	10	PVC	0.01	71	20.6	-0.7	
GM-IS-53	MH-IS-195	775.63	PSBPWW	775.63	45.7	0	10	PVC	0.01	590	88.3	-0.1	
GM-IS-54	MH-IS-59	828.09	MH-IS-58	819.51	192.3	0.045	10	PVC	0.01	57	18.4	-0.7	
GM-IS-55	MH-IS-53	830.15	MH-IS-59	828.09	188.3	0.011	10	PVC	0.01	56	18.2	-0.7	
GM-IS-56	MH-IS-58	819.51	MH-IS-60	809.95	383.8	0.025	10	PVC	0.01	61	19	-0.7	
GM-IS-57	MH-IS-60	809.95	MH-IS-49	804.65	214.5	0.025	10	PVC	0.01	62	19.2	-0.7	
GM-IS-58	MH-IS-64	788.27	MH-IS-65	770.15	350.9	0.052	10	Ductile Iron	0.013	602	62.1	-0.3	
GM-IS-59	MH-IS-63	796.38	MH-IS-64	788.27	45.8	0.177	10	Ductile Iron	0.013	601	62.1	-0.3	
GM-IS-60	MH-IS-61	800.77	MH-IS-62	799.18	294.1	0.005	10	Ductile Iron	0.013	599	69.5	-0.3	
GM-IS-61	MH-IS-65	770.15	MH-IS-116	769.83	183.2	0.002	10	Ductile Iron	0.013	602	100	0.2	
GM-IS-63	MH-IS-62	799.18	MH-IS-63	796.38	321.1	0.009	10	Ductile Iron	0.013	600	62	-0.3	
GM-IS-64(1)	MH-IS-152	852.91	MH-IS-BP_ssMH_2512	837.33	197.1	0.079	10	PVC	0.01	48	16.9	-0.7	
GM-IS-64(2)	MH-IS-BP_ssMH_2512	837.33	MH-IS-67	832.9	282.2	0.016	10	PVC	0.01	50	17.1	-0.7	
GM-IS-66	MH-IS-67	832.9	MH-IS-53	830.15	327.8	0.008	10	PVC	0.01	51	17.3	-0.7	
GM-IS-67	MH-IS-69	876.77	MH-IS-146	876.12	109.3	0.006	10	Ductile Iron	0.013	39	15.4	-0.7	
GM-IS-68	MH-IS-70	866.12	MH-IS-71	858.15	228.3	0.035	10	Ductile Iron	0.013	42	15.7	-0.7	
GM-IS-69	MH-IS-71	858.15	MH-IS-152	852.91	245.9	0.021	10	Ductile Iron	0.013	47	16.6	-0.7	
GM-IS-70	MH-IS-294	409.13	MH-IS-230	408.12	139.2	0.007	12	PVC	0.01	1	62.8	-0.4	
GM-IS-71	MH-IS-72	415.04	MH-IS-230	408.12	240.6	0.029	15	PVC	0.01	1,550	60	-0.5	
GM-IS-72	MH-IS-77	422.01	MH-IS-72	415.04	250	0.028	15	PVC	0.01	1,549	60	-0.5	
GM-IS-73	MH-IS-MH-2	408.8	MH-IS-232	406.2	302.4	0.009	36	Concrete	0.013	3,257	28.3	-2.2	
GM-IS-74	MH-IS-230	408.12	MH-IS-MH-2	408.8	32.2	-0.021	24	Concrete	0.013	1,552	81.9	-0.4	
GM-IS-75	MH-IS-81	438.64	MH-IS-78	430.27	309.1	0.027	15	PVC	0.01	1,548	59.9	-0.5	
GM-IS-76	MH-IS-82	448.73	MH-IS-81	438.64	294.7	0.034	15	PVC	0.01	1,545	59.9	-0.5	
GM-IS-77	MH-IS-76	491.15	MH-IS-75	479.82	294.7	0.038	15	PVC	0.01	1,541	59.8	-0.5	
GM-IS-78	MH-IS-74	465.04	MH-IS-82	448.73	296.4	0.055	15	PVC	0.01	1,543	59.8	-0.5	
GM-IS-79	MH-IS-75	479.82	MH-IS-74	465.04	275	0.054	15	PVC	0.01	1,542	59.8	-0.5	
GM-IS-80	MH-IS-78	430.27	MH-IS-77	422.01	303.5	0.027	15	PVC	0.01	1,548	60	-0.5	
GM-IS-81	MH-IS-128	510.28	MH-IS-84	509.54	45.6	0.016	12	PVC	0.01	62	15.2	-0.8	
GM-IS-82	MH-IS-154	499.58	MH-IS-121	498.94	147.4	0.004	12	PVC	0.01	5	10.8	-0.9	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-83	MH-IS-84	509.54	MH-IS-121	498.94	356.1	0.03	15	PVC	0.01	1,534	59.7	-0.5	
GM-IS-84	MH-IS-83	573.01	MH-IS-87	563.08	301	0.033	15	PVC	0.01	1,468	58.3	-0.5	
GM-IS-85	MH-IS-87	563.08	MH-IS-86	543.15	300	0.066	15	PVC	0.01	1,469	58.3	-0.5	
GM-IS-86	MH-IS-86	543.15	MH-IS-85	525.48	251.4	0.07	15	PVC	0.01	1,470	58.3	-0.5	
GM-IS-87	MH-IS-85	525.48	MH-IS-84	509.54	296.7	0.054	15	PVC	0.01	1,471	58.4	-0.5	
GM-IS-88	MH-IS-48	588.13	MH-IS-99	587.49	150.6	0.004	12	PVC	0.01	40	12.2	-0.9	
GM-IS-89	MH-IS-90	583.48	MH-IS-89	577.39	235.4	0.026	15	PVC	0.01	1,454	58	-0.5	
GM-IS-90	MH-IS-99	587.49	MH-IS-90	583.48	306.8	0.013	15	PVC	0.01	1,453	58	-0.5	
GM-IS-91	MH-IS-101	594.05	MH-IS-99	587.49	246	0.027	15	PVC	0.01	1,412	57.1	-0.5	
GM-IS-92	MH-IS-89	577.39	MH-IS-83	573.01	316.6	0.014	15	PVC	0.01	1,467	58.3	-0.5	
GM-IS-93	MH-IS-121	498.94	MH-IS-76	491.15	268.4	0.029	15	PVC	0.01	1,540	59.8	-0.5	
GM-IS-94	MH-IS-112	687.28	MH-IS-111	668.45	304.2	0.062	15	PVC	0.01	1,388	56.6	-0.5	
GM-IS-95	MH-IS-113	708.48	MH-IS-112	687.28	306.5	0.069	15	PVC	0.01	1,387	56.6	-0.5	
GM-IS-96	MH-IS-117	796.57	MH-IS-116	769.83	386.7	0.069	15	PVC	0.01	145	17.6	-1	
GM-IS-97	MH-IS-118	807.25	MH-IS-117	796.57	109.3	0.098	12	PVC	0.01	136	22.7	-0.8	
GM-IS-98	MH-IS-119	829.53	MH-IS-118	807.25	297.4	0.075	12	PVC	0.01	136	22.6	-0.8	
GM-IS-99	MH-IS-120	850.27	MH-IS-119	829.53	297.3	0.07	12	PVC	0.01	6	4.6	-1	
GM-IS-100	MH-IS-123	863.89	MH-IS-120	850.27	318.5	0.043	12	PVC	0.01	5	4.2	-1	
GM-IS-101	MH-IS-124	870.98	MH-IS-123	863.89	227.3	0.031	12	PVC	0.01	2	3	-1	
GM-IS-102	MH-IS-125	874.79	MH-IS-124	870.98	247.6	0.015	12	PVC	0.01	2	2.4	-1	
GM-IS-103	MH-IS-129	645.79	MH-IS-107	644.73	147.5	0.007	12	PVC	0.01	19	8.3	-0.9	
GM-IS-104	MH-IS-296	797.56	MH-IS-117	796.57	70.4	0.014	12	PVC	0.01	1	1.7	-1	
GM-IS-105	MH-IS-116	769.83	MH-IS-115	750.98	298.9	0.063	15	PVC	0.01	748	41	-0.7	
GM-IS-106	MH-IS-291	874.15	MH-IS-125	874.79	46.8	-0.014	12	PVC	0.01	1	67.3	-0.3	
GM-IS-107	MH-IS-111	668.45	MH-IS-108	657.51	300.5	0.036	15	PVC	0.01	1,389	56.6	-0.5	
GM-IS-108	MH-IS-108	657.51	MH-IS-107	644.73	299.4	0.043	15	PVC	0.01	1,389	56.7	-0.5	
GM-IS-109	MH-IS-107	644.73	MH-IS-106	632.04	300.6	0.042	15	PVC	0.01	1,410	57.1	-0.5	
GM-IS-110	MH-IS-106	632.04	MH-IS-105	612.67	299.9	0.065	15	PVC	0.01	1,410	57.1	-0.5	
GM-IS-111	MH-IS-115	750.98	MH-IS-114	728.11	298.5	0.077	15	PVC	0.01	1,385	56.6	-0.5	
GM-IS-112	MH-IS-114	728.11	MH-IS-113	708.48	305.3	0.064	15	PVC	0.01	1,386	56.6	-0.5	
GM-IS-113	MH-IS-126	830.14	MH-IS-119	829.53	121.4	0.005	12	PVC	0.01	129	22.1	-0.8	
GM-IS-114	MH-IS-127	755.09	MH-IS-115	750.98	63.4	0.065	12	PVC	0.01	637	50.4	-0.5	
GM-IS-115	MH-IS-102	756.47	MH-IS-127	755.09	85.5	0.016	12	PVC	0.01	636	50.4	-0.5	
GM-IS-116	MH-IS-105	612.67	MH-IS-101	594.05	299.6	0.062	15	PVC	0.01	1,411	57.1	-0.5	
GM-IS-117	MH-IS-214	408.1	MH-IS-188	407.79	51	0.006	10	Concrete	0.013	17	10.1	-0.7	SM4
GM-IS-118	MH-IS-188	407.79	MH-IS-148	404.7	143.4	0.022	10	Concrete	0.013	24	11.7	-0.7	SM4
GM-IS-119	MH-IS-238	409.5	MH-IS-214	408.1	378.8	0.004	10	Concrete	0.013	9	8.8	-0.8	
GM-IS-120	MH-IS-148	404.7	MH-IS-145	404.12	72.9	0.008	10	Concrete	0.013	66	19.8	-0.7	SM4
GM-IS-121	MH-IS-145	404.12	MH-IS-144	403.08	80.2	0.013	10	Concrete	0.013	68	20.1	-0.7	SM4
GM-IS-122	MH-IS-144	403.08	PS2WW	399.5	22.6	0.159	10	Concrete	0.013	78	21.5	-0.7	SM4
GM-IS-124	MH-IS-192	405.19	PS1WW	401	69.8	0.06	18	PVC	0.01	1,702	49.6	-0.8	SM3A
GM-IS-125	MH-IS-242	406.96	MH-IS-218	405.44	302.2	0.005	18	PVC	0.01	1,667	49.1	-0.8	SM3A
GM-IS-126	MH-IS-218	405.44	MH-IS-192	405.19	294	9E-04	18	PVC	0.01	1,676	70.6	-0.4	SM3A
GM-IS-127	MH-IS-248	408.21	MH-IS-242	406.96	304.1	0.004	18	PVC	0.01	1,658	49	-0.8	SM3A
GM-IS-128	MH-IS-245	410.33	MH-IS-238	409.5	339.2	0.002	10	Concrete	0.013	7	8.4	-0.8	
GM-IS-130	MH-IS-162	413.59	MH-IS-156	413.09	173.5	0.003	12	Concrete	0.013	428	50	-0.5	
GM-IS-131	MH-IS-278	412.1	MH-IS-271	410.4	374.1	0.005	12	Concrete	0.013	445	44.8	-0.6	
GM-IS-132	MH-IS-156	413.09	MH-IS-278	412.1	264.7	0.004	12	Concrete	0.013	437	46.7	-0.5	
GM-IS-134	MH-IS-140	409.52	MH-IS-256	408.25	330.5	0.004	18	PVC	0.01	1,632	48.5	-0.8	SM3A

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-135	MH-IS-256	408.25	MH-IS-248	408.21	330.4	1E-04	18	PVC	0.01	1,641	83.1	-0.3	SM3A
GM-IS-136	MH-IS-MH-6	414.56	MH-IS-267	409.97	156.9	0.029	10	Concrete	0.013	87	22.7	-0.6	
GM-IS-137	MH-IS-134	408.52	MH-IS-193	407.54	156	0.006	10	Concrete	0.013	132	28.2	-0.6	
GM-IS-139	MH-IS-193	407.54	MH-IS-155	406.97	73.7	0.008	10	Concrete	0.013	390	49.5	-0.4	
GM-IS-140	MH-IS-155	406.97	PS3WW	402.5	38.7	0.116	10	Concrete	0.013	393	49.7	-0.4	
GM-IS-141	MH-IS-136	409.7	MH-IS-134	408.52	183.2	0.006	10	Concrete	0.013	126	27.6	-0.6	
GM-IS-142	MH-IS-167	414.72	MH-IS-162	413.59	394.7	0.003	12	Concrete	0.013	419	49.4	-0.5	
GM-IS-143	MH-IS-170	415.38	MH-IS-167	414.72	402.9	0.002	12	Concrete	0.013	410	57.7	-0.4	
GM-IS-144	MH-IS-172	416.48	MH-IS-170	415.38	421.1	0.003	12	Concrete	0.013	402	49.5	-0.5	SM3B
GM-IS-145	MH-IS-138	409.59	MH-IS-136	409.7	170.6	-6E-04	10	Concrete	0.013	116	63.4	-0.3	
GM-IS-146	MH-IS-139	410.69	MH-IS-138	409.59	287.4	0.004	10	Concrete	0.013	110	28.8	-0.6	
GM-IS-147	MH-IS-30	415.33	MH-IS-168	415.07	234.8	0.001	12	PVC	0.01	813	87.1	-0.1	SM1A
GM-IS-148	MH-IS-28	415.51	MH-IS-30	415.38	32	0.004	12	PVC	0.01	795	71.4	-0.3	SM1A
GM-IS-149	MH-IS-26	415.99	MH-IS-28	415.52	243.8	0.002	12	PVC	0.01	786	71.4	-0.3	SM1A
GM-IS-150	MH-IS-24	416.67	MH-IS-26	415.99	247.7	0.003	12	PVC	0.01	778	62.5	-0.4	SM1B
GM-IS-151	MH-IS-23	417.17	MH-IS-24	416.67	121	0.004	12	PVC	0.01	751	55	-0.5	SM1B
GM-IS-152	MH-IS-21	417.29	MH-IS-23	417.17	10.7	0.011	12	PVC	0.01	743	54.7	-0.5	SM1B
GM-IS-153	MH-IS-19	418.18	MH-IS-21	417.29	400.3	0.002	12	PVC	0.01	734	64.6	-0.4	SM1B
GM-IS-154	MH-IS-14	419.81	MH-IS-19	418.18	399.8	0.004	12	PVC	0.01	725	54	-0.5	SM1C
GM-IS-155	MH-IS-122	420.49	MH-IS-14	419.81	271.6	0.003	12	PVC	0.01	717	61	-0.4	SM1C
GM-IS-156	MH-IS-110	420.69	MH-IS-122	420.49	37.8	0.005	10	PVC	0.01	708	67.6	-0.3	
GM-IS-157	MH-IS-98	421.68	MH-IS-110	420.69	269.9	0.004	10	PVC	0.01	699	74.4	-0.2	
GM-IS-158	MH-IS-80	422.48	MH-IS-98	421.68	122	0.007	10	PVC	0.01	690	66.7	-0.3	
GM-IS-162	MH-IS-213	410.46	MH-GIS-SF_ssMH_1447	410.46	125.9	0	48	Glass	0.013	171	8.6	-3.7	
GM-IS-166	MH-IS-266	415.38	MH-IS-253	412.61	351	0.008	10	Concrete	0.013	9	7.4	-0.8	
GM-IS-167	MH-IS-253	412.61	MH-IS-137	411.83	356.6	0.002	10	Concrete	0.013	63	25	-0.6	
GM-IS-168	MH-IS-260	419.11	MH-IS-259	418.07	388.7	0.003	10	Concrete	0.013	3	5.6	-0.8	
GM-IS-169	MH-IS-259	418.07	MH-SUR-5103	416.7	121.3	0.011	10	Concrete	0.013	6	6	-0.8	
GM-IS-170(1)	MH-IS-135	409.66	MH-IS-GS_ssMH_1480	408.77	316.2	0.003	10	Concrete	0.013	85	27.2	-0.6	SM4
GM-IS-171	MH-IS-237	410.7	MH-IS-135	409.66	244	0.004	10	Concrete	0.013	76	23.2	-0.6	
GM-IS-172	MH-IS-137	411.83	MH-IS-237	410.7	353.6	0.003	10	Concrete	0.013	72	24.4	-0.6	SM4
GM-IS-174	MH-IS-0	414.12	MH-IS-253	412.61	403.5	0.004	10	Concrete	0.013	50	19.6	-0.7	
GM-IS-175	MH-IS-257	414.64	MH-IS-0	414.12	186.8	0.003	10	Concrete	0.013	47	20.3	-0.7	
GM-IS-185	MH-IS-274	415.08	MH-IS-266	415.38	300.2	-1E-03	10	Concrete	0.013	3	46.3	-0.4	
GM-IS-187(1)	MH-SUR-5103	416.7	MH-SUR-5001	414.95	586.6	0.003	10	Concrete	0.013	9	9.2	-0.8	
GM-IS-187(2)	MH-SUR-5001	414.95	MH-IS-257	414.64	53.7	0.006	10	Concrete	0.013	13	9	-0.8	
GM-IS-191	MH-IS-232	406.2	KCPSWW	405.5	50.1	0.014	36	Concrete	0.013	3,257	28.3	-2.2	
GM-IS-192	MH-IS-168	414.99	MH-IS-166	414.65	213.7	0.002	12	PVC	0.01	821	78.3	-0.2	
GM-IS-193	MH-IS-166	414.65	MH-IS-161	413.96	200.6	0.003	12	PVC	0.01	830	60.5	-0.4	
GM-IS-194	MH-IS-161	413.96	MH-IS-1	413.11	256.6	0.003	12	PVC	0.01	839	61.7	-0.4	
GM-IS-198	MH-IS-132	430.98	MH-IS-57	425.87	109.1	0.047	10	PVC	0.01	324	45	-0.5	
GM-IS-199	MH-IS-4	435.34	MH-IS-132	430.98	200.3	0.022	10	PVC	0.01	316	44.3	-0.5	
GM-IS-200	MH-IS-5	436.69	MH-IS-4	435.34	150.2	0.009	10	PVC	0.01	307	43.7	-0.5	
GM-IS-201	MH-IS-6	446.59	MH-IS-5	436.69	299.9	0.033	10	PVC	0.01	298	43	-0.5	
GM-IS-202	MH-IS-7	454.62	MH-IS-6	446.59	271.1	0.03	10	PVC	0.01	289	42.4	-0.5	
GM-IS-203	MH-IS-8	461.15	MH-IS-7	454.62	331.7	0.02	10	PVC	0.01	281	41.7	-0.5	
GM-IS-204	MH-IS-9	462.21	MH-IS-8	461.15	263.7	0.004	10	Ductile Iron	0.013	272	46.2	-0.4	
GM-IS-205	MH-IS-10	462.79	MH-IS-9	462.21	184.3	0.003	10	Ductile Iron	0.013	263	48.6	-0.4	
GM-IS-206	MH-IS-11	463.53	MH-IS-10	462.79	260.7	0.003	10	Ductile Iron	0.013	255	49.2	-0.4	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-207	MH-IS-12	464.55	MH-IS-11	463.53	301.3	0.003	10	PVC	0.01	246	39.6	-0.5	
GM-IS-208	MH-IS-13	465.69	MH-IS-12	464.55	286.9	0.004	10	PVC	0.01	237	38.2	-0.5	
GM-IS-209	MH-IS-16	465.97	MH-IS-13	465.69	190.1	0.001	10	Ductile Iron	0.013	228	56.4	-0.4	
GM-IS-302	MH-IS-205	845.9	MH-IS-203	843.68	158.3	0.014	10	PVC	0.01	77	21.4	-0.7	
GM-IS-306	MH-IS-38	767.46	MH-IS-102	756.47	256.2	0.043	12	PVC	0.01	635	50.4	-0.5	
GM-IS-500	MH-IS-1	413.11	MH-IS-96	412.74	165.9	0.002	12	PVC	0.01	865	72.6	-0.3	
GM-IS-501	MH-IS-96	412.74	MH-IS-95	411.63	253.7	0.004	12	PVC	0.01	908	60.7	-0.4	
GM-IS-502	MH-IS-95	411.63	MH-IS-94	411.22	254.7	0.002	15	PVC	0.01	917	56.2	-0.5	
GM-IS-503	MH-IS-94	411.22	MH-IS-93	410.62	358.1	0.002	15	PVC	0.01	978	57.6	-0.5	
GM-IS-504	MH-IS-93	410.62	MH-IS-92	409.88	276.6	0.003	15	PVC	0.01	987	50.5	-0.6	
GM-IS-505	MH-IS-92	409.88	MH-IS-140	409.52	236.8	0.002	18	PVC	0.01	1,117	48.1	-0.8	
GM-IS-506	MH-IS-267	409.97	MH-IS-92	409.88	18	0.005	15	PVC	0.01	121	50.7	-0.6	
GM-IS-507	MH-IS-97	412.47	MH-IS-94	411.22	158.6	0.008	10	Concrete	0.013	52	17.6	-0.7	SM4
GM-IS-508	MH-IS-275	417.67	MH-IS-97	412.47	203.5	0.026	10	Concrete	0.013	9	7.1	-0.8	
GM-IS-509(1)	MH-GIS-DT_ssMH_2513	414.27	MH-IS-277	413.81	32.9	0.014	10	Concrete	0.013	9	7.1	-0.8	
GM-RD-SSGM-CO-6	GM-RD-MH-7	902.6	MH-GIS-NJ_ssMH_2565	895.08	195.7	0.038	12		0.013	116	20.9	-0.8	
GM-RD-SSGM-CO-7	GM-RD-MH-8	909.76	GM-RD-MH-7	902.6	223	0.032	12		0.013	115	20.8	-0.8	
GM-RD-SSGM-CO-8	GM-RD-MH-9	910.89	GM-RD-MH-8	909.76	54.1	0.021	12		0.013	97	19	-0.8	
GM-RD-SSGM-CO-9	GM-RD-MH-10	920.14	GM-RD-MH-9	910.89	217.2	0.043	12		0.013	95	18.9	-0.8	
GM-RD-SSGM-CO-10	GM-RD-MH-11	928.71	GM-RD-MH-10	920.14	99.4	0.086	12		0.013	94	18.8	-0.8	
GM-RD-SSGM-CO-11	GM-RD-MH-11	928.71	GM-RD-MH-12	955.39	204.3	0.131	12		0.013	60	14.9	25.8	
GM-RD-SSGM-CO-12	GM-RD-MH-12	955.39	GM-RD-MH-13	973.11	125.1	0.142	12		0.013	58	14.7	16.9	
GM-RD-SSGM-CO-13	GM-RD-MH-13	973.11	GM-RD-MH-14	980.3	57.9	0.124	12		0.013	22	8.9	6.3	
GM-RD-SSGM-CO-14	GM-RD-MH-14	980.3	GM-RD-MH-15	1,011.97	230.2	0.138	12		0.013	20	8.7	30.8	
GM-RD-SSGM-CO-15	GM-RD-MH-15	1,011.97	GM-RD-MH-16	1,025.99	104.2	0.135	12		0.013	19	8.4	13.1	
GM-RD-SSGM-CO-16	GM-RD-MH-16	1,025.99	GM-RD-MH-17	1,043.99	150	0.12	12		0.013	18	8.1	17.1	
GM-RD-SSGM-CO-17	GM-RD-MH-17	1,043.99	GM-RD-MH-18	1,053.31	89.7	0.104	12		0.013	17	7.8	8.4	
GM-RD-SSGM-CO-18	GM-RD-MH-18	1,053.31	GM-RD-MH-19	1,065.28	121.3	0.099	12		0.013	15	7.5	11	
GM-RD-SSGM-CO-19	GM-RD-MH-19	1,065.28	GM-RD-MH-20	1,090.77	317.5	0.08	12		0.013	6	4.8	24.5	
GM-RD-SSGM-CO-20	GM-RD-MH-20	1,090.77	GM-RD-MH-21	1,092.07	86.3	0.015	8		0.013	5	7.2	0.7	
GM-RD-SSGM-CO-21	GM-RD-MH-21	1,092.07	GM-RD-MH-22	1,106.43	133.2	0.108	8		0.013	4	6.2	13.7	
GM-RD-SSGM-CO-22	GM-RD-MH-22	1,106.43	GM-RD-MH-23	1,119.30	193.9	0.066	8		0.013	3	5.1	12.2	
GM-RD-SSGM-CO-23	GM-RD-MH-23	1,119.30	GM-RD-MH-24	1,128.16	217.4	0.041	8		0.013	1	3.6	8.2	
GM-RD-SSGM-CO-24	GM-RD-MH-25	1,128.84	GM-RD-MH-26	1,126.66	170	0.013	8		0.013	3	5.1	-0.6	
GM-RD-SSGM-CO-25	GM-RD-MH-26	1,126.66	GM-RD-MH-27	1,115.27	187.2	0.061	8		0.013	4	6.2	-0.6	
GM-RD-SSGM-CO-26	GM-RD-MH-27	1,115.27	GM-RD-MH-28	1,044.72	264.2	0.267	8		0.013	5	7.2	-0.6	
GM-RD-SSGM-CO-27	GM-RD-MH-28	1,044.72	GM-RD-MH-29	1,026.74	124.6	0.144	8		0.013	6	8	-0.6	
GM-RD-SSGM-CO-28	GM-RD-MH-29	1,026.74	GM-RD-MH-30	1,018.26	68.8	0.123	8		0.013	8	8.8	-0.6	
GM-RD-SSGM-CO-29	GM-RD-MH-30	1,018.26	GM-RD-MH-31	1,006.12	259	0.047	8		0.013	10	10.2	-0.6	
GM-RD-SSGM-CO-30	GM-RD-MH-31	1,006.12	GM-RD-MH-32	999.84	80.1	0.078	8		0.013	28	17	-0.6	
GM-RD-SSGM-CO-31	GM-RD-MH-32	999.84	GM-RD-MH-33	994	75	0.078	8		0.013	29	17.4	-0.6	
GM-RD-SSGM-CO-32	GM-RD-MH-33	994	GM-RD-MH-34	989	71.9	0.07	8		0.013	30	17.7	-0.5	
GM-RD-SSGM-CO-33	GM-RD-MH-34	989	GM-RD-MH-35	983.13	219.9	0.027	8		0.013	32	18.1	-0.5	
GM-RD-SSGM-CO-34	GM-RD-MH-35	983.13	GM-RD-MH-36	979.25	64.8	0.06	8		0.013	33	18.5	-0.5	
GM-RD-SSGM-CO-35	GM-RD-MH-36	979.25	GM-RD-MH-37	973.65	81.8	0.068	8		0.013	34	18.9	-0.5	
GM-RD-SSGM-CO-36	GM-RD-MH-37	973.65	GM-RD-MH-13	973.11	55.4	0.01	8		0.013	36	19.2	-0.5	
GM-RD-SSGM-CO-37	GM-RD-MH-38	1,018.43	GM-RD-MH-30	1,018.26	88.7	0.002	8		0.013	1	5.3	-0.6	
GM-RD-SSGM-CO-38	GM-RD-MH-39	1,073.12	GM-RD-MH-40	1,069.72	58.7	0.058	8		0.013	1	3.6	-0.6	
GM-RD-SSGM-CO-39	GM-RD-MH-40	1,069.72	GM-RD-MH-41	1,067.73	67.4	0.03	8		0.013	3	5.1	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-RD-SSGM-CO-40	GM-RD-MH-41	1,067.73	GM-RD-MH-42	1,064.52	194.6	0.016	8		0.013	4	6.2	-0.6	
GM-RD-SSGM-CO-41	GM-RD-MH-42	1,064.52	GM-RD-MH-43	1,045.23	230.8	0.084	8		0.013	11	10.8	-0.6	
GM-RD-SSGM-CO-42	GM-RD-MH-43	1,045.23	GM-RD-MH-44	1,036.63	67.3	0.128	8		0.013	13	11.3	-0.6	
GM-RD-SSGM-CO-43	GM-RD-MH-44	1,036.63	GM-RD-MH-45	1,025.54	81.4	0.136	8		0.013	14	11.9	-0.6	
GM-RD-SSGM-CO-44	GM-RD-MH-45	1,025.54	GM-RD-MH-46	1,015.06	80.5	0.13	8		0.013	15	12.5	-0.6	
GM-RD-SSGM-CO-45	GM-RD-MH-46	1,015.06	GM-RD-MH-31	1,006.12	139.9	0.064	8		0.013	17	13	-0.6	
GM-RD-SSGM-CO-46	GM-RD-MH-47	1,109.18	GM-RD-MH-48	1,098.20	120	0.091	8		0.013	1	3.6	-0.6	
GM-RD-SSGM-CO-47	GM-RD-MH-48	1,098.20	GM-RD-MH-49	1,084.11	175.3	0.08	8		0.013	3	5.1	-0.6	
GM-RD-SSGM-CO-48	GM-RD-MH-49	1,084.11	GM-RD-MH-50	1,072.16	112.2	0.107	8		0.013	4	6.2	-0.6	
GM-RD-SSGM-CO-49	GM-RD-MH-50	1,072.16	GM-RD-MH-51	1,067.51	71.6	0.065	8		0.013	5	7.2	-0.6	
GM-RD-SSGM-CO-50	GM-RD-MH-51	1,067.51	GM-RD-MH-42	1,064.52	83.4	0.036	8		0.013	6	8	-0.6	
GM-RD-SSGM-CO-51	GM-RD-MH-11	928.71	GM-RD-MH-52	932.05	49.2	0.068	12		0.013	33	11	2.5	
GM-RD-SSGM-CO-52	GM-RD-MH-52	932.05	GM-RD-MH-53	942.75	83.4	0.128	8		0.013	32	18.1	10.2	
GM-RD-SSGM-CO-53	GM-RD-MH-53	942.75	GM-RD-MH-54	941.38	109.6	-0.013	8		0.013	30	100	-0.5	
GM-RD-SSGM-CO-54	GM-RD-MH-54	941.38	GM-RD-MH-55	945.93	125.1	0.036	8		0.013	29	17.4	4	
GM-RD-SSGM-CO-55	GM-RD-MH-55	945.93	GM-RD-MH-56	951.31	95.3	0.056	8		0.013	28	17	4.8	
GM-RD-SSGM-CO-56	GM-RD-MH-56	951.31	GM-RD-MH-57	951.46	124.2	0.001	8		0.013	27	25.4	-0.3	
GM-RD-SSGM-CO-57	GM-RD-MH-57	951.46	GM-RD-MH-58	954.56	111.1	0.028	8		0.013	25	16.2	2.5	
GM-RD-SSGM-CO-58	GM-RD-MH-58	954.56	GM-RD-MH-59	955.5	50	0.019	8		0.013	24	15.7	0.4	
GM-RD-SSGM-CO-59	GM-RD-MH-59	955.5	GM-RD-MH-60	956.79	162.2	0.008	8		0.013	23	15.3	0.7	
GM-RD-SSGM-CO-60	GM-RD-MH-60	956.79	GM-RD-MH-61	956.83	60.7	7E-04	8		0.013	22	25.2	-0.5	
GM-RD-SSGM-CO-61	GM-RD-MH-61	956.83	GM-RD-MH-62	959.5	45.9	0.058	8		0.013	20	14.4	2.1	
GM-RD-SSGM-CO-62	GM-RD-MH-62	959.5	GM-RD-MH-63	965.81	54	0.117	8		0.013	19	14	5.7	
GM-RD-SSGM-CO-63	GM-RD-MH-63	965.81	GM-RD-MH-64	974.99	51	0.18	8		0.013	18	13.5	8.6	
GM-RD-SSGM-CO-64	GM-RD-MH-64	974.99	GM-RD-MH-65	980.22	31.5	0.166	8		0.013	17	13	4.6	
GM-RD-SSGM-CO-65	GM-RD-MH-65	980.22	GM-RD-MH-66	984.57	48.7	0.089	8		0.013	4	6.2	3.7	
GM-RD-SSGM-CO-66	GM-RD-MH-66	984.57	GM-RD-MH-67	985.09	49	0.011	8		0.013	3	5.1	-0.1	
GM-RD-SSGM-CO-67	GM-RD-MH-67	985.09	GM-RD-MH-68	986.37	112.9	0.011	8		0.013	1	3.6	0.6	
GM-RD-SSGM-CO-68	GM-RD-MH-65	980.22	GM-RD-MH-69	983.64	29.6	0.116	8		0.013	11	10.8	2.8	
GM-RD-SSGM-CO-69	GM-RD-MH-69	983.64	GM-RD-MH-70	996.1	49.5	0.252	8		0.013	10	10.2	11.9	
GM-RD-SSGM-CO-70	GM-RD-MH-70	996.1	GM-RD-MH-71	1,022.88	97.9	0.273	8		0.013	9	9.5	26.2	
GM-RD-SSGM-CO-71	GM-RD-MH-71	1,022.88	GM-RD-MH-72	1,021.26	29.9	-0.054	8		0.013	4	100	-0.6	
GM-RD-SSGM-CO-72	GM-RD-MH-72	1,021.26	GM-RD-MH-73	1,021.56	157.3	0.002	8		0.013	3	100	1	
GM-RD-SSGM-CO-73	GM-RD-MH-73	1,021.56	GM-RD-MH-74	1,021.12	97.7	-0.005	8		0.013	1	100	0.7	
GM-RD-SSGM-CO-74	GM-RD-MH-71	1,022.88	GM-RD-MH-75	1,020.90	83.5	-0.024	8		0.013	4	100	-0.6	
GM-RD-SSGM-CO-75	GM-RD-MH-75	1,020.90	GM-RD-MH-76	1,026.26	80.9	0.066	8		0.013	3	5.1	4.7	
GM-RD-SSGM-CO-76	GM-RD-MH-76	1,026.26	GM-RD-MH-77	1,030.33	30.7	0.133	8		0.013	1	3.6	3.4	
GM-RD-SSGM-CO-77	GM-RD-MH-19	1,065.28	GM-RD-MH-78	1,067.51	67.3	0.033	12		0.013	8	5.3	1.3	
GM-RD-SSGM-CO-78	GM-RD-MH-78	1,067.51	GM-RD-MH-79	1,071.77	88.8	0.048	12		0.013	6	4.8	3.3	
GM-RD-SSGM-CO-79	GM-RD-MH-79	1,071.77	GM-RD-MH-80	1,088.22	247.9	0.066	12		0.013	5	4.3	15.5	
GM-RD-SSGM-CO-80	GM-RD-MH-80	1,088.22	GM-RD-MH-81	1,097.92	142	0.068	12		0.013	4	3.7	8.7	
GM-RD-SSGM-CO-81	MH-GIS-EP_ssMH_2584	1,074.61	GM-RD-MH-82	1,079.02	76.1	0.058	12		0.013	10	6.1	3.5	
GM-RD-SSGM-CO-82	GM-RD-MH-82	1,079.02	GM-RD-MH-83	1,085.84	121	0.056	12		0.013	9	5.7	5.9	
GM-RD-SSGM-CO-83	GM-RD-MH-83	1,085.84	GM-RD-MH-84	1,093.77	148	0.054	12		0.013	8	5.3	7	
GM-RD-SSGM-CO-84	GM-RD-MH-84	1,093.77	GM-RD-MH-85	1,102.24	156.9	0.054	12		0.013	6	4.8	7.5	
GM-RD-SSGM-CO-85	GM-RD-MH-85	1,102.24	GM-RD-MH-86	1,106.41	149.2	0.028	12		0.013	5	4.3	3.2	
GM-RD-SSGM-CO-86	GM-RD-MH-86	1,106.41	GM-RD-MH-87	1,108.92	95.6	0.026	8		0.013	4	6.2	1.9	
GM-RD-SSGM-CO-87	GM-RD-MH-87	1,108.92	GM-RD-MH-88	1,109.78	86.5	0.01	8		0.013	3	5.1	0.2	
GM-RD-SSGM-CO-88	GM-RD-MH-88	1,109.78	GM-RD-MH-89	1,109.94	125.1	0.001	8		0.013	1	5.8	-0.5	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-RD-SSGM-CO-89	MH-GIS-MH-197	1,071.22	GM-RD-MH-90	1,081.74	199.5	0.053	8		0.013	5	7.2	9.9	
GM-RD-SSGM-CO-90	GM-RD-MH-90	1,081.74	GM-RD-MH-91	1,096.59	307.4	0.048	8		0.013	4	6.2	14.2	
GM-RD-SSGM-CO-91	GM-RD-MH-91	1,096.59	GM-RD-MH-92	1,102.46	128.9	0.046	8		0.013	3	5.1	5.2	
GM-RD-SSGM-CO-92	GM-RD-MH-92	1,102.46	GM-RD-MH-93	1,108.54	143.4	0.042	8		0.013	1	3.6	5.4	
GM-RD-SSGM-CO-93	GM-RD-MH-94	1,108.82	MH-GIS-MH-99	1,100.90	141.1	0.056	8		0.013	5	7.2	-0.6	
GM-RD-SSGM-CO-94	GM-RD-MH-95	1,118.63	GM-RD-MH-94	1,108.82	155.1	0.063	8		0.013	4	6.2	-0.6	
GM-RD-SSGM-CO-95	GM-RD-MH-96	1,123.41	GM-RD-MH-95	1,118.63	101.1	0.047	8		0.013	3	5.1	-0.6	
GM-RD-SSGM-CO-96	GM-RD-MH-97	1,128.94	GM-RD-MH-96	1,123.41	140.5	0.039	8		0.013	1	3.6	-0.6	
GM-RD-SSGM-CO-97	GM-RD-MH-99	978.38	GM-RD-MH-98	985.89	85.6	0.088	8		0.013	1	2.3	6.9	
GM-RD-SSGM-CO-98	GM-RD-MH-100	977.51	GM-RD-MH-99	978.38	95.9	0.009	8		0.013	1	3.3	0.2	
GM-RD-SSGM-CO-99	GM-RD-MH-101	971.18	GM-RD-MH-100	977.51	141.5	0.045	8		0.013	2	3.9	5.7	
GM-RD-SSGM-CO-100	GM-RD-MH-102	968.37	GM-RD-MH-101	971.18	122.5	0.023	8		0.013	2	4.6	2.2	
GM-RD-SSGM-CO-101	GM-RD-MH-103	965.89	GM-RD-MH-102	968.37	138.9	0.018	8		0.013	3	100	2.6	
GM-RD-SSGM-CO-102	GM-RD-MH-104	969.05	GM-RD-MH-103	965.89	103.3	-0.031	8		0.013	3	100	-0.6	
GM-RD-SSGM-CO-103	GM-RD-MH-105	962.62	GM-RD-MH-104	969.05	193.1	0.033	8		0.013	4	6.1	5.8	
GM-RD-SSGM-CO-104	GM-RD-MH-106	958.2	GM-RD-MH-105	962.62	161.8	0.027	8		0.013	4	6.5	3.8	
GM-RD-SSGM-CO-105	GM-RD-MH-107	961.88	GM-RD-MH-106	958.2	108.8	-0.034	8		0.013	5	100	-0.6	
GM-RD-SSGM-CO-106	GM-RD-MH-108	962.13	GM-RD-MH-107	961.88	36.4	0.007	8		0.013	3	5.5	-0.6	
GM-RD-SSGM-CO-107	GM-RD-MH-109	965.58	GM-RD-MH-108	962.13	43.9	0.079	8		0.013	2	4.6	-0.6	
GM-RD-SSGM-CO-108	GM-RD-MH-110	975.13	GM-RD-MH-109	965.58	64	0.149	8		0.013	2	3.9	-0.6	
GM-RD-SSGM-CO-109	GM-RD-MH-111	977.36	GM-RD-MH-110	975.13	149.8	0.015	8		0.013	1	3.3	-0.6	
GM-RD-SSGM-CO-110	GM-RD-MH-112	977.65	GM-RD-MH-111	977.36	81.3	0.004	8		0.013	1	3	-0.6	
GM-RD-SSGM-CO-113	GM-RD-MH-107	961.88	Hospital PS-WW	958	13.6	0.284	8		0.013	8	8.9	-0.6	
GM-RD-SSGM-CO-114	GM-RD-MH-113	884	PSS12A-WW	871.69	17.5	0.704	8		0.013	16	12.7	-0.6	
GM-RD-SSGM-CO-115	GM-RD-MH-114	884.05	GM-RD-MH-113	884	37.5	0.001	8		0.013	14	18.2	-0.5	
GM-RD-SSGM-CO-116	GM-RD-MH-115	884.22	GM-RD-MH-114	884.05	131.6	0.001	8		0.013	13	17.5	-0.5	
GM-RD-SSGM-CO-117	GM-RD-MH-116	884.37	GM-RD-MH-115	884.22	121.1	0.001	8		0.013	11	16.5	-0.6	
GM-RD-SSGM-CO-118	GM-RD-MH-117	884.76	GM-RD-MH-116	884.37	97.6	0.004	8		0.013	10	11.8	-0.6	
GM-RD-SSGM-CO-119	GM-RD-MH-118	886.88	GM-RD-MH-117	884.76	146.4	0.014	8		0.013	9	9.4	-0.6	
GM-RD-SSGM-CO-120	GM-RD-MH-119	888.51	GM-RD-MH-118	886.88	176.8	0.009	8		0.013	7	8.6	-0.6	
GM-RD-SSGM-CO-121	GM-RD-MH-120	890.76	GM-RD-MH-119	888.51	178.6	0.013	8		0.013	6	7.6	-0.6	
GM-RD-SSGM-CO-122	GM-RD-MH-121	891.95	GM-RD-MH-120	890.76	79.1	0.015	8		0.013	4	6.6	-0.6	
GM-RD-SSGM-CO-123	GM-RD-MH-122	892.48	GM-RD-MH-121	891.95	164.2	0.003	8		0.013	3	6.9	-0.6	
GM-RD-SSGM-CO-124	GM-RD-MH-123	892.86	GM-RD-MH-122	892.48	116.5	0.003	8		0.013	1	4.9	-0.6	
GM-RD-SSGM-CO-125	GM-RD-MH-8	909.76	GM-RD-MH-124	905.29	53.2	-0.084	8		0.013	17	100	-0.5	
GM-RD-SSGM-CO-127	GM-RD-MH-25	1,128.84	GM-RD-MH-125	1,134.00	185.7	0.028	8		0.013	1	3.6	4.5	
GM-RD-SSGM-CO-128	GM-RD-MH-81	1,097.92	GM-RD-MH-126	1,114.04	236.1	0.068	12		0.013	3	3	15.2	
GM-RD-SSGM-CO-129	GM-RD-MH-126	1,114.04	GM-RD-MH-127	1,130.57	225.3	0.073	12		0.013	1	2.1	15.6	
GM-RD-SSGM-CO-130	GM-RD-MH-128	1,124.84	MH-GIS-MH-75	1,110.99	148.4	0.093	8		0.013	4	6.2	-0.6	
GM-RD-SSGM-CO-131	GM-RD-MH-129	1,134.00	GM-RD-MH-128	1,124.84	196.7	0.047	8		0.013	3	5.1	-0.6	
GM-RD-SSGM-CO-132	GM-RD-MH-130	1,134.71	GM-RD-MH-129	1,134.00	177.5	0.004	8		0.013	1	4.4	-0.6	
GM-SUR-304	MH-IS-57	425.87	MH-IS-80	422.48	336.3	0.01	10	Ductile Iron	0.013	682	66.3	-0.3	
GM-SUR-5001	MH-IS-271	410.4	MH-SUR-5002	410.5	88.2	-0.001	12	Concrete	0.013	471	80.1	-0.2	
GM-SUR-5002	MH-SUR-5002	410.5	MH-IS-140	409.52	29.8	0.033	12	Concrete	0.013	480.21	43.5	-0.6	

Existing (2017) with Proposed Improvements - Peak Hour Flow - Wet Well Table

Label	Ground Elevation (ft)	Maximum Elevation (ft)	Initial Elevation (ft)	Minimum Elevation (ft)	Base Elevation (ft)	Flow In (gpm)	Flow Out (gpm)	Net Flow In (gpm)
Hospital PS-WW	968	3.75	1.7	0	958	8	225	-217
IPPS Wetwell	430.65	4	2.5	0	400.65	223	4,852	-4629
KCPSWW	428.11	14	0.6	0	399.5	3,257	9,079	-5821
PS1WW	419.19	7.6	5	0	394.33	1,702	2,066	-364
PS2WW	415.2	4.25	2	0	395.25	78	499	-421
PS3WW	418.23	5.15	2.85	0	401.67	393	756	-363
PS4WW	417.46	4.2	3	0	399.83	129	243	-114
PSBPWW	796.77	9.7	4.5	0	765.5	590	1,039	-448
PSEWW	762.77	6.5	3.5	0	736.5	138	280	-142
PSFWW	721.2	4	2.5	0	704	47	272	-225
PSK3-WW	818.91	7.1	3.1	0	793	100	241	-142
PSLWW	807.37	11.1	5.6	0	777.9	355	493	-138
PSS12A-WW	886.8	4.1	2.1	0	871.69	16	123	-108
Pump Station K2 (Burke St) Wetwell	698.45	6.6	3.1	0	688.45	28	89	-62
Pump Station N6 Wetwell	727.14	4.4	2.9	0	717.14	18	120	-102
Pump Station No. 6 Wetwell	425	4	2	0	415	11	0	11
Pump Station Z (Gala) Wetwell	537.95	7.1	3.5	0	527.95	33	84	-50

City of Snoqualmie
General Sewer Plan
SewerGEMS Results

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
CO-28	MH-GIS-MH-36	749.5	PSEWW	736.5	15.4	0.847	8	PVC	0.01	84	29.8	-0.5	
CO-30	MH-GIS-MH-77	756.31	PSEWW	736.5	8.8	2.263	8	PVC	0.01	57	24.3	-0.5	
GM-GIS-AC_ssGM_1255	MH-GIS-AC_ssMH_2569	987.01	MH-GIS-RI_ssMH_2320	987.3	60	-0.005	8	PVC	0.01	4	84.4	-0.1	
GM-GIS-AC_ssGM_1266	MH-GIS-AC_ssMH_2570	966.73	MH-GIS-CR_ssMH_2321	968.83	100.7	-0.021	8	PVC	0.01	77	100	1.8	
GM-GIS-AC_ssGM_1419	MH-GIS-AC_ssMH_2543	957.94	MH-GIS-AC_ssMH_2522	961.45	68	0.052	8	PVC	0.01	5	59.5	3.2	
GM-GIS-AC_ssGM_1420	MH-GIS-AC_ssMH_2522	961.45	MH-GIS-AC_ssMH_2530	980.95	400	0.049	8	PVC	0.01	4	6	18.9	
GM-GIS-AC_ssGM_1421	MH-GIS-AC_ssMH_2533	955.84	MH-GIS-AC_ssMH_2521	970.9	260	0.058	8	PVC	0.01	5	7.3	14.4	
GM-GIS-AC_ssGM_1422	MH-GIS-AC_ssMH_2521	970.9	MH-GIS-AC_ssMH_2529	986.8	240	0.066	8	PVC	0.01	4	6	15.3	
GM-GIS-AC_ssGM_1423	MH-GIS-AC_ssMH_2537	990.52	MH-GIS-AC_ssMH_2529	986.8	137.1	0.027	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1424	MH-GIS-AC_ssMH_2539	981.15	MH-GIS-AC_ssMH_2527	977.75	175.8	0.019	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1425	MH-GIS-AC_ssMH_2540	975.33	MH-GIS-AC_ssMH_2544	973.78	90.9	0.017	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1426	MH-GIS-AC_ssMH_2518	963.48	MH-GIS-AC_ssMH_2514	975.79	158.5	0.078	8	PVC	0.01	12	11.2	11.7	
GM-GIS-AC_ssGM_1427	MH-GIS-AC_ssMH_2514	975.79	MH-GIS-AC_ssMH_2534	992.06	244.7	0.066	8	PVC	0.01	5	7.3	15.7	
GM-GIS-AC_ssGM_1428	MH-GIS-AC_ssMH_2569	987.01	MH-GIS-AC_ssMH_2517	987.35	74.8	0.005	8	PVC	0.01	2	33.4	-0.1	
GM-GIS-AC_ssGM_1429	MH-GIS-AC_ssMH_2523	960.92	MH-GIS-AC_ssMH_2524	964.82	121.6	-0.032	8	PVC	0.01	72	100	7.6	
GM-GIS-AC_ssGM_1430	MH-GIS-AC_ssMH_2525	957.38	MH-GIS-AC_ssMH_2535	965.08	175.4	0.044	8	PVC	0.01	33	18.5	7.2	
GM-GIS-AC_ssGM_1431	MH-GIS-AC_ssMH_2535	965.08	MH-GIS-AC_ssMH_2527	977.75	300.5	0.042	8	PVC	0.01	5	7.3	12.1	
GM-GIS-AC_ssGM_1432	MH-GIS-AC_ssMH_2524	964.82	MH-GIS-AC_ssMH_2526	966.2	72.7	-0.019	8	PVC	0.01	74	100	3.7	
GM-GIS-AC_ssGM_1433	MH-GIS-AC_ssMH_2526	966.2	MH-GIS-AC_ssMH_2570	966.73	37.3	-0.014	8	PVC	0.01	75	100	2.3	
GM-GIS-AC_ssGM_1434	MH-GIS-AC_ssMH_2531	960.07	MH-GIS-AC_ssMH_2546	971.34	240.5	0.047	8	PVC	0.01	24	15.8	10.7	
GM-GIS-AC_ssGM_1435	MH-GIS-AC_ssMH_2528	957.15	MH-GIS-AC_ssMH_2525	957.38	35.4	0.006	8	PVC	0.01	35	100	4	
GM-GIS-AC_ssGM_1436	MH-GIS-AC_ssMH_2523	960.92	MH-GIS-AC_ssMH_2532	960.88	126.7	-3E-04	8	PVC	0.01	70	100	5.3	
GM-GIS-AC_ssGM_1437	MH-GIS-AC_ssMH_2532	960.88	MH-GIS-AC_ssMH_2519	957.9	120.4	-0.025	8	PVC	0.01	54	100	5.3	
GM-GIS-AC_ssGM_1438	MH-GIS-AC_ssMH_2519	957.9	MH-GIS-AC_ssMH_2533	955.84	123.8	-0.017	8	PVC	0.01	52	100	5.3	
GM-GIS-AC_ssGM_1439	MH-GIS-AC_ssMH_2520	956.8	MH-GIS-AC_ssMH_2533	955.84	270	0.004	8	PVC	0.01	45	100	4.4	
GM-GIS-AC_ssGM_1440	MH-GIS-AC_ssMH_2515	981.51	MH-GIS-AC_ssMH_2516	977.36	84.2	0.049	8	PVC	0.01	4	6	-0.6	
GM-GIS-AC_ssGM_1441	MH-GIS-AC_ssMH_2518	963.48	MH-GIS-AC_ssMH_2532	960.88	90.8	0.029	8	PVC	0.01	14	100	2.7	
GM-GIS-AC_ssGM_1442	MH-GIS-AC_ssMH_2528	957.15	MH-GIS-AC_ssMH_2520	956.8	244.1	0.001	8	PVC	0.01	37	100	4	
GM-GIS-AC_ssGM_1443	MH-GIS-AC_ssMH_2515	981.51	MH-GIS-AC_ssMH_2536	986.72	122.9	0.042	8	PVC	0.01	2	4.2	4.6	
GM-GIS-AC_ssGM_1444	MH-GIS-AC_ssMH_2538	982.94	MH-GIS-AC_ssMH_2530	980.95	159.3	0.012	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1445	MH-GIS-AC_ssMH_2535	965.08	MH-GIS-AC_ssMH_2531	960.07	276	-0.018	8	PVC	0.01	26	100	-0.5	
GM-GIS-AC_ssGM_1446	MH-GIS-AC_ssMH_2542	992.86	MH-GIS-AC_ssMH_2534	992.06	87.2	0.009	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1447	MH-GIS-AC_ssMH_2516	977.36	MH-GIS-AC_ssMH_2514	975.79	71.6	0.022	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-AC_ssGM_1448	MH-GIS-MH-86	993.66	MH-GIS-AC_ssMH_2534	992.06	54	0.03	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1449	MH-GIS-MH-55	976.71	MH-GIS-AC_ssMH_2527	977.75	37.6	-0.028	8	PVC	0.01	2	100	0.4	
GM-GIS-AC_ssGM_1450	MH-GIS-AC_ssMH_2520	956.8	MH-GIS-AC_ssMH_2543	957.94	32	0.036	8	PVC	0.01	7	100	4.4	
GM-GIS-AC_ssGM_1451	MH-GIS-AC_ssMH_2544	973.78	MH-GIS-AC_ssMH_2545	972.76	41.9	0.024	8	PVC	0.01	4	6	-0.6	
GM-GIS-AC_ssGM_1452	MH-GIS-AC_ssMH_2546	971.34	MH-GIS-AC_ssMH_2545	972.76	53.2	0.027	8	PVC	0.01	23	15.2	0.9	
GM-GIS-AC_ssGM_1453	MH-GIS-AC_ssMH_2547	974.61	MH-GIS-AC_ssMH_2545	972.76	39.9	0.046	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-AC_ssGM_1454	MH-GIS-AC_ssMH_2541	978.1	MH-GIS-AC_ssMH_2547	974.61	162	0.022	8	PVC	0.01	16	12.6	-0.6	
GM-GIS-AC_ssGM_1455	MH-GIS-MH-46	977.43	MH-GIS-AC_ssMH_2541	978.1	30	-0.022	8	PVC	0.01	14	100	0.1	
GM-GIS-AR_ssGM_751	MH-GIS-AR_ssMH_2012	534.92	MH-GIS-AR_ssMH_2015	531.19	92.4	0.04	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AR_ssGM_753	MH-GIS-AR_ssMH_2015	531.19	MH-GIS-AR_ssMH_2017	517.96	169.4	0.078	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-AR_ssGM_754	MH-GIS-AR_ssMH_2014	539.39	MH-GIS-AR_ssMH_2015	531.19	249.8	0.033	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AR_ssGM_755	MH-GIS-AR_ssMH_2013	551.42	MH-GIS-AR_ssMH_2015	531.19	287.7	0.07	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AU_ssGM_218	MH-GIS-AU_ssMH_1599	866.04	MH-GIS-AU_ssMH_1600	851.08	203.6	0.073	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-AU_ssGM_219	MH-GIS-FW_ssMH_1596	871.76	MH-GIS-AU_ssMH_1599	866.04	192.1	0.03	8	PVC	0.01	4	6.1	-0.6	
GM-GIS-AU_ssGM_220	MH-GIS-AU_ssMH_1600	851.08	MH-GIS-DH_ssMH_1601	841.46	194.5	0.049	8	PVC	0.01	9	9.5	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-AU_ssGM_367	MH-GIS-AU_ssMH_1767	885.96	MH-GIS-FW_ssMH_1608	884.67	106.1	0.012	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-AU_ssGM_368	MH-GIS-AU_ssMH_1765	892.62	MH-GIS-AU_ssMH_1766	889	127.1	0.028	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-AU_ssGM_369	MH-GIS-AU_ssMH_1764	894	MH-GIS-AU_ssMH_1765	892.62	263.7	0.005	8	PVC	0.01	2	5	-0.6	
GM-GIS-AU_ssGM_370	MH-GIS-AU_ssMH_1768	892.9	MH-GIS-AU_ssMH_1764	894	127	-0.009	8	PVC	0.01	1	100	0.5	
GM-GIS-AU_ssGM_371	MH-GIS-MH-166	894	MH-GIS-AU_ssMH_1764	894	139.4	0	8	PVC	0.01	1	8.5	-0.6	
GM-GIS-AU_ssGM_372	MH-GIS-MH-191	894	MH-GIS-AU_ssMH_1765	892.62	162.7	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AU_ssGM_373	MH-GIS-AU_ssMH_1766	889	MH-GIS-AU_ssMH_1767	885.96	213.5	0.014	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-AU_ssGM_374	MH-GIS-AU_ssMH_1761	877.23	MH-GIS-AU_ssMH_1760	876.04	130.6	0.009	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-AU_ssGM_375	MH-GIS-AU_ssMH_1762	882.91	MH-GIS-AU_ssMH_1761	877.23	279.6	0.02	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AU_ssGM_376	MH-GIS-AU_ssMH_1760	876.04	MH-GIS-AU_ssMH_1600	851.08	129.2	0.193	8	PVC	0.01	4	6.1	-0.6	
GM-GIS-AU_ssGM_377	MH-GIS-AU_ssMH_1769	889.03	MH-GIS-AU_ssMH_1763	885.95	170	0.018	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-AU_ssGM_378	MH-GIS-AU_ssMH_1763	885.95	MH-GIS-AU_ssMH_1762	882.91	118.2	0.026	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-AU_ssGM_379	MH-GIS-AU_ssMH_1770	856.12	MH-GIS-AU_ssMH_1771	842.97	132.6	0.099	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-AU_ssGM_380	MH-GIS-AU_ssMH_1771	842.97	MH-GIS-DH_ssMH_1773	832.79	221.5	0.046	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AU_ssGM_382	MH-GIS-MH-85	861.23	MH-GIS-AU_ssMH_1770	856.12	52.7	0.097	6	PVC	0.01	1	3.9	-0.5	
GM-GIS-AZ_ssGM_1106	MH-GIS-AZ_ssMH_2479	751.27	MH-GIS-AZ_ssMH_2495	736.45	117	0.127	8	PVC	0.01	14	12	-0.6	
GM-GIS-AZ_ssGM_1107	MH-GIS-AZ_ssMH_2472	826.5	MH-GIS-AZ_ssMH_2471	823.93	56.8	0.045	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-AZ_ssGM_1108	MH-GIS-AZ_ssMH_2474	822.64	MH-GIS-AZ_ssMH_2475	825.15	283.1	-0.009	8	PVC	0.01	11	100	2	
GM-GIS-AZ_ssGM_1109	MH-GIS-AZ_ssMH_2473	822.85	MH-GIS-AZ_ssMH_2474	822.64	39.4	0.005	8	PVC	0.01	9	100	1.8	
GM-GIS-AZ_ssGM_1110	MH-GIS-AZ_ssMH_2475	825.15	MH-GIS-AZ_ssMH_2485	809.69	332.1	0.047	8	PVC	0.01	16	12.6	-0.6	
GM-GIS-AZ_ssGM_1111	MH-GIS-AZ_ssMH_2483	790.7	MH-GIS-AZ_ssMH_2477	788.86	75.8	0.024	8	PVC	0.01	5	7.4	-0.6	
GM-GIS-AZ_ssGM_1112	MH-GIS-AZ_ssMH_2478	770.13	MH-GIS-AZ_ssMH_2479	751.27	144.5	0.13	8	PVC	0.01	10	9.9	-0.6	
GM-GIS-AZ_ssGM_1113	MH-GIS-AZ_ssMH_2480	725.46	MH-GIS-AZ_ssMH_2481	722.02	56.6	0.061	8	PVC	0.01	16	12.9	-0.6	
GM-GIS-AZ_ssGM_1114	MH-GIS-AZ_ssMH_2505	771.4	MH-GIS-AZ_ssMH_2504	770.86	66.9	0.008	8	PVC	0.01	14	11.8	-0.6	
GM-GIS-AZ_ssGM_1115	MH-GIS-AZ_ssMH_2476	814.59	MH-GIS-AZ_ssMH_2477	788.86	314.7	0.082	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1116	MH-GIS-AZ_ssMH_2498	814.65	MH-GIS-AZ_ssMH_2482	806.69	220.5	0.036	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-AZ_ssGM_1117	MH-GIS-AZ_ssMH_2503	748.41	MH-GIS-AZ_ssMH_2488	733.3	174	0.087	8	PVC	0.01	23	15.2	-0.6	
GM-GIS-AZ_ssGM_1118	MH-GIS-AZ_ssMH_2488	733.3	MH-GIS-AZ_ssMH_2486	724.31	122	0.074	8	PVC	0.01	24	15.6	-0.6	
GM-GIS-AZ_ssGM_1119	MH-GIS-AZ_ssMH_2506	777.34	MH-GIS-AZ_ssMH_2505	771.4	145.7	0.041	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-AZ_ssGM_1120	MH-GIS-AZ_ssMH_2482	806.69	MH-GIS-AZ_ssMH_2484	799.77	225.1	0.031	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1121	MH-GIS-AZ_ssMH_2492	802.29	MH-GIS-AZ_ssMH_2483	790.7	192.3	0.06	8	PVC	0.01	4	6.6	-0.6	
GM-GIS-AZ_ssGM_1122	MH-GIS-AZ_ssMH_2489	806.65	MH-IS-18	799.57	257.4	0.028	8	PVC	0.01	68	26.7	-0.5	
GM-GIS-AZ_ssGM_1123	MH-GIS-AZ_ssMH_2471	823.93	MH-GIS-AZ_ssMH_2473	822.85	148	0.007	8	PVC	0.01	7	100	0.7	
GM-GIS-AZ_ssGM_1124	MH-GIS-AZ_ssMH_2477	788.86	MH-GIS-AZ_ssMH_2478	770.13	151.6	0.124	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-AZ_ssGM_1125	MH-GIS-AZ_ssMH_2485	809.69	MH-GIS-AZ_ssMH_2491	807.92	226.7	0.008	8	PVC	0.01	63	25.8	-0.5	
GM-GIS-AZ_ssGM_1126	MH-GIS-AZ_ssMH_2491	807.92	MH-GIS-AZ_ssMH_2489	806.65	193.7	0.007	8	PVC	0.01	65	26.2	-0.5	
GM-GIS-AZ_ssGM_1127	MH-GIS-AZ_ssMH_2481	722.02	MH-GIS-AZ_ssMH_2486	724.31	231.9	-0.01	8	PVC	0.01	17	100	1.8	
GM-GIS-AZ_ssGM_1128	MH-GIS-AZ_ssMH_2507	793.93	MH-GIS-AZ_ssMH_2506	777.34	311.8	0.053	8	PVC	0.01	5	6.8	-0.6	
GM-GIS-AZ_ssGM_1129	MH-GIS-AZ_ssMH_2484	799.77	MH-GIS-AZ_ssMH_2492	802.29	112.1	-0.022	8	PVC	0.01	3	100	1.9	
GM-GIS-AZ_ssGM_1130	MH-GIS-AZ_ssMH_2504	770.86	MH-GIS-AZ_ssMH_2503	748.41	196.1	0.114	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-AZ_ssGM_1131	MH-GIS-AZ_ssMH_2493	760.45	MH-GIS-AZ_ssMH_2479	751.27	163.2	0.056	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-AZ_ssGM_1132	MH-GIS-AZ_ssMH_2494	777.45	MH-GIS-AZ_ssMH_2493	760.45	193.7	0.088	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1133	MH-GIS-AZ_ssMH_2495	736.45	MH-GIS-AZ_ssMH_2480	725.46	123.1	0.089	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-AZ_ssGM_1134	MH-GIS-AZ_ssMH_2496	827.6	MH-GIS-AZ_ssMH_2475	825.15	82	0.03	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1135	MH-GIS-AZ_ssMH_2497	817.01	MH-GIS-AZ_ssMH_2476	814.59	110.9	0.022	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-AZ_ssGM_1136	MH-GIS-AZ_ssMH_2499	783.08	MH-GIS-AZ_ssMH_2494	777.45	94.7	0.059	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-AZ_ssGM_1137	MH-GIS-AZ_ssMH_2486	724.31	MH-GIS-AZ_ssMH_2500	713.38	121.3	0.09	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-AZ_ssGM_1138	MH-GIS-AZ_ssMH_2500	713.38	MH-GIS-AZ_ssMH_2487	707.6	37.2	0.155	8	PVC	0.01	43	21.2	-0.5	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-AZ_ssGM_1139	MH-GIS-AZ_ssMH_2487	707.6	MH-GIS-AZ_ssMH_2502	691.99	195.9	0.08	8	PVC	0.01	44	21.5	-0.5	
GM-GIS-AZ_ssGM_1140	MH-GIS-AZ_ssMH_2502	691.99	ump Station K2 (Burke St) Wetwe	688.45	7.8	0.453	8	PVC	0.01	45	21.7	-0.5	
GM-GIS-AZ_ssGM_1417	MH-GIS-AZ_ssMH_2501	832.13	MH-GIS-AZ_ssMH_2472	826.5	177.9	0.032	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-BA_ssGM_622	MH-GIS-BR_ssMH_1261	547.04	MH-GIS-BR_ssMH_1256	547.29	34.7	-0.007	8	Glass	0.013	29	63.9	-0.2	
GM-GIS-BA_ssGM_623	MH-GIS-BR_ssMH_1258	534.86	MH-GIS-BR_ssMH_1257	532.52	21.3	0.11	8	Glass	0.013	32	18.1	-0.5	
GM-GIS-BA_ssGM_624	MH-GIS-BR_ssMH_1257	532.52	Pump Station Z (Gala) Wetwell	527.95	6.8	0.676	8	Glass	0.013	34	18.6	-0.5	
GM-GIS-BA_ssGM_625	MH-GIS-BR_ssMH_1262	543.07	MH-GIS-BR_ssMH_1261	547.04	112.7	-0.035	8	Glass	0.013	27	100	3.7	
GM-GIS-BA_ssGM_626	MH-GIS-BR_ssMH_1258	534.86	MH-GIS-BR_ssMH_1256	547.29	123.7	0.1	8	Glass	0.013	30	17.7	11.9	
GM-GIS-BA_ssGM_627	MH-GIS-BR_ssMH_1275	560.87	MH-GIS-BR_ssMH_1274	553.5	109.5	0.067	8	Glass	0.013	3	5.8	-0.6	
GM-GIS-BA_ssGM_628	MH-GIS-BR_ssMH_1260	564	MH-GIS-BR_ssMH_1275	560.87	106.8	0.029	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-BA_ssGM_629	MH-GIS-BR_ssMH_1259	564	MH-GIS-BR_ssMH_1263	564	153.3	0	8	Glass	0.013	2	12.9	-0.6	
GM-GIS-BA_ssGM_630	MH-GIS-BR_ssMH_1269	551.44	MH-GIS-BR_ssMH_1265	548.23	68.3	0.047	8	Glass	0.013	8	100	1.1	
GM-GIS-BA_ssGM_631	MH-GIS-BR_ssMH_1265	548.23	MH-GIS-BR_ssMH_1264	547.25	116.7	0.008	8	Glass	0.013	10	100	4.4	
GM-GIS-BA_ssGM_632	MH-GIS-BR_ssMH_1264	547.25	MH-GIS-BR_ssMH_1266	552.11	140.5	-0.035	8	Glass	0.013	12	100	10.2	
GM-GIS-BA_ssGM_633	MH-GIS-BR_ssMH_1266	552.11	MH-GIS-BR_ssMH_1267	559.23	115.6	-0.062	8	Glass	0.013	13	100	7.7	
GM-GIS-BA_ssGM_634	MH-GIS-BR_ssMH_1267	559.23	MH-GIS-BR_ssMH_1268	560.34	122.1	-0.009	8	Glass	0.013	15	100	0.6	
GM-GIS-BA_ssGM_635	MH-GIS-BR_ssMH_1268	560.34	MH-GIS-BR_ssMH_1272	557.8	102.3	0.025	8	Glass	0.013	17	13.1	-0.6	
GM-GIS-BA_ssGM_636	MH-GIS-BR_ssMH_1270	552.27	MH-GIS-BR_ssMH_1269	551.44	328	0.003	8	Glass	0.013	7	100	0.3	
GM-GIS-BA_ssGM_637	MH-GIS-BR_ssMH_1263	564	MH-GIS-BR_ssMH_1271	563.3	116.1	0.006	8	Glass	0.013	3	6.4	-0.6	
GM-GIS-BA_ssGM_638	MH-GIS-BR_ssMH_1271	563.3	MH-GIS-BR_ssMH_1272	557.8	111.4	0.049	8	Glass	0.013	5	7.1	-0.6	
GM-GIS-BA_ssGM_639	MH-GIS-BR_ssMH_1272	557.8	MH-GIS-BR_ssMH_1273	544	227.8	0.061	8	Glass	0.013	23	15.6	-0.6	
GM-GIS-BA_ssGM_640	MH-GIS-BR_ssMH_1273	544	MH-GIS-BR_ssMH_1262	543.07	92.4	0.01	8	Glass	0.013	25	100	2.8	
GM-GIS-BA_ssGM_641	MH-GIS-BR_ssMH_1274	553.5	MH-GIS-BR_ssMH_1270	552.27	52.5	0.023	8	Glass	0.013	5	7.1	-0.6	
GM-GIS-BA_ssGM_646	MH-GIS-BA_ssMH_1930	789.51	MH-GIS-BA_ssMH_1942	788.17	202.8	0.007	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_647	MH-GIS-BA_ssMH_1919	830.9	MH-GIS-BA_ssMH_1923	831.44	93.5	-0.006	8	PVC	0.01	1	88.3	-0.1	
GM-GIS-BA_ssGM_648	MH-GIS-BA_ssMH_1925	830.88	MH-GIS-BA_ssMH_1924	830.07	46.9	0.017	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-BA_ssGM_649	MH-GIS-BA_ssMH_1926	768.21	MH-GIS-BA_ssMH_1927	766.81	90.4	0.015	8	PVC	0.01	54	23.6	-0.5	
GM-GIS-BA_ssGM_650	MH-GIS-BA_ssMH_1924	830.07	MH-GIS-BA_ssMH_1933	829.47	40.8	0.015	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-BA_ssGM_651	MH-GIS-BA_ssMH_1936	844	MH-GIS-BA_ssMH_1929	839.27	124	0.038	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-BA_ssGM_652	MH-GIS-BA_ssMH_1928	769.11	MH-GIS-BA_ssMH_1926	768.21	59.2	0.015	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-BA_ssGM_653	MH-GIS-BA_ssMH_1931	809	MH-GIS-BA_ssMH_1940	804.21	206.8	0.023	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_654	MH-GIS-BA_ssMH_1941	821.69	MH-GIS-BA_ssMH_1939	818.4	207.3	0.016	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_655	MH-GIS-BA_ssMH_1932	824.81	MH-GIS-BA_ssMH_1939	818.4	116.8	0.055	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-BA_ssGM_656	MH-GIS-BA_ssMH_1938	828.53	MH-GIS-BA_ssMH_1932	824.81	83.3	0.045	8	PVC	0.01	20	14.2	-0.6	
GM-GIS-BA_ssGM_657	MH-GIS-BA_ssMH_1921	829	MH-GIS-BA_ssMH_1933	829.47	61.7	-0.008	8	PVC	0.01	1	80.3	-0.1	
GM-GIS-BA_ssGM_658	MH-GIS-BA_ssMH_1933	829.47	MH-GIS-BA_ssMH_1934	829	90.8	0.005	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-BA_ssGM_659	MH-GIS-BA_ssMH_1920	830.84	MH-GIS-BA_ssMH_1925	830.88	59.2	-7E-04	8	PVC	0.01	1	14.2	-0.6	
GM-GIS-BA_ssGM_660	MH-GIS-BA_ssMH_1918	843.65	MH-GIS-BA_ssMH_1922	842.94	39.7	0.018	8	PVC	0.01	1	65.2	-0.2	
GM-GIS-BA_ssGM_661	MH-GIS-BA_ssMH_1922	842.94	MH-GIS-BA_ssMH_1935	843.62	53.1	-0.013	8	PVC	0.01	3	100	0.5	
GM-GIS-BA_ssGM_662	MH-GIS-BA_ssMH_1940	804.21	MH-GIS-BA_ssMH_1942	788.17	247.1	0.065	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-BA_ssGM_663	MH-GIS-BA_ssMH_1939	818.4	MH-GIS-BA_ssMH_1940	804.21	255.2	0.056	8	PVC	0.01	24	15.6	-0.6	
GM-GIS-BA_ssGM_664	MH-GIS-BA_ssMH_1937	832.81	MH-GIS-BA_ssMH_1938	828.53	82.4	0.052	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-BA_ssGM_665	MH-GIS-BA_ssMH_1934	829	MH-GIS-BA_ssMH_1938	828.53	113.6	0.004	8	PVC	0.01	11	10.5	-0.6	
GM-GIS-BA_ssGM_666	MH-GIS-BA_ssMH_1935	843.62	MH-GIS-BA_ssMH_1936	844	104.4	-0.004	8	PVC	0.01	4	69.7	-0.2	
GM-GIS-BA_ssGM_667	MH-GIS-BA_ssMH_1929	839.27	MH-GIS-BA_ssMH_1937	832.81	135.3	0.048	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-BA_ssGM_668	MH-GIS-BA_ssMH_1923	831.44	MH-GIS-BA_ssMH_1925	830.88	44.1	0.013	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-BA_ssGM_669	MH-GIS-BA_ssMH_1942	788.17	MH-GIS-BA_ssMH_1943	785.61	60.7	0.042	8	PVC	0.01	29	17.3	-0.6	
GM-GIS-BA_ssGM_670	MH-GIS-BA_ssMH_1943	785.61	MH-GIS-BA_ssMH_1944	781.15	85.3	0.052	8	PVC	0.01	30	17.7	-0.5	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-BA_ssGM_671	MH-GIS-BA_ssMH_1944	781.15	MH-GIS-BA_ssMH_1945	769.62	120.7	0.096	8	PVC	0.01	32	18.1	-0.5	
GM-GIS-BA_ssGM_672	MH-GIS-BA_ssMH_1927	766.81	MH-GIS-BA_ssMH_1284	764.62	108.8	0.02	8	PVC	0.01	55	23.9	-0.5	
GM-GIS-BA_ssGM_673	MH-GIS-BA_ssMH_1945	769.62	MH-GIS-BA_ssMH_1928	769.11	70.6	0.007	8	PVC	0.01	51	23.1	-0.5	
GM-GIS-BP_ssGM_2	MH-GIS-BP_ssMH_1535	839.22	MH-GIS-BP_ssMH_1536	840.96	86.2	-0.02	8	PVC	0.01	3	100	1.1	
GM-GIS-BP_ssGM_3	MH-GIS-BP_ssMH_1536	840.96	MH-IS-53	830.15	89	0.122	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-BP_ssGM_4	MH-GIS-BP_ssMH_1534	855.03	MH-GIS-BP_ssMH_1535	839.22	259.3	0.061	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_5	MH-GIS-BP_ssMH_1537	828.7	MH-GIS-BP_ssMH_1538	830.07	85	-0.016	8	PVC	0.01	1	100	0.8	
GM-GIS-BP_ssGM_6	MH-GIS-BP_ssMH_1539	828.73	MH-GIS-BP_ssMH_1540	825.06	130.9	0.028	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_7	MH-GIS-BP_ssMH_1540	825.06	MH-IS-49	804.65	232	0.088	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_340	MH-GIS-BP_ssMH_1753	780.94	MH-IS-198	779.52	38.9	0.037	8	Ductile Iron	0.013	721	88.2	-0.1	
GM-GIS-BP_ssGM_341	MH-GIS-BP_ssMH_1538	830.07	MH-IS-58	819.51	38	0.278	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_342	MH-GIS-BP_ssMH_1737	845.7	MH-GIS-BP_ssMH_1738	838.64	302.4	0.023	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_345	MH-GIS-BP_ssMH_1741	809	MH-IS-50	797.44	95.4	0.121	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_347	MH-GIS-MH-44	791.82	MH-IS-MH-210	778.16	30	0.456	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_357(1)	MH-GIS-BP_ssMH_1738	838.64	MH-GIS-MH-90	835.24	264	0.013	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-BP_ssGM_357(2)	MH-GIS-MH-90	835.24	MH-IS-MH-5	825.27	73.1	0.136	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-BP_ssGM_359	MH-GIS-BP_ssMH_1755	801.95	MH-GIS-BP_ssMH_1758	796.09	160.6	0.036	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_360	MH-GIS-BP_ssMH_1754	788.61	MH-GIS-BP_ssMH_1753	780.94	210	0.037	8	Ductile Iron	0.013	720	88.1	-0.1	
GM-GIS-BP_ssGM_361	MH-GIS-BP_ssMH_1756	807.02	MH-GIS-BP_ssMH_1755	801.95	251.4	0.02	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_362	MH-GIS-BP_ssMH_1757	792.54	MH-GIS-BP_ssMH_1754	788.61	107.5	0.037	8	PVC	0.01	719	88.1	-0.1	
GM-GIS-BP_ssGM_363	MH-GIS-BP_ssMH_1758	796.09	MH-GIS-BP_ssMH_1757	792.54	146.8	0.024	8	PVC	0.01	717	88	-0.1	
GM-GIS-BP_ssGM_571	MH-GIS-MH-113	877.1	MH-IS-123	863.89	73.8	0.179	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_572	MH-GIS-MH-171	870.05	MH-IS-123	863.89	147.4	0.042	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_1083	MH-GIS-MH-89	836.77	MH-GIS-MH-90	835.24	56.1	0.027	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-BP_ssGM_1084	MH-GIS-BP_ssMH_2211	840.99	MH-GIS-MH-162	839	182.5	0.011	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_1085	MH-GIS-MH-162	839	MH-GIS-BP_ssMH_2210	838.36	135.2	0.005	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-BP_ssGM_1086	MH-GIS-BP_ssMH_2210	838.36	MH-GIS-BP_ssMH_2209	838.39	119.5	-3E-04	8	PVC	0.01	2	15.8	-0.6	
GM-GIS-BP_ssGM_1087	MH-GIS-BP_ssMH_2209	838.39	MH-GIS-MH-89	836.77	47.3	0.034	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-BP_ssGM_1283	MH-GIS-BP_ssMH_2352	835.22	MH-GIS-BP_ssMH_2354	825.07	150.8	0.067	8	PVC	0.01	283	56.1	-0.3	
GM-GIS-BP_ssGM_1284	MH-GIS-BP_ssMH_2354	825.07	MH-GIS-BP_ssMH_2353	824.9	43.2	0.004	8	PVC	0.01	622	100	0.1	
GM-GIS-BP_ssGM_1298	MH-GIS-BP_ssMH_2362	814.43	MH-GIS-BP_ssMH_2361	808.69	309	0.019	8	PVC	0.01	710	87.7	-0.1	
GM-GIS-BP_ssGM_1299	MH-GIS-BP_ssMH_2353	824.9	MH-GIS-BP_ssMH_2362	814.43	168	0.062	8	PVC	0.01	708	87.6	-0.1	
GM-GIS-BP_ssGM_1300	MH-GIS-BP_ssMH_2361	808.69	MH-GIS-BP_ssMH_2363	800.67	342.5	0.023	8	PVC	0.01	712	87.8	-0.1	
GM-GIS-BP_ssGM_1301	MH-GIS-BP_ssMH_2363	800.67	MH-GIS-BP_ssMH_1758	796.09	385.8	0.012	8	PVC	0.01	714	87.8	-0.1	
GM-GIS-BP_ssGM_1458	MH-GIS-MH-70	809.18	MH-GIS-BP_ssMH_1741	809	44.2	0.004	8	PVC	0.01	1	4	-0.6	
GM-GIS-CO-22	MH-GIS-DY_ssMH_2561	721.57	Pump Station N6 Wetwell	717.14	10.7	0.415	8	Glass	0.013	18	13.6	-0.6	
GM-GIS-CO-126	MH-IS-GS_ssMH_1480	408.77	MH-IS-193	407.54	235	0.005	10	Concrete	0.013	255	41.4	-0.5	SM4
GM-GIS-CO_ssGM_109	MH-GIS-CO_ssMH_1372	904.88	MH-GIS-CO_ssMH_1428	902.68	138.3	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_110	MH-GIS-CO_ssMH_1428	902.68	MH-GIS-CO_ssMH_1427	902.11	85.1	0.007	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_111	MH-GIS-CO_ssMH_1371	905.28	MH-GIS-CO_ssMH_1427	902.11	193.4	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_113	MH-GIS-CO_ssMH_1426	899	MH-GIS-CO_ssMH_1419	896.39	127.3	0.021	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_114	MH-GIS-CO_ssMH_1425	904.06	MH-GIS-CO_ssMH_1426	899	134.1	0.038	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_115	MH-GIS-CO_ssMH_1423	887.13	MH-GIS-CO_ssMH_1424	884.92	121.8	0.018	8	PVC	0.01	33	18.6	-0.5	
GM-GIS-CO_ssGM_116	MH-GIS-CO_ssMH_1422	891.5	MH-GIS-CO_ssMH_1423	887.13	123.9	0.035	8	PVC	0.01	31	17.9	-0.5	
GM-GIS-CO_ssGM_117	MH-GIS-CO_ssMH_1429	894	MH-GIS-CO_ssMH_1422	891.5	153	0.016	8	PVC	0.01	29	17.3	-0.6	
GM-GIS-CO_ssGM_118	MH-GIS-CO_ssMH_1421	894	MH-GIS-CO_ssMH_1429	894	82.7	0	8	PVC	0.01	18	25.9	-0.5	
GM-GIS-CO_ssGM_119	MH-GIS-CO_ssMH_1420	896.71	MH-GIS-CO_ssMH_1421	894	96.8	0.028	8	PVC	0.01	16	12.6	-0.6	
GM-GIS-CO_ssGM_120	MH-GIS-CO_ssMH_1419	896.39	MH-GIS-CO_ssMH_1420	896.71	68.2	-0.005	8	PVC	0.01	13	66.8	-0.2	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CO_ssGM_121	MH-GIS-CO_ssMH_1418	899.03	MH-GIS-CO_ssMH_1419	896.39	177	0.015	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-CO_ssGM_122	MH-GIS-CO_ssMH_1417	899.91	MH-GIS-CO_ssMH_1418	899.03	45.7	0.019	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_123	MH-GIS-CO_ssMH_1416	902.07	MH-GIS-CO_ssMH_1417	899.91	129.1	0.017	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_157	MH-GIS-CO_ssMH_1395	851.41	MH-GIS-SC_ssMH_1409	837.73	140.2	0.098	8	PVC	0.01	38	19.8	-0.5	
GM-GIS-CO_ssGM_161	MH-GIS-CO_ssMH_1427	902.11	MH-GIS-CO_ssMH_1429	894	234.2	0.035	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-CO_ssGM_170	MH-GIS-CO_ssMH_1424	884.92	MH-GIS-CO_ssMH_1395	851.41	229.8	0.146	8	PVC	0.01	36	19.2	-0.5	
GM-GIS-CO_ssGM_453	MH-GIS-CO_ssMH_1820	903.4	MH-GIS-CO_ssMH_1831	899	138.2	0.032	8	Ductile Iron	0.013	7	8.2	-0.6	
GM-GIS-CO_ssGM_454	MH-GIS-CO_ssMH_1821	909	MH-GIS-CO_ssMH_1820	903.4	227.7	0.025	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-CO_ssGM_455	MH-GIS-CO_ssMH_1822	900.21	MH-GIS-CO_ssMH_1831	899	115.9	0.01	8	Ductile Iron	0.013	12	11.2	-0.6	
GM-GIS-CO_ssGM_456	MH-GIS-CO_ssMH_1830	902.92	MH-GIS-CO_ssMH_1822	900.21	132	0.021	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-CO_ssGM_457	MH-GIS-CO_ssMH_1823	899	MH-GIS-CO_ssMH_1829	901.61	169.9	-0.015	8	PVC	0.01	1	100	3.4	
GM-GIS-CO_ssGM_458	MH-GIS-CO_ssMH_1824	905.92	MH-GIS-CO_ssMH_1832	907.32	89	-0.016	8	PVC	0.01	2	100	0.8	
GM-GIS-CO_ssGM_459	MH-GIS-CO_ssMH_1825	905.89	MH-GIS-CO_ssMH_1830	902.92	282	0.011	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-CO_ssGM_460	MH-GIS-CO_ssMH_1832	907.32	MH-GIS-CO_ssMH_1825	905.89	145.1	0.01	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-CO_ssGM_461	MH-GIS-CO_ssMH_1826	901.33	MH-GIS-CO_ssMH_1827	901.05	166.8	0.002	8	PVC	0.01	1	100	1	
GM-GIS-CO_ssGM_462	MH-GIS-CO_ssMH_1836	902.92	MH-GIS-CO_ssMH_1828	901.53	175.2	0.008	8	PVC	0.01	3	16.3	-0.6	
GM-GIS-CO_ssGM_463	MH-GIS-MH-163	905.76	MH-GIS-CO_ssMH_1827	901.05	138	0.034	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-CO_ssGM_464	MH-GIS-CO_ssMH_1828	901.53	MH-GIS-CO_ssMH_1829	901.61	126.4	-6E-04	8	PVC	0.01	5	100	0.8	
GM-GIS-CO_ssGM_465	MH-GIS-MH-169	904.03	MH-GIS-CO_ssMH_1828	901.53	147	0.017	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-CO_ssGM_466	MH-GIS-CO_ssMH_1829	901.61	MH-GIS-CO_ssMH_1830	902.92	210.1	-0.006	8	PVC	0.01	7	100	0.8	
GM-GIS-CO_ssGM_467	MH-GIS-CO_ssMH_1831	899	MH-IS-69	876.77	261.2	0.085	8	Ductile Iron	0.013	20	14.3	-0.6	
GM-GIS-CO_ssGM_468	MH-GIS-MH-182	905.23	MH-GIS-CO_ssMH_1833	907.18	156.4	-0.012	8	PVC	0.01	1	100	1.5	
GM-GIS-CO_ssGM_469	MH-GIS-CO_ssMH_1835	909	MH-GIS-CO_ssMH_1821	909	149.3	0	8	PVC	0.01	1	9.1	-0.6	
GM-GIS-CO_ssGM_470	MH-GIS-CO_ssMH_1834	908.47	MH-GIS-CO_ssMH_1818	908.92	68.1	-0.007	8	PVC	0.01	2	95.5	0	
GM-GIS-CO_ssGM_471	MH-GIS-MH-192	905.9	MH-GIS-CO_ssMH_1834	908.47	163.1	-0.016	8	PVC	0.01	1	100	2.5	
GM-GIS-CO_ssGM_472	MH-GIS-CO_ssMH_1833	907.18	MH-GIS-CO_ssMH_1824	905.92	93.4	0.013	8	PVC	0.01	2	31.6	-0.5	
GM-GIS-CO_ssGM_473	MH-GIS-CO_ssMH_1827	901.05	MH-GIS-CO_ssMH_1836	902.92	42	-0.045	8	PVC	0.01	2	100	1.3	
GM-GIS-CO_ssGM_1050	MH-GIS-CO_ssMH_1819	909	MH-GIS-CO_ssMH_1821	909	93.9	0	8	PVC	0.01	4	15.2	-0.6	
GM-GIS-CO_ssGM_1051	MH-GIS-CO_ssMH_1818	908.92	MH-GIS-CO_ssMH_1819	909	146.6	-6E-04	8	PVC	0.01	3	28	-0.5	
GM-GIS-CO_ssGM_1052	MH-GIS-CO_ssMH_1817	909	MH-GIS-CO_ssMH_1818	908.92	112.5	7E-04	8	PVC	0.01	1	16	-0.6	
GM-GIS-CR_ssGM_1194	MH-GIS-DP_ssMH_2281	901.58	MH-GIS-DP_ssMH_2302	898.53	183.1	0.017	8	PVC	0.01	322	59.9	-0.3	
GM-GIS-CR_ssGM_1250	MH-GIS-CR_ssMH_2568	970.75	MH-GIS-CR_ssMH_2321	968.83	67	0.029	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-CR_ssGM_1251	MH-GIS-MH-167	916.76	MH-GIS-DP_ssMH_2281	901.58	141.9	0.107	8	PVC	0.01	320	59.8	-0.3	
GM-GIS-CR_ssGM_1252	MH-GIS-DP_ssMH_2328	919	MH-GIS-MH-167	916.76	57.8	0.039	8	PVC	0.01	318	59.6	-0.3	
GM-GIS-CR_ssGM_1254	MH-GIS-CR_ssMH_2323	955.99	MH-GIS-CR_ssMH_2330	955.7	161.5	0.002	8	PVC	0.01	248	69.5	-0.2	
GM-GIS-CR_ssGM_1256	MH-GIS-CR_ssMH_2331	979.07	MH-GIS-CR_ssMH_2321	968.83	146.8	0.07	8	PVC	0.01	157	41.2	-0.4	
GM-GIS-CR_ssGM_1258	MH-GIS-CR_ssMH_2321	968.83	MH-GIS-CR_ssMH_2332	960.9	145.9	0.054	8	PVC	0.01	243	51.7	-0.3	
GM-GIS-CR_ssGM_1259	MH-GIS-CR_ssMH_2332	960.9	MH-GIS-CR_ssMH_2333	955.94	143.9	0.034	8	PVC	0.01	244	51.9	-0.3	
GM-GIS-CR_ssGM_1260	MH-GIS-CR_ssMH_2333	955.94	MH-GIS-CR_ssMH_2323	955.99	126.1	-4E-04	8	PVC	0.01	246	100	0	
GM-GIS-CR_ssGM_1261	MH-GIS-DP_ssMH_2335	934.79	MH-GIS-DP_ssMH_2336	925.87	60.5	0.147	8	PVC	0.01	315	59.2	-0.3	
GM-GIS-CR_ssGM_1262	MH-GIS-DP_ssMH_2336	925.87	MH-GIS-DP_ssMH_2328	919	152.7	0.045	8	PVC	0.01	316	59.4	-0.3	
GM-GIS-CR_ssGM_1263	MH-GIS-CR_ssMH_2334	943.18	MH-GIS-DP_ssMH_2335	934.79	90.3	0.093	8	PVC	0.01	313	59.1	-0.3	
GM-GIS-CR_ssGM_1267	MH-GIS-CR_ssMH_2337	958.27	MH-GIS-CR_ssMH_2338	941.9	203	0.081	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-CR_ssGM_1268	MH-GIS-CR_ssMH_2379	970.91	MH-GIS-CR_ssMH_2337	958.27	101.6	0.124	8	PVC	0.01	46	21.8	-0.5	
GM-GIS-CR_ssGM_1269	MH-GIS-CR_ssMH_2338	941.9	MH-GIS-CR_ssMH_2339	940.05	67.1	0.028	8	PVC	0.01	58	100	1	
GM-GIS-CR_ssGM_1270	MH-GIS-CR_ssMH_2339	940.05	MH-GIS-CR_ssMH_2334	943.18	174.8	-0.018	8	PVC	0.01	60	100	2.9	
GM-GIS-CR_ssGM_1271	MH-GIS-CR_ssMH_2330	955.7	MH-GIS-CR_ssMH_2340	948.55	204.8	0.035	8	PVC	0.01	250	52.5	-0.3	
GM-GIS-CR_ssGM_1272	MH-GIS-CR_ssMH_2340	948.55	MH-GIS-CR_ssMH_2334	943.18	94.8	0.057	8	PVC	0.01	251	52.7	-0.3	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CR_ssGM_1877	MH-GIS-CR_ssMH_2978	979.6	MH-GIS-CR_ssMH_2568	970.75	77	0.115	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CR_ssGM_1878	MH-GIS-CR_ssMH_2979	986.08	MH-GIS-CR_ssMH_2978	979.6	75.6	0.086	8	PVC	0.01	4	6	-0.6	
GM-GIS-CR_ssGM_1879	MH-GIS-CR_ssMH_2980	990.89	MH-GIS-CR_ssMH_2979	986.08	75.7	0.064	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-CR_ssGM_1880	MH-GIS-CR_ssMH_2990	959.4	MH-GIS-CR_ssMH_2337	958.27	55.5	0.02	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-CR_ssGM_1881	MH-GIS-CR_ssMH_2981	978.58	MH-GIS-CR_ssMH_2990	959.4	249.3	0.077	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-CR_ssGM_1882	MH-GIS-CR_ssMH_2984	988.74	MH-GIS-CR_ssMH_2982	983.25	226.8	0.024	8	PVC	0.01	4	6	-0.6	
GM-GIS-CR_ssGM_1883	MH-GIS-CR_ssMH_2982	983.25	MH-GIS-CR_ssMH_2981	978.58	126.4	0.037	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CR_ssGM_1884	MH-GIS-CR_ssMH_2983	991.74	MH-GIS-CR_ssMH_2984	988.74	86.3	0.035	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-CT_ssGM_8	MH-GIS-CT_ssMH_1278	749.62	MH-GIS-MH-36	749.5	23.3	0.005	8	PVC	0.01	83	29.5	-0.5	
GM-GIS-CT_ssGM_9	MH-GIS-MH-93	762.41	MH-GIS-CT_ssMH_1293	750.54	60.1	0.198	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_10	MH-GIS-CT_ssMH_1293	750.54	MH-GIS-CT_ssMH_1277	750.19	56	0.006	8	PVC	0.01	80	29	-0.5	
GM-GIS-CT_ssGM_11	MH-GIS-CT_ssMH_1277	750.19	MH-GIS-CT_ssMH_1278	749.62	46.1	0.012	8	PVC	0.01	81	29.3	-0.5	
GM-GIS-CT_ssGM_12	MH-GIS-CT_ssMH_1291	754.92	MH-GIS-CT_ssMH_1276	754.24	87.6	0.008	8	PVC	0.01	67	26.4	-0.5	
GM-GIS-CT_ssGM_13	MH-GIS-CT_ssMH_1276	754.24	MH-GIS-CT_ssMH_1294	752.33	82.1	0.023	8	PVC	0.01	68	26.7	-0.5	
GM-GIS-CT_ssGM_14	MH-GIS-CT_ssMH_1286	762.24	MH-GIS-CT_ssMH_1287	761.05	151.9	0.008	8	PVC	0.01	59	24.8	-0.5	
GM-GIS-CT_ssGM_15	MH-GIS-MH-116	765.96	MH-GIS-CT_ssMH_1290	756.86	76.6	0.119	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_16	MH-GIS-CT_ssMH_1280	764	MH-GIS-CT_ssMH_1279	763.04	73.8	0.013	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CT_ssGM_17	MH-GIS-CT_ssMH_1283	769	MH-GIS-CT_ssMH_1282	767.57	230.3	0.006	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_18	MH-GIS-BA_ssMH_1284	764.62	MH-GIS-CT_ssMH_1285	762.94	157.8	0.011	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-CT_ssGM_19	MH-GIS-CT_ssMH_1290	756.86	MH-GIS-CT_ssMH_1291	754.92	253.1	0.008	8	PVC	0.01	65	26.2	-0.5	
GM-GIS-CT_ssGM_20	MH-GIS-CT_ssMH_1292	751.73	MH-GIS-CT_ssMH_1293	750.54	197.8	0.006	8	PVC	0.01	77	28.5	-0.5	
GM-GIS-CT_ssGM_21	MH-GIS-CT_ssMH_1294	752.33	MH-GIS-CT_ssMH_1292	751.73	108.9	0.006	8	PVC	0.01	76	28.3	-0.5	
GM-GIS-CT_ssGM_22	MH-GIS-CT_ssMH_1289	758.1	MH-GIS-CT_ssMH_1290	756.86	167.8	0.007	8	PVC	0.01	63	25.7	-0.5	
GM-GIS-CT_ssGM_23	MH-GIS-CT_ssMH_1288	760.29	MH-GIS-CT_ssMH_1289	758.1	295.1	0.007	8	PVC	0.01	61	25.4	-0.5	
GM-GIS-CT_ssGM_24	MH-GIS-CT_ssMH_1287	761.05	MH-GIS-CT_ssMH_1288	760.29	80	0.01	8	PVC	0.01	60	25.1	-0.5	
GM-GIS-CT_ssGM_25	MH-GIS-CT_ssMH_1285	762.94	MH-GIS-CT_ssMH_1286	762.24	72.1	0.01	8	PVC	0.01	57	24.5	-0.5	
GM-GIS-CT_ssGM_26	MH-GIS-CT_ssMH_1282	767.57	MH-GIS-CT_ssMH_1281	766.46	218.9	0.005	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-CT_ssGM_27	MH-GIS-CT_ssMH_1279	763.04	MH-GIS-CT_ssMH_1294	752.33	59.9	0.179	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-CT_ssGM_28	MH-GIS-CT_ssMH_1281	766.46	MH-GIS-CT_ssMH_1280	764	307.2	0.008	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-CT_ssGM_246	MH-GIS-CT_ssMH_1692	756.63	MH-GIS-MH-77	756.31	49.4	0.006	8	PVC	0.01	55	24	-0.5	
GM-GIS-CT_ssGM_247	MH-GIS-CT_ssMH_1693	768.42	MH-GIS-CT_ssMH_1692	756.63	202.7	0.058	8	PVC	0.01	54	23.7	-0.5	
GM-GIS-CT_ssGM_248	MH-GIS-GC_ssMH_1622	773.42	MH-GIS-CT_ssMH_1693	768.42	112.9	0.044	8	Ductile Iron	0.013	53	23.4	-0.5	
GM-GIS-CV_ssGM_201	MH-GIS-CV_ssMH_1587	788.2	MH-GIS-CV_ssMH_1586	779.6	113.2	0.076	8	PVC	0.01	25	16	-0.6	
GM-GIS-CV_ssGM_202	MH-GIS-CV_ssMH_1586	779.6	MH-GIS-CV_ssMH_1585	771.51	125.8	0.064	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-CV_ssGM_203	MH-GIS-CV_ssMH_1585	771.51	MH-GIS-CV_ssMH_1584	767.13	180.4	0.024	8	PVC	0.01	28	100	1	
GM-GIS-CV_ssGM_204	MH-GIS-CV_ssMH_1584	767.13	MH-GIS-GC_ssMH_1590	769.6	299	-0.008	8	PVC	0.01	29	100	5.8	
GM-GIS-CV_ssGM_211	MH-GIS-GC_ssMH_1588	794	MH-GIS-CV_ssMH_1587	788.2	176.7	0.033	8	PVC	0.01	24	15.6	-0.6	
GM-GIS-CV_ssGM_212	MH-GIS-CV_ssMH_1598	859.22	MH-GIS-CV_ssMH_1597	850.39	107.1	0.082	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_242	MH-GIS-CV_ssMH_1625	716.37	PSFWW	704	24.3	0.509	8	PVC	0.01	47	22.2	-0.5	
GM-GIS-CV_ssGM_495	MH-GIS-MH-100	732.8	MH-GIS-CV_ssMH_1698	728.76	63.2	0.064	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_496	MH-GIS-CV_ssMH_1699	725.63	MH-GIS-CV_ssMH_1698	728.76	107.6	-0.029	8	PVC	0.01	42	100	2.7	
GM-GIS-CV_ssGM_497	MH-GIS-CV_ssMH_1700	727.16	MH-GIS-CV_ssMH_1699	725.63	103.1	0.015	8	PVC	0.01	41	100	1.2	
GM-GIS-CV_ssGM_498	MH-GIS-CV_ssMH_1701	730.39	MH-GIS-CV_ssMH_1700	727.16	103.7	0.031	8	PVC	0.01	39	20.2	-0.5	
GM-GIS-CV_ssGM_499	MH-GIS-CV_ssMH_1703	742.7	MH-GIS-CV_ssMH_1701	730.39	195.6	0.063	8	PVC	0.01	38	19.9	-0.5	
GM-GIS-CV_ssGM_500	MH-GIS-CV_ssMH_1702	749	MH-GIS-CV_ssMH_1703	742.7	156.5	0.04	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-CV_ssGM_501	MH-GIS-MH-121	752.94	MH-GIS-CV_ssMH_1702	749	81.1	0.049	6	PVC	0.01	1	5.2	-0.5	
GM-GIS-CV_ssGM_502	MH-GIS-CV_ssMH_1705	756.4	MH-GIS-CV_ssMH_1703	742.7	194.6	0.07	8	PVC	0.01	34	18.8	-0.5	
GM-GIS-CV_ssGM_503	MH-GIS-CV_ssMH_1706	767.27	MH-GIS-CV_ssMH_1705	756.4	173.7	0.063	8	Ductile Iron	0.013	33	18.4	-0.5	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CV_ssGM_504	MH-GIS-CV_ssMH_1707	771.95	MH-GIS-CV_ssMH_1706	767.27	87.8	0.053	8	Ductile Iron	0.013	32	18	-0.5	
GM-GIS-CV_ssGM_505	MH-GIS-CV_ssMH_1704	775.43	MH-GIS-CV_ssMH_1707	771.95	104.4	0.033	8	Ductile Iron	0.013	22	15.1	-0.6	
GM-GIS-CV_ssGM_506	MH-GIS-CV_ssMH_1708	782.07	MH-GIS-CV_ssMH_1704	775.43	102.6	0.065	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-CV_ssGM_507	MH-GIS-CV_ssMH_1711	787.91	MH-GIS-CV_ssMH_1708	782.07	102.2	0.057	8	PVC	0.01	20	14.2	-0.6	
GM-GIS-CV_ssGM_508	MH-GIS-CV_ssMH_1712	795.98	MH-GIS-CV_ssMH_1711	787.91	120.3	0.067	8	Ductile Iron	0.013	18	13.7	-0.6	
GM-GIS-CV_ssGM_509	MH-GIS-CV_ssMH_1715	794	MH-GIS-CV_ssMH_1712	795.98	101.7	-0.019	8	PVC	0.01	4	100	1.4	
GM-GIS-CV_ssGM_510	MH-GIS-CV_ssMH_1717	794	MH-GIS-CV_ssMH_1715	794	54.3	0	8	PVC	0.01	3	100	1.4	
GM-GIS-CV_ssGM_511	MH-GIS-CV_ssMH_1718	803.09	MH-GIS-CV_ssMH_1717	794	134.8	0.067	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_512	MH-GIS-CV_ssMH_1721	804.66	MH-GIS-CV_ssMH_1720	794.25	68.3	0.152	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-CV_ssGM_513	MH-GIS-CV_ssMH_1709	772.62	MH-GIS-CV_ssMH_1707	771.95	70.4	0.01	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_514	MH-GIS-CV_ssMH_1720	794.25	MH-GIS-CV_ssMH_1719	779	182.9	0.083	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-CV_ssGM_515	MH-GIS-CV_ssMH_1719	779	MH-GIS-CV_ssMH_1710	774	207.8	0.024	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CV_ssGM_516	MH-GIS-CV_ssMH_1710	774	MH-GIS-CV_ssMH_1709	772.62	179.2	0.008	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-CV_ssGM_517	MH-GIS-CV_ssMH_1731	826.6	MH-GIS-CV_ssMH_1729	831.01	260.2	-0.017	8	Ductile Iron	0.013	4	100	3.9	
GM-GIS-CV_ssGM_518	MH-GIS-MH-128	831.4	MH-GIS-CV_ssMH_1732	827.91	86.2	0.04	8	Ductile Iron	0.013	1	3.6	-0.6	
GM-GIS-CV_ssGM_519	MH-GIS-CV_ssMH_1728	825.39	MH-GIS-GC_ssMH_1591	822.34	141.2	0.022	8	Ductile Iron	0.013	9	9.6	-0.6	
GM-GIS-CV_ssGM_520	MH-GIS-CV_ssMH_1727	827.49	MH-GIS-CV_ssMH_1728	825.39	235.2	0.009	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_521	MH-GIS-CV_ssMH_1726	828.67	MH-GIS-CV_ssMH_1727	827.49	192.3	0.006	8	Ductile Iron	0.013	7	8.7	-0.6	
GM-GIS-CV_ssGM_522	MH-GIS-CV_ssMH_1725	824	MH-GIS-CV_ssMH_1726	828.67	189.6	-0.025	8	Ductile Iron	0.013	5	100	4.1	
GM-GIS-CV_ssGM_523	MH-GIS-CV_ssMH_1724	830.43	MH-GIS-CV_ssMH_1725	824	159.8	0.04	8	Ductile Iron	0.013	4	6.3	-0.6	
GM-GIS-CV_ssGM_524	MH-GIS-CV_ssMH_1723	837.84	MH-GIS-CV_ssMH_1724	830.43	357.5	0.021	8	Ductile Iron	0.013	3	5.2	-0.6	
GM-GIS-CV_ssGM_525	MH-GIS-CV_ssMH_1730	842.76	MH-GIS-CV_ssMH_1723	837.84	248.5	0.02	8	Ductile Iron	0.013	1	3.6	-0.6	
GM-GIS-CV_ssGM_526	MH-GIS-CV_ssMH_1732	827.91	MH-GIS-CV_ssMH_1731	826.6	95.1	0.014	8	Ductile Iron	0.013	3	100	2.5	
GM-GIS-CV_ssGM_527	MH-GIS-MH-139	808.6	MH-GIS-CV_ssMH_1721	804.66	100.2	0.039	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_528	MH-GIS-CV_ssMH_1597	850.39	MH-GIS-CV_ssMH_1729	831.01	193.6	0.1	8	Ductile Iron	0.013	3	5.2	-0.6	
GM-GIS-CV_ssGM_529	MH-GIS-CV_ssMH_1697	722.01	MH-GIS-CV_ssMH_1625	716.37	75.2	0.075	8	PVC	0.01	46	21.9	-0.5	
GM-GIS-CV_ssGM_530	MH-GIS-CV_ssMH_1698	728.76	MH-GIS-CV_ssMH_1697	722.01	216.6	0.031	8	PVC	0.01	45	21.5	-0.5	
GM-GIS-CV_ssGM_1043	MH-GIS-CV_ssMH_1722	826.36	MH-GIS-CV_ssMH_1716	812.89	206.2	0.065	8	Ductile Iron	0.013	9	9.6	-0.6	
GM-GIS-CV_ssGM_1044	MH-GIS-CV_ssMH_1729	831.01	MH-GIS-CV_ssMH_1722	826.36	250.8	0.019	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_1045	MH-GIS-CV_ssMH_1714	807.44	MH-GIS-CV_ssMH_1713	802.34	86.6	0.059	8	PVC	0.01	12	11	-0.6	
GM-GIS-CV_ssGM_1046	MH-GIS-CV_ssMH_1713	802.34	MH-GIS-CV_ssMH_1712	795.98	110.1	0.058	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-CV_ssGM_1047	MH-GIS-CV_ssMH_1716	812.89	MH-GIS-CV_ssMH_1714	807.44	87.8	0.062	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-CV_ssGM_1053	MH-GIS-GC_ssMH_1590	769.6	MH-GIS-GC_ssMH_1622	773.42	80	-0.048	8	PVC	0.01	30	100	3.3	
GM-GIS-DH_ssGM_199	MH-GIS-DH_ssMH_1602	809.49	MH-GIS-DH_ssMH_1627	802	228.7	0.033	8	PVC	0.01	19	14	-0.6	
GM-GIS-DH_ssGM_200	MH-GIS-MU_ssMH_1805	809.96	MH-GIS-DH_ssMH_1602	809.49	80.7	0.006	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-DH_ssGM_213	MH-GIS-MH-30	818.72	MH-GIS-DH_ssMH_1621	814.69	19.2	0.21	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_214	MH-GIS-DH_ssMH_1601	841.46	MH-GIS-DH_ssMH_1772	828	136.4	0.099	8	PVC	0.01	28	17	-0.6	
GM-GIS-DH_ssGM_221	MH-GIS-DH_ssMH_1855	841	MH-GIS-DH_ssMH_1601	841.46	130.8	-0.004	8	PVC	0.01	18	92	-0.1	
GM-GIS-DH_ssGM_243	MH-GIS-DH_ssMH_1627	801.7	PSK3-WW	801.5	54.7	0.004	10	PVC	0.01	68	20.1	-0.7	
GM-GIS-DH_ssGM_244	MH-GIS-DH_ssMH_1772	828	MH-GIS-DH_ssMH_1621	814.69	112.1	0.119	8	PVC	0.01	32	18.1	-0.5	
GM-GIS-DH_ssGM_245	MH-GIS-DH_ssMH_1621	814.69	PSK3-WW	793	133.3	0.163	8	PVC	0.01	33	18.5	-0.5	
GM-GIS-DH_ssGM_264	MH-GIS-DH_ssMH_1643	907.41	MH-GIS-DH_ssMH_1642	904	206	0.017	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-DH_ssGM_265	MH-GIS-DH_ssMH_1631	907.59	MH-GIS-DH_ssMH_1633	902.33	166.9	0.032	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-DH_ssGM_266	MH-GIS-DH_ssMH_1630	907.74	MH-GIS-DH_ssMH_1631	907.59	187.5	8E-04	8	PVC	0.01	2	7.8	-0.6	
GM-GIS-DH_ssGM_267	MH-GIS-DH_ssMH_1629	909	MH-GIS-DH_ssMH_1630	907.74	107.7	0.012	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_268	MH-GIS-MH-149	912.36	MH-GIS-DH_ssMH_1640	911.41	115.9	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_269	MH-GIS-DH_ssMH_1640	911.41	MH-GIS-DH_ssMH_1641	907.27	320.9	0.013	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_270	MH-GIS-DH_ssMH_1650	912.29	MH-GIS-DH_ssMH_1644	908.13	203.6	0.02	8	PVC	0.01	7	8.7	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DH_ssGM_271	MH-GIS-DH_ssMH_1633	902.33	MH-GIS-DH_ssMH_1634	900.81	32.8	0.046	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-DH_ssGM_272	MH-GIS-MH-193	912.64	MH-GIS-DH_ssMH_1632	903.43	164.7	0.056	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_273	MH-GIS-DH_ssMH_1645	916.73	MH-GIS-DH_ssMH_1646	917.3	159.3	-0.004	8	PVC	0.01	1	100	0.5	
GM-GIS-DH_ssGM_274	MH-GIS-DH_ssMH_1646	917.3	MH-GIS-DH_ssMH_1647	917.68	140.8	-0.003	8	PVC	0.01	2	87.1	-0.1	
GM-GIS-DH_ssGM_275	MH-GIS-DH_ssMH_1647	917.68	MH-GIS-DH_ssMH_1648	917.81	84.7	-0.002	8	PVC	0.01	2	30.1	-0.5	
GM-GIS-DH_ssGM_276	MH-GIS-DH_ssMH_1648	917.81	MH-GIS-DH_ssMH_1649	914	274.8	0.014	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-DH_ssGM_277	MH-GIS-DH_ssMH_1651	917.06	MH-GIS-DH_ssMH_1650	912.29	201.9	0.024	8	PVC	0.01	2	5	-0.6	
GM-GIS-DH_ssGM_278	MH-GIS-DH_ssMH_1652	919	MH-GIS-DH_ssMH_1651	917.06	205.7	0.009	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_279	MH-GIS-DH_ssMH_1653	919	MH-GIS-DH_ssMH_1652	919	268.8	0	8	PVC	0.01	1	9.7	-0.6	
GM-GIS-DH_ssGM_280	MH-GIS-DH_ssMH_1635	884.99	MH-GIS-DH_ssMH_1636	887.23	38.1	-0.059	8	PVC	0.01	7	100	7	
GM-GIS-DH_ssGM_281	MH-GIS-DH_ssMH_1634	900.81	MH-GIS-DH_ssMH_1635	884.99	141.7	0.112	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-DH_ssGM_282	MH-GIS-DH_ssMH_1636	887.23	MH-GIS-DH_ssMH_1637	888.71	122.6	-0.012	8	PVC	0.01	8	100	4.8	
GM-GIS-DH_ssGM_283	MH-GIS-DH_ssMH_1637	888.71	MH-GIS-DH_ssMH_1638	888.98	222	-0.001	8	PVC	0.01	9	100	3.3	
GM-GIS-DH_ssGM_284	MH-GIS-DH_ssMH_1638	888.98	MH-GIS-DH_ssMH_1639	892.53	204.7	-0.017	8	PVC	0.01	10	100	3	
GM-GIS-DH_ssGM_285	MH-GIS-DH_ssMH_1639	892.53	MH-GIS-DH_ssMH_1310	888.97	106.7	0.033	8	PVC	0.01	11	10.5	-0.6	
GM-GIS-DH_ssGM_286	MH-GIS-DH_ssMH_1633	902.33	MH-GIS-DH_ssMH_1632	903.43	21.1	0.052	8	PVC	0.01	2	4.1	0.5	
GM-GIS-DH_ssGM_287	MH-GIS-MH-148	911.26	MH-GIS-DH_ssMH_1629	909	114.6	0.02	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_288	MH-GIS-DH_ssMH_1641	907.27	MH-GIS-DH_ssMH_1643	907.41	221.6	-6E-04	8	PVC	0.01	2	33.1	-0.4	
GM-GIS-DH_ssGM_289	MH-GIS-DH_ssMH_1649	914	MH-GIS-DH_ssMH_1650	912.29	85.4	0.02	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-DH_ssGM_290	MH-GIS-DH_ssMH_1644	908.13	MH-GIS-DH_ssMH_1643	907.41	104.9	0.007	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-DH_ssGM_381	MH-GIS-DH_ssMH_1773	832.79	MH-GIS-DH_ssMH_1772	828	28.2	0.17	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-DH_ssGM_383	MH-GIS-DH_ssMH_1796	867.52	MH-GIS-DH_ssMH_1775	858.76	181.9	0.048	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_384	MH-GIS-DH_ssMH_1775	858.76	MH-GIS-DH_ssMH_1795	855.63	126.9	0.025	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_385	MH-GIS-DH_ssMH_1795	855.63	MH-GIS-DH_ssMH_1777	854	91.2	0.018	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_386	MH-GIS-DH_ssMH_1777	854	MH-GIS-DH_ssMH_1776	854	98.8	0	8	PVC	0.01	3	23.5	-0.5	
GM-GIS-DH_ssGM_387	MH-GIS-DH_ssMH_1776	854	MH-GIS-DH_ssMH_1774	854	94.5	0	8	PVC	0.01	4	23.3	-0.5	
GM-GIS-DH_ssGM_388	MH-GIS-DH_ssMH_1774	854	MH-GIS-DH_ssMH_1794	854.06	44.9	-0.001	8	PVC	0.01	4	23	-0.5	
GM-GIS-DH_ssGM_389	MH-GIS-DH_ssMH_1778	857.96	MH-GIS-DH_ssMH_1794	854.06	158.5	0.025	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_390	MH-GIS-DH_ssMH_1782	858.36	MH-GIS-DH_ssMH_1778	857.96	122.3	0.003	8	PVC	0.01	1	4.4	-0.6	
GM-GIS-DH_ssGM_391	MH-GIS-DH_ssMH_1780	878.22	MH-GIS-DH_ssMH_1779	874.82	183.8	0.018	8	PVC	0.01	8	9	-0.6	
GM-GIS-DH_ssGM_392	MH-GIS-DH_ssMH_1784	879	MH-GIS-DH_ssMH_1780	878.22	103.4	0.008	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-DH_ssGM_393	MH-GIS-DH_ssMH_1781	875.18	MH-GIS-DH_ssMH_1780	878.22	126	-0.024	8	PVC	0.01	2	100	2.4	
GM-GIS-DH_ssGM_394	MH-GIS-DH_ssMH_1788	874	MH-GIS-DH_ssMH_1781	875.18	101.8	-0.012	8	PVC	0.01	1	100	3.6	
GM-GIS-DH_ssGM_395	MH-GIS-DH_ssMH_1779	874.82	MH-GIS-DH_ssMH_1783	862.01	106.7	0.12	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-DH_ssGM_396	MH-GIS-DH_ssMH_1783	862.01	MH-GIS-DH_ssMH_1794	854.06	159.3	0.05	8	PVC	0.01	10	9.8	-0.6	
GM-GIS-DH_ssGM_397	MH-GIS-DH_ssMH_1786	902.52	MH-GIS-DH_ssMH_1785	896.55	131	0.046	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_398	MH-GIS-DH_ssMH_1785	896.55	MH-GIS-DH_ssMH_1784	879	213.2	0.082	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_399	MH-GIS-DH_ssMH_1787	912.62	MH-GIS-DH_ssMH_1786	902.52	116.9	0.086	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_400	MH-GIS-DH_ssMH_1790	872.4	MH-GIS-DH_ssMH_1788	874	77.4	-0.021	8	PVC	0.01	1	100	5.2	
GM-GIS-DH_ssGM_401	MH-GIS-DH_ssMH_1789	879	MH-GIS-DH_ssMH_1780	878.22	160.3	0.005	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-DH_ssGM_402	MH-GIS-DH_ssMH_1791	880.21	MH-GIS-DH_ssMH_1789	879	193.5	0.006	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_403	MH-GIS-DH_ssMH_1792	888.54	MH-GIS-DH_ssMH_1791	880.21	144.5	0.058	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_404	MH-GIS-DH_ssMH_1793	860.37	MH-GIS-DH_ssMH_1782	858.36	108.8	0.018	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_405	MH-GIS-DH_ssMH_1794	854.06	MH-GIS-DH_ssMH_1854	847.07	184	0.038	8	PVC	0.01	17	13.1	-0.6	
GM-GIS-DH_ssGM_478	MH-GIS-DH_ssMH_1840	904.51	MH-GIS-DH_ssMH_1841	902.08	121.4	0.02	8	PVC	0.01	17	13	-0.6	
GM-GIS-DH_ssGM_479	MH-GIS-DH_ssMH_1642	904	MH-GIS-DH_ssMH_1840	904.51	90.7	-0.006	8	PVC	0.01	12	95	0	
GM-GIS-DH_ssGM_482	MH-GIS-DH_ssMH_1845	914	MH-GIS-DH_ssMH_1844	908.63	274.7	0.02	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_483	MH-GIS-DH_ssMH_1844	908.63	MH-GIS-DH_ssMH_1843	905.71	251.5	0.012	8	PVC	0.01	2	5	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DH_ssGM_484	MH-GIS-DH_ssMH_1843	905.71	MH-GIS-DH_ssMH_1840	904.51	277.1	0.004	8	PVC	0.01	3	6.1	-0.6	
GM-GIS-DH_ssGM_485	MH-GIS-DH_ssMH_1846	915.61	MH-GIS-DH_ssMH_1845	914	277.6	0.006	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_494	MH-GIS-DH_ssMH_1854	847.07	MH-GIS-DH_ssMH_1855	841	218.6	0.028	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1141	MH-GIS-DP_ssMH_2226	886.37	MH-GIS-DP_ssMH_2225	875.46	339.3	0.032	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1142	MH-GIS-DP_ssMH_2232	854.82	MH-GIS-DP_ssMH_2231	852.15	45.5	0.059	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-DP_ssGM_1143	MH-GIS-DP_ssMH_2235	900.74	MH-GIS-DP_ssMH_2234	891.07	142.3	0.068	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1144	MH-GIS-DP_ssMH_2234	891.07	MH-GIS-MH-81	886.96	62.1	0.066	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1145	MH-GIS-DP_ssMH_2236	854	MH-GIS-DP_ssMH_2227	854	78.9	0	8	PVC	0.01	9	100	5.3	
GM-GIS-DP_ssGM_1146	MH-GIS-DP_ssMH_2237	884.29	MH-GIS-DP_ssMH_2271	886.47	90.5	-0.024	8	PVC	0.01	2	100	1.6	
GM-GIS-DP_ssGM_1147	MH-GIS-DP_ssMH_2271	886.47	MH-GIS-DP_ssMH_2226	886.37	51.9	0.002	8	PVC	0.01	4	7.5	-0.6	
GM-GIS-DP_ssGM_1148	MH-GIS-DP_ssMH_2267	857.19	MH-GIS-DP_ssMH_2262	860.27	79.6	-0.039	8	PVC	0.01	14	100	8.4	
GM-GIS-DP_ssGM_1149	MH-GIS-DP_ssMH_2238	873.56	MH-GIS-DP_ssMH_2263	872.16	41.6	0.034	8	PVC	0.01	4	39.5	-0.4	
GM-GIS-DP_ssGM_1150	MH-GIS-DP_ssMH_2231	852.15	MH-GIS-MH-32	848.68	70.2	0.049	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-DP_ssGM_1151	MH-GIS-DP_ssMH_2265	857.32	MH-GIS-DP_ssMH_2230	832.03	264.5	0.096	8	PVC	0.01	334	61.1	-0.3	
GM-GIS-DP_ssGM_1152	MH-GIS-DP_ssMH_2270	872.05	MH-GIS-DP_ssMH_2228	859.78	247.7	0.05	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1153(1)	MH-GIS-DP_ssMH_2239	840	MH-GIS-DP_ssMH_2572	839	113.7	0.009	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-DP_ssGM_1153(2)	MH-GIS-DP_ssMH_2572	839	MH-GIS-DP_ssMH_2351	839	25.5	0	8	PVC	0.01	21	86.6	-0.1	
GM-GIS-DP_ssGM_1154	MH-GIS-DP_ssMH_2230	832.03	MH-GIS-DP_ssMH_2573	826.42	113.2	0.05	8	PVC	0.01	336	61.3	-0.3	
GM-GIS-DP_ssGM_1154(1)	MH-GIS-DP_ssMH_2573	826.42	MH-GIS-BP_ssMH_2354	825.07	25	0.054	8	PVC	0.01	337	61.5	-0.3	
GM-GIS-DP_ssGM_1155	MH-GIS-DP_ssMH_2240	826.56	MH-GIS-DP_ssMH_2574	824.46	144.6	0.015	8	PVC	0.01	26	16.5	-0.6	
GM-GIS-DP_ssGM_1156	MH-GIS-DP_ssMH_2243	857.36	MH-GIS-DP_ssMH_2239	840	212.3	0.082	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1157	MH-GIS-DP_ssMH_2241	896.36	MH-GIS-DP_ssMH_2242	889.46	115.1	0.06	8	PVC	0.01	325	60.3	-0.3	
GM-GIS-DP_ssGM_1158	MH-GIS-MH-48	881.7	MH-GIS-DP_ssMH_2244	879.62	32.6	0.064	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-DP_ssGM_1159	MH-GIS-DP_ssMH_2244	879.62	MH-GIS-DP_ssMH_2246	862.14	195.4	0.089	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1160	MH-GIS-DP_ssMH_2251	866.38	MH-GIS-DP_ssMH_2250	853.91	149.5	0.083	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-DP_ssGM_1161	MH-GIS-DP_ssMH_2250	853.91	MH-GIS-DP_ssMH_2249	853.17	59.9	0.012	8	PVC	0.01	26	100	4.6	
GM-GIS-DP_ssGM_1162	MH-GIS-MH-26	894.4	MH-GIS-DP_ssMH_2253	893.86	15	0.036	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-DP_ssGM_1163	MH-GIS-DP_ssMH_2253	893.86	MH-GIS-DP_ssMH_2252	878.79	161.1	0.094	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-DP_ssGM_1164	MH-GIS-DP_ssMH_2252	878.79	MH-GIS-DP_ssMH_2251	866.38	138.5	0.09	8	PVC	0.01	23	15.3	-0.6	
GM-GIS-DP_ssGM_1165	MH-GIS-DP_ssMH_2248	853.14	MH-GIS-DP_ssMH_2247	853.34	85	-0.002	8	PVC	0.01	30	100	5.5	
GM-GIS-DP_ssGM_1166	MH-GIS-DP_ssMH_2249	853.17	MH-GIS-DP_ssMH_2248	853.14	63.8	5E-04	8	PVC	0.01	28	100	5.3	
GM-GIS-DP_ssGM_1167	MH-GIS-DP_ssMH_2233	901.08	MH-GIS-MH-132	897.42	98	0.037	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-DP_ssGM_1168	MH-GIS-DP_ssMH_2257	903.51	MH-GIS-DP_ssMH_2233	901.08	84.4	0.029	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-DP_ssGM_1169	MH-GIS-DP_ssMH_2256	906.73	MH-GIS-DP_ssMH_2257	903.51	96	0.034	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1170	MH-GIS-DP_ssMH_2255	908.98	MH-GIS-DP_ssMH_2256	906.73	136.8	0.016	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1171	MH-GIS-DP_ssMH_2254	912.48	MH-GIS-DP_ssMH_2255	908.98	48.2	0.073	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1172	MH-GIS-DP_ssMH_2258	869	MH-GIS-DP_ssMH_2243	857.36	200.7	0.058	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-DP_ssGM_1173	MH-GIS-DP_ssMH_2259	874.02	MH-GIS-DP_ssMH_2258	869	123.1	0.041	8	PVC	0.01	14	12	-0.6	
GM-GIS-DP_ssGM_1174	MH-GIS-DP_ssMH_2261	899.74	MH-GIS-DP_ssMH_2260	879.52	245.2	0.082	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-DP_ssGM_1175	MH-GIS-DP_ssMH_2260	879.52	MH-GIS-DP_ssMH_2259	874.02	56.4	0.098	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1176	MH-GIS-MH-27	900.33	MH-GIS-DP_ssMH_2261	899.74	17.1	0.035	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-DP_ssGM_1177	MH-GIS-DP_ssMH_2266	855.35	MH-GIS-DP_ssMH_2267	857.19	83.1	-0.022	8	PVC	0.01	12	100	7.2	
GM-GIS-DP_ssGM_1179	MH-GIS-DP_ssMH_2227	854	MH-GIS-DP_ssMH_2266	855.35	130	-0.01	8	PVC	0.01	11	100	6.7	
GM-GIS-DP_ssGM_1180	MH-GIS-DP_ssMH_2268	875.98	MH-GIS-DP_ssMH_2269	875.13	92.9	0.009	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1181	MH-GIS-DP_ssMH_2269	875.13	MH-GIS-DP_ssMH_2270	872.05	54.9	0.056	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1182	MH-GIS-DP_ssMH_2273	871.91	MH-GIS-DP_ssMH_2272	870.72	84.4	0.014	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-DP_ssGM_1183	MH-GIS-DP_ssMH_2274	877.11	MH-GIS-DP_ssMH_2273	871.91	233.8	0.022	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1184	MH-GIS-DP_ssMH_2298	866.27	MH-GIS-DP_ssMH_2232	854.82	205	0.056	8	PVC	0.01	40	20.5	-0.5	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1185	MH-GIS-DP_ssMH_2272	870.72	MH-GIS-DP_ssMH_2298	866.27	77.7	0.057	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1186	MH-GIS-DP_ssMH_2225	875.46	MH-GIS-DP_ssMH_2273	871.91	126.2	0.028	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1187	MH-GIS-DP_ssMH_2275	877.45	MH-GIS-DP_ssMH_2238	873.56	59.9	0.065	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1188	MH-GIS-DP_ssMH_2228	859.78	MH-GIS-DP_ssMH_2236	854	256.6	0.023	8	PVC	0.01	7	33	-0.4	
GM-GIS-DP_ssGM_1189	MH-GIS-DP_ssMH_2277	852.62	MH-GIS-DP_ssMH_2276	849.27	106.1	0.032	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-DP_ssGM_1190	MH-GIS-DP_ssMH_2290	828.38	MH-GIS-DP_ssMH_2240	826.56	70.6	0.026	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-DP_ssGM_1191	MH-GIS-MH-106	902.27	MH-GIS-DP_ssMH_2233	901.08	71.4	0.017	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1192	MH-GIS-MH-135	906.59	MH-GIS-MH-106	902.27	117.5	0.037	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1193	MH-GIS-DP_ssMH_2280	909.09	MH-GIS-MH-135	906.59	99.1	0.025	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1195	MH-GIS-DP_ssMH_2284	857.2	MH-GIS-DP_ssMH_2282	857.41	123.6	-0.002	8	PVC	0.01	51	69.6	-0.2	
GM-GIS-DP_ssGM_1196	MH-GIS-DP_ssMH_2283	843.58	MH-GIS-MH-38	840.28	35.7	0.093	8	PVC	0.01	54	23.8	-0.5	
GM-GIS-DP_ssGM_1197	MH-GIS-DP_ssMH_2247	853.34	MH-GIS-DP_ssMH_2245	856.11	77.7	-0.036	8	PVC	0.01	32	100	8.1	
GM-GIS-DP_ssGM_1197(1)	MH-GIS-DP_ssMH_2245	856.11	MH-GIS-DP_ssMH_2246	862.14	69.1	-0.087	8	PVC	0.01	33	100	5.6	
GM-GIS-DP_ssGM_1198	MH-GIS-DP_ssMH_2246	862.14	MH-GIS-DP_ssMH_2285	857.88	117.2	0.036	8	PVC	0.01	47	22.2	-0.5	
GM-GIS-DP_ssGM_1199	MH-GIS-DP_ssMH_2285	857.88	MH-GIS-DP_ssMH_2284	857.2	42.8	0.016	8	PVC	0.01	49	22.6	-0.5	
GM-GIS-DP_ssGM_1200	MH-GIS-DP_ssMH_2282	857.41	MH-GIS-DP_ssMH_2283	843.58	131.9	0.105	8	PVC	0.01	53	23.4	-0.5	
GM-GIS-DP_ssGM_1201	MH-GIS-DP_ssMH_2278	868.39	MH-GIS-DP_ssMH_2289	854	258.7	0.056	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-DP_ssGM_1202	MH-GIS-DP_ssMH_2289	854	MH-GIS-DP_ssMH_2277	852.62	88.6	0.016	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1203	MH-GIS-MH-104	874.4	MH-GIS-DP_ssMH_2278	868.39	66.6	0.09	8	PVC	0.01	14	12	-0.6	
GM-GIS-DP_ssGM_1204	MH-GIS-DP_ssMH_2276	849.27	MH-GIS-DP_ssMH_2291	826.74	92.4	0.244	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-DP_ssGM_1205	MH-GIS-DP_ssMH_2291	826.74	MH-GIS-DP_ssMH_2290	828.38	66.6	-0.025	8	PVC	0.01	23	100	1.1	
GM-GIS-DP_ssGM_1206	MH-GIS-DP_ssMH_2294	876.38	MH-GIS-DP_ssMH_2293	847.37	200.4	0.145	8	PVC	0.01	171	43.1	-0.4	
GM-GIS-DP_ssGM_1207	MH-GIS-MH-34	843.8	MH-GIS-DP_ssMH_2292	844.23	23	0.019	8	PVC	0.01	178	44	0.1	
GM-GIS-DP_ssGM_1208	MH-GIS-MH-19	877.92	MH-GIS-DP_ssMH_2294	876.38	10	0.154	8	PVC	0.01	169	42.8	-0.4	
GM-GIS-DP_ssGM_1209	MH-GIS-DP_ssMH_2295	904.7	MH-GIS-MH-52	902.93	37	0.048	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1210	MH-GIS-DP_ssMH_2279	927.21	MH-GIS-DP_ssMH_2254	912.48	208.3	0.071	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1211	MH-GIS-DP_ssMH_2296	867.82	MH-GIS-DP_ssMH_2297	872.58	109.2	-0.044	8	PVC	0.01	23	100	6	
GM-GIS-DP_ssGM_1212	MH-GIS-DP_ssMH_2263	872.16	MH-GIS-DP_ssMH_2296	867.82	94.4	0.046	8	PVC	0.01	5	100	1	
GM-GIS-DP_ssGM_1213	MH-GIS-DP_ssMH_2262	860.27	MH-GIS-DP_ssMH_2296	867.82	155.3	-0.049	8	PVC	0.01	16	100	12.9	
GM-GIS-DP_ssGM_1214	MH-GIS-DP_ssMH_2299	874.3	MH-GIS-DP_ssMH_2298	866.27	247.5	0.032	8	PVC	0.01	26	16.5	-0.6	
GM-GIS-DP_ssGM_1215	MH-GIS-DP_ssMH_2297	872.58	MH-GIS-DP_ssMH_2299	874.3	94.5	-0.018	8	PVC	0.01	25	100	1.2	
GM-GIS-DP_ssGM_1216	MH-GIS-DP_ssMH_2293	847.37	MH-GIS-DP_ssMH_2292	844.23	200	0.016	8	PVC	0.01	176	43.7	-0.4	
GM-GIS-DP_ssGM_1217	MH-GIS-DP_ssMH_2300	849.15	MH-GIS-DP_ssMH_2293	847.37	69.5	0.026	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1218	MH-GIS-DP_ssMH_2300	849.15	MH-GIS-MH-33	853.18	20	0.202	8	PVC	0.01	2	4.2	3.4	
GM-GIS-DP_ssGM_1219	MH-GIS-DP_ssMH_2242	889.46	MH-GIS-DP_ssMH_2301	875.07	181.8	0.079	8	PVC	0.01	327	60.4	-0.3	
GM-GIS-DP_ssGM_1220	MH-GIS-DP_ssMH_2264	864	MH-GIS-DP_ssMH_2265	857.32	144.6	0.046	8	PVC	0.01	332	61	-0.3	
GM-GIS-DP_ssGM_1221	MH-GIS-DP_ssMH_2301	875.07	MH-GIS-DP_ssMH_2229	867.69	99.1	0.074	8	PVC	0.01	329	60.6	-0.3	
GM-GIS-DP_ssGM_1222	MH-GIS-DP_ssMH_2229	867.69	MH-GIS-DP_ssMH_2264	864	111.8	0.033	8	PVC	0.01	330	60.8	-0.3	
GM-GIS-DP_ssGM_1223	MH-GIS-MH-81	886.96	MH-GIS-DP_ssMH_2303	886.09	50	0.017	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1225	MH-GIS-DP_ssMH_2304	893.01	MH-GIS-DP_ssMH_2303	886.09	200.5	0.035	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1226	MH-GIS-DP_ssMH_2308	901.14	MH-GIS-DP_ssMH_2309	902.8	137	-0.012	8	PVC	0.01	5	100	1.1	
GM-GIS-DP_ssGM_1227	MH-GIS-MH-52	902.93	MH-GIS-DP_ssMH_2308	901.14	50	0.036	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1228	MH-GIS-DP_ssMH_2306	886.34	MH-GIS-DP_ssMH_2307	876.14	271.1	0.038	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1229	MH-GIS-DP_ssMH_2303	886.09	MH-GIS-MH-48	881.7	78	0.056	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-DP_ssGM_1230	MH-GIS-MH-132	897.42	MH-GIS-MH-26	894.4	110	0.027	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1231	MH-GIS-DP_ssMH_2309	902.8	MH-GIS-MH-27	900.33	70	0.035	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1232	MH-GIS-DP_ssMH_2302	898.53	MH-GIS-DP_ssMH_2241	896.36	79.8	0.027	8	PVC	0.01	323	60.1	-0.3	
GM-GIS-DP_ssGM_1233	MH-GIS-DP_ssMH_2310	880.97	MH-GIS-MH-50	882.1	35	0.032	8	PVC	0.01	2	4.2	0.5	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1234	MH-GIS-DP_ssMH_2313	874	MH-GIS-DP_ssMH_2312	876.61	124.7	-0.021	8	PVC	0.01	11	100	2.1	
GM-GIS-DP_ssGM_1235	MH-GIS-DP_ssMH_2307	876.14	MH-GIS-DP_ssMH_2313	874	151.3	0.014	8	PVC	0.01	9	90	-0.1	
GM-GIS-DP_ssGM_1236	MH-GIS-DP_ssMH_2312	876.61	MH-GIS-MH-104	874.4	75	0.029	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1237	MH-GIS-DP_ssMH_2310	880.97	MH-GIS-MH-19	877.92	46.6	0.065	8	PVC	0.01	167	42.6	-0.4	
GM-GIS-DP_ssGM_1238	MH-GIS-DP_ssMH_2305	891.12	MH-GIS-DP_ssMH_2314	887.98	54.9	0.057	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1239	MH-GIS-DP_ssMH_2314	887.98	MH-GIS-DP_ssMH_2306	886.34	59.5	0.028	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1240	MH-GIS-DP_ssMH_2311	896.03	MH-GIS-DP_ssMH_2305	891.12	123.7	0.04	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1241	MH-GIS-DP_ssMH_2315	882.04	MH-GIS-DP_ssMH_2310	880.97	126.6	0.008	8	PVC	0.01	164	42.1	-0.4	
GM-GIS-DP_ssGM_1242	MH-GIS-DP_ssMH_2316	889	MH-GIS-DP_ssMH_2315	882.04	400	0.017	8	PVC	0.01	162	41.9	-0.4	
GM-GIS-DP_ssGM_1243	MH-GIS-NJ_ssMH_2565	895.08	MH-GIS-DP_ssMH_2316	889	211	0.029	8	PVC	0.01	160	41.7	-0.4	
GM-GIS-DP_ssGM_1274	MH-GIS-DP_ssMH_2360	836.89	MH-GIS-DP_ssMH_2347	827.82	148.1	0.061	8	PVC	0.01	49	22.6	-0.5	
GM-GIS-DP_ssGM_1275	MH-GIS-MH-173	852.82	MH-GIS-DP_ssMH_2341	849.09	64.9	0.057	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1276	MH-GIS-DP_ssMH_2341	849.09	MH-GIS-DP_ssMH_2348	849	251	4E-04	8	Glass	0.013	7	17.7	-0.5	
GM-GIS-DP_ssGM_1277	MH-GIS-DP_ssMH_2355	840.68	MH-GIS-DP_ssMH_2343	837.64	115	0.026	8	PVC	0.01	192	45.8	-0.4	
GM-GIS-DP_ssGM_1278	MH-GIS-DP_ssMH_2351	839	MH-GIS-DP_ssMH_2344	838.9	112.8	9E-04	8	PVC	0.01	280	86.6	-0.1	
GM-GIS-DP_ssGM_1279	MH-GIS-DP_ssMH_2348	849	MH-GIS-DP_ssMH_2342	844	400	0.013	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-DP_ssGM_1280	MH-GIS-DP_ssMH_2358	834	MH-GIS-DP_ssMH_2349	839	260	-0.019	8	PVC	0.01	255	100	5.6	
GM-GIS-DP_ssGM_1281	MH-GIS-DP_ssMH_2349	839	MH-GIS-DP_ssMH_2351	839	291.8	0	8	PVC	0.01	257	100	0.3	
GM-GIS-DP_ssGM_1282	MH-GIS-DP_ssMH_2344	838.9	MH-GIS-BP_ssMH_2352	835.22	94.5	0.039	8	PVC	0.01	281	55.9	-0.3	
GM-GIS-DP_ssGM_1285	MH-GIS-DP_ssMH_2350	824	MH-GIS-BP_ssMH_2353	824.9	116.1	-0.008	8	PVC	0.01	84	100	0.8	
GM-GIS-DP_ssGM_1286	MH-GIS-DP_ssMH_2345	824	MH-GIS-DP_ssMH_2350	824	119.4	0	8	PVC	0.01	54	100	0.8	
GM-GIS-DP_ssGM_1287	MH-GIS-DP_ssMH_2346	824	MH-GIS-DP_ssMH_2345	824	79.5	0	8	PVC	0.01	53	100	0.8	
GM-GIS-DP_ssGM_1288	MH-GIS-DP_ssMH_2347	827.82	MH-GIS-DP_ssMH_2346	824	139.4	0.027	8	PVC	0.01	51	23.1	-0.5	
GM-GIS-DP_ssGM_1289	MH-GIS-MH-34	843.8	MH-GIS-DP_ssMH_2355	840.68	25	0.125	8	PVC	0.01	180	44.2	-0.4	
GM-GIS-DP_ssGM_1290	MH-GIS-DP_ssMH_2342	844	MH-GIS-DP_ssMH_2355	840.68	71.3	0.047	8	Glass	0.013	11	10.4	-0.6	
GM-GIS-DP_ssGM_1291	MH-GIS-DP_ssMH_2574	824.46	MH-GIS-DP_ssMH_2350	824	25	0.018	8	PVC	0.01	28	100	0.4	
GM-GIS-DP_ssGM_1292	MH-GIS-MH-38	840.28	MH-GIS-DP_ssMH_2343	837.64	25	0.106	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-DP_ssGM_1293	MH-GIS-DP_ssMH_2357	834	MH-GIS-DP_ssMH_2358	834	111.1	0	8	PVC	0.01	253	100	5.5	
GM-GIS-DP_ssGM_1294	MH-GIS-DP_ssMH_2356	834	MH-GIS-DP_ssMH_2357	834	140.9	0	8	PVC	0.01	252	100	5.5	
GM-GIS-DP_ssGM_1295	MH-GIS-DP_ssMH_2343	837.64	MH-GIS-DP_ssMH_2356	834	99.5	0.037	8	PVC	0.01	250	100	1.8	
GM-GIS-DP_ssGM_1296	MH-GIS-MH-32	848.68	MH-GIS-DP_ssMH_2359	847.39	20	0.065	8	PVC	0.01	46	21.8	-0.5	
GM-GIS-DP_ssGM_1297	MH-GIS-DP_ssMH_2359	847.39	MH-GIS-DP_ssMH_2360	836.89	187.4	0.056	8	PVC	0.01	47	22.2	-0.5	
GM-GIS-DT_ssGM_760	MH-GIS-MH-196	418.86	MH-GIS-RW_ssMH_1506	417.71	175	0.007	8	Concrete	0.013	9	9.9	-0.6	SM4
GM-GIS-DT_ssGM_761	MH-GIS-MH-186	419.33	MH-GIS-RW_ssMH_1506	417.71	404.2	0.004	8	Concrete	0.013	18	15.5	-0.6	
GM-GIS-DT_ssGM_762	MH-GIS-MH-185	419.96	MH-GIS-MH-186	419.33	158	0.004	8	Concrete	0.013	9	11.1	-0.6	
GM-GIS-DT_ssGM_763	MH-IS-277	413.81	MH-IS-96	412.74	166.6	0.006	10	Concrete	0.013	36	14.5	-0.7	
GM-GIS-DT_ssGM_770	MH-GIS-DT_ssMH_2022	415.16	MH-GIS-DT_ssMH_2021	414	290.8	0.004	8	Concrete	0.013	9	11.1	-0.6	
GM-GIS-DT_ssGM_771	MH-GIS-DT_ssMH_2021	414	MH-IS-271	410.4	323.6	0.011	8	Concrete	0.013	18	13.5	-0.6	
GM-GIS-DT_ssGM_782	MH-GIS-DT_ssMH_1492	416.47	MH-GIS-DT_ssMH_2026	415.29	296.2	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-DT_ssGM_783	MH-GIS-DT_ssMH_2026	415.29	MH-IS-136	409.7	368.5	0.015	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-DT_ssGM_788	MH-GIS-DT_ssMH_1483	415.09	MH-IS-138	409.59	399.9	0.014	8	Concrete	0.013	3	5.8	-0.6	SM4
GM-GIS-DT_ssGM_791	MH-GIS-RW_ssMH_1485	415.75	MH-IS-139	410.69	189.6	0.027	8	Concrete	0.013	63	25.7	-0.5	
GM-GIS-DT_ssGM_802	MH-GIS-RW_ssMH_1498	414	MH-IS-277	413.81	297	7E-04	8	Glass	0.013	18	24.2	-0.5	
GM-GIS-DT_ssGM_804	MH-GIS-MH-198	414.78	MH-GIS-MH-15	414.08	182.5	0.004	8	Concrete	0.013	3	100	1.9	
GM-GIS-DT_ssGM_805	MH-GIS-DT_ssMH_2029	415.39	MH-IS-139	410.69	316.4	0.015	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-DT_ssGM_806	MH-GIS-MH-168	416.02	MH-GIS-DT_ssMH_2029	415.39	144	0.004	8	Glass	0.013	3	6.8	-0.6	
GM-GIS-DT_ssGM_807	MH-GIS-MH-179	416.76	MH-GIS-DT_ssMH_1472	416.37	150.1	0.003	8	Concrete	0.013	3	45.6	-0.4	
GM-GIS-DT_ssGM_808	MH-GIS-DT_ssMH_2031	412.24	MH-IS-139	410.69	171.5	0.009	8	Concrete	0.013	43	21.2	-0.5	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DT_ssGM_809	MH-GIS-DT_ssMH_1472	416.37	MH-GIS-DT_ssMH_2030	416.92	184.3	-0.003	8	Concrete	0.013	10	100	0	
GM-GIS-DT_ssGM_810	MH-GIS-DT_ssMH_2030	416.92	MH-GIS-DT_ssMH_2031	412.24	297	0.016	8	Concrete	0.013	13	11.6	-0.6	
GM-GIS-DT_ssGM_813	MH-GIS-RW_ssMH_2034	414	MH-GIS-DT_ssMH_2031	412.24	228.8	0.008	8	Concrete	0.013	27	16.5	-0.6	
GM-GIS-DT_ssGM_920	MH-GIS-DT_ssMH_2107	418.03	MH-GIS-DT_ssMH_1472	416.37	433.8	0.004	8	Concrete	0.013	3	7.1	-0.6	
GM-GIS-DT_ssGM_972	MH-GIS-GS_ssMH_2154	416.74	MH-IS-137	411.83	318.3	0.015	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-DT_ssGM_1011	MH-GIS-RW_ssMH_2095	415.61	MH-IS-140	409.52	115.2	0.053	8	Concrete	0.013	27	16.6	-0.6	
GM-GIS-DT_ssGM_1013	MH-GIS-MH-160	418.62	MH-GIS-RW_ssMH_2094	417.87	130.7	0.006	8	Concrete	0.013	9	10.2	-0.6	
GM-GIS-DT_ssGM_1456	MH-GIS-MH-53	414	MH-IS-192	405.19	64	0.138	15	Concrete	0.013	18	6.1	-1.2	
GM-GIS-DT_ssGM_1457	MH-GIS-MH-54	414	MH-GIS-MH-53	414	37.2	0	15	Concrete	0.013	9	8.6	-1.1	
GM-GIS-DY_ssGM_1459	MH-GIS-DY_ssMH_2562	754	MH-GIS-DY_ssMH_2548	754.07	240.5	-3E-04	8	Glass	0.013	1	20.6	-0.5	
GM-GIS-DY_ssGM_1460	MH-GIS-DY_ssMH_2551	737.26	MH-GIS-DY_ssMH_2549	743.29	74.9	0.081	8	Glass	0.013	10	9.9	5.4	
GM-GIS-DY_ssGM_1461	MH-GIS-DY_ssMH_2548	754.07	MH-GIS-DY_ssMH_2550	745.64	122.1	0.069	8	Glass	0.013	2	4.9	-0.6	
GM-GIS-DY_ssGM_1462	MH-GIS-DY_ssMH_2550	745.64	MH-GIS-DY_ssMH_2549	743.29	37.9	0.062	8	Glass	0.013	4	6	-0.6	
GM-GIS-DY_ssGM_1463	MH-GIS-DY_ssMH_2561	721.57	MH-GIS-DY_ssMH_2551	737.26	171.8	0.091	8	Glass	0.013	11	10.5	15.1	
GM-GIS-DY_ssGM_1464	MH-GIS-DY_ssMH_2555	717.93	MH-GIS-DY_ssMH_2556	716.86	51.1	-0.021	8	Glass	0.013	4	100	3.1	
GM-GIS-DY_ssGM_1465	MH-GIS-DY_ssMH_2555	717.93	MH-GIS-DY_ssMH_2552	718.95	69.9	-0.015	8	Glass	0.013	5	100	3.1	
GM-GIS-DY_ssGM_1466	MH-GIS-DY_ssMH_2561	721.57	MH-GIS-DY_ssMH_2552	718.95	43.5	-0.06	8	Glass	0.013	6	100	-0.6	
GM-GIS-DY_ssGM_1467	MH-GIS-DY_ssMH_2557	739	MH-GIS-DY_ssMH_2558	739	68.4	0	8	Glass	0.013	4	100	3.7	
GM-GIS-DY_ssGM_1468	MH-GIS-DY_ssMH_2560	734	MH-GIS-DY_ssMH_2559	734	83.1	0	8	Glass	0.013	1	100	5.3	
GM-GIS-DY_ssGM_1469	MH-GIS-DY_ssMH_2549	743.29	MH-GIS-DY_ssMH_2557	739	79.3	-0.054	8	Glass	0.013	5	100	-0.6	
GM-GIS-DY_ssGM_1470	MH-GIS-DY_ssMH_2559	734	MH-GIS-DY_ssMH_2558	739	296.5	-0.017	8	Glass	0.013	2	100	8.7	
GM-GIS-DY_ssGM_1471	MH-GIS-DY_ssMH_2553	711.51	MH-GIS-DY_ssMH_2554	713.53	58.5	-0.035	8	Glass	0.013	1	100	7.4	
GM-GIS-DY_ssGM_1472	MH-GIS-DY_ssMH_2556	716.86	MH-GIS-DY_ssMH_2554	713.53	106.5	-0.031	8	Glass	0.013	2	100	4.1	
GM-GIS-EL_ssGM_1	MH-GIS-GC_ssMH_2036	775.66	MH-GIS-GC_ssMH_1622	773.42	52.2	0.043	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-EL_ssGM_825	MH-GIS-EL_ssMH_2037	786.68	MH-GIS-GC_ssMH_2036	775.66	133	0.083	8	PVC	0.01	20	14.2	-0.6	
GM-GIS-EL_ssGM_826	MH-GIS-EL_ssMH_2045	822.1	MH-GIS-EL_ssMH_2039	813.97	63.2	0.129	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-EL_ssGM_827	MH-GIS-EL_ssMH_2052	807.93	MH-GIS-EL_ssMH_2040	802.37	48.4	0.115	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-EL_ssGM_828	MH-GIS-EL_ssMH_2053	820.51	MH-GIS-EL_ssMH_2052	807.93	272.9	0.046	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-EL_ssGM_829	MH-GIS-EL_ssMH_2040	802.37	MH-GIS-EL_ssMH_2051	797.05	55.5	0.096	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-EL_ssGM_830	MH-GIS-EL_ssMH_2050	793.43	MH-GIS-EL_ssMH_2051	797.05	53.2	-0.068	8	PVC	0.01	8	100	3.1	
GM-GIS-EL_ssGM_831	MH-GIS-EL_ssMH_2044	793.41	MH-GIS-EL_ssMH_2050	793.43	66.5	-3E-04	8	PVC	0.01	7	100	3.1	
GM-GIS-EL_ssGM_832	MH-GIS-EL_ssMH_2043	804.53	MH-GIS-EL_ssMH_2057	797.97	68	0.096	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-EL_ssGM_833	MH-GIS-EL_ssMH_2057	797.97	MH-GIS-EL_ssMH_2044	793.41	211.4	0.022	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-EL_ssGM_834	MH-GIS-EL_ssMH_2039	813.97	MH-GIS-EL_ssMH_2043	804.53	69.3	0.136	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-EL_ssGM_835	MH-GIS-EL_ssMH_2051	797.05	MH-GIS-EL_ssMH_2049	793.26	67.6	0.056	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-EL_ssGM_836	MH-GIS-EL_ssMH_2049	793.26	MH-GIS-EL_ssMH_2058	788.67	54.5	0.084	8	PVC	0.01	17	13.2	-0.6	
GM-GIS-EL_ssGM_837	MH-GIS-EL_ssMH_2055	834.28	MH-GIS-EL_ssMH_2054	829.37	73.6	0.067	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-EL_ssGM_838	MH-GIS-EL_ssMH_2058	788.67	MH-GIS-EL_ssMH_2037	786.68	129.2	0.015	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-EL_ssGM_839	MH-GIS-EL_ssMH_2054	829.37	MH-GIS-EL_ssMH_2053	820.51	150.8	0.059	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-EN_ssGM_329	MH-GIS-EN_ssMH_1694	700	MH-GIS-IR_ssMH_1695	661.78	331	0.115	8	PVC	0.01	27	16.5	-0.6	
GM-GIS-EN_ssGM_330	MH-GIS-EN_ssMH_1366	703.34	MH-GIS-EN_ssMH_1694	700	29.9	0.112	8	PVC	0.01	26	16.3	-0.6	
GM-GIS-EN_ssGM_588	MH-GIS-EN_ssMH_1350	786.65	MH-GIS-EN_ssMH_1351	786.96	97.8	-0.003	8	Glass	0.013	2	100	0.4	
GM-GIS-EN_ssGM_589	MH-GIS-EN_ssMH_1351	786.96	MH-GIS-EN_ssMH_1352	787.67	99.2	-0.007	8	Glass	0.013	3	100	0.1	
GM-GIS-EN_ssGM_590	MH-GIS-EN_ssMH_1354	762.16	MH-GIS-EN_ssMH_1353	762.07	120.2	8E-04	8	Glass	0.013	2	9	-0.6	
GM-GIS-EN_ssGM_591	MH-GIS-EN_ssMH_1355	763	MH-GIS-EN_ssMH_1354	762.16	101.1	0.008	8	Glass	0.013	2	4.2	-0.6	
GM-GIS-EN_ssGM_592	MH-GIS-EN_ssMH_1353	762.07	MH-GIS-EN_ssMH_1365	751.94	130.6	0.078	8	Glass	0.013	21	14.6	-0.6	
GM-GIS-EN_ssGM_593	MH-GIS-EN_ssMH_1365	751.94	MH-GIS-EN_ssMH_1356	739.92	120.6	0.1	8	Glass	0.013	22	14.8	-0.6	
GM-GIS-EN_ssGM_594	MH-GIS-EN_ssMH_1356	739.92	MH-GIS-EN_ssMH_1357	727.9	120.8	0.1	8	Glass	0.013	22	15.2	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-EN_ssGM_595	MH-GIS-EN_ssMH_1357	727.9	MH-GIS-EN_ssMH_1358	723.94	90	0.044	8	Glass	0.013	23	15.5	-0.6	
GM-GIS-EN_ssGM_596	MH-GIS-EN_ssMH_1358	723.94	MH-GIS-EN_ssMH_1359	703.73	187.4	0.108	8	Glass	0.013	24	15.7	-0.6	
GM-GIS-EN_ssGM_597	MH-GIS-EN_ssMH_1352	787.67	MH-GIS-EN_ssMH_1370	777.86	233.3	0.042	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-EN_ssGM_598	MH-GIS-EN_ssMH_1370	777.86	MH-GIS-EN_ssMH_1369	774.89	78.7	0.038	8	Glass	0.013	5	7.2	-0.6	
GM-GIS-EN_ssGM_599	MH-GIS-EN_ssMH_1369	774.89	MH-GIS-EN_ssMH_1360	769.1	95.6	0.061	8	Glass	0.013	6	7.6	-0.6	
GM-GIS-EN_ssGM_600	MH-GIS-EN_ssMH_1360	769.1	MH-GIS-EN_ssMH_1361	762.16	107.5	0.065	8	Glass	0.013	17	13	-0.6	
GM-GIS-EN_ssGM_601	MH-GIS-EN_ssMH_1361	762.16	MH-GIS-EN_ssMH_1353	762.07	98.2	9E-04	8	Glass	0.013	17	22	-0.5	
GM-GIS-EN_ssGM_602	MH-GIS-EN_ssMH_1362	770.19	MH-GIS-EN_ssMH_1360	769.1	41.2	0.026	8	Glass	0.013	10	10	-0.6	
GM-GIS-EN_ssGM_603	MH-GIS-EN_ssMH_1364	779.77	MH-GIS-EN_ssMH_1362	770.19	104	0.092	8	Glass	0.013	9	9.6	-0.6	
GM-GIS-EN_ssGM_604	MH-GIS-EN_ssMH_1363	787.35	MH-GIS-EN_ssMH_1364	779.77	74.3	0.102	8	Glass	0.013	8	9.2	-0.6	
GM-GIS-EN_ssGM_605	MH-GIS-MH-97	794	MH-GIS-EN_ssMH_1363	787.35	61	0.109	8	Glass	0.013	7	8.7	-0.6	
GM-GIS-EN_ssGM_606	MH-GIS-EN_ssMH_1359	703.73	MH-GIS-EN_ssMH_1366	703.34	41.7	0.009	8	Glass	0.013	25	16	-0.6	
GM-GIS-EN_ssGM_607	MH-GIS-MH-101	784	MH-GIS-EN_ssMH_1367	784	63.2	0	8	Glass	0.013	1	100	3.1	
GM-GIS-EN_ssGM_608	MH-GIS-EN_ssMH_1367	784	MH-GIS-EN_ssMH_1350	786.65	124.1	-0.021	8	Glass	0.013	2	100	3.1	
GM-GIS-EN_ssGM_609	MH-GIS-EN_ssMH_1368	763.36	MH-GIS-EN_ssMH_1355	763	42.8	0.008	8	Glass	0.013	1	3.1	-0.6	
GM-GIS-EP_ssGM_1253	MH-GIS-EP_ssMH_2571	1,044.00	MH-GIS-EP_ssMH_2317	1,044.00	20	0	8	PVC	0.01	111	100	0.6	
GM-GIS-EP_ssGM_1477	MH-GIS-EP_ssMH_2579	1,063.97	MH-GIS-EP_ssMH_2590	1,059.65	112.1	0.039	8	Glass	0.013	18	13.4	-0.6	
GM-GIS-EP_ssGM_1478	MH-GIS-EP_ssMH_2585	1,067.19	MH-GIS-EP_ssMH_2584	1,074.61	115.1	0.064	8	Glass	0.013	16	12.7	6.8	
GM-GIS-EP_ssGM_1479	MH-GIS-EP_ssMH_2587	1,053.88	MH-GIS-EP_ssMH_2585	1,067.19	204.1	0.065	8	Glass	0.013	18	13.4	12.7	
GM-GIS-EP_ssGM_1480	MH-GIS-EP_ssMH_2600	1,085.09	MH-GIS-EP_ssMH_2583	1,079.32	59.4	0.097	8	Glass	0.013	14	12	-0.6	
GM-GIS-EP_ssGM_1481	MH-GIS-EP_ssMH_2590	1,059.65	MH-GIS-EP_ssMH_2594	1,058.00	129.4	0.013	8	Glass	0.013	60	100	3	
GM-GIS-EP_ssGM_1482	MH-GIS-EP_ssMH_2578	1,064.51	MH-GIS-EP_ssMH_2601	1,069.76	160.9	0.033	8	Glass	0.013	2	4.2	4.6	
GM-GIS-EP_ssGM_1483	MH-GIS-EP_ssMH_2592	1,062.35	MH-GIS-EP_ssMH_2594	1,058.00	186	0.023	8	Glass	0.013	4	100	0.2	
GM-GIS-EP_ssGM_1484	MH-GIS-EP_ssMH_2581	1,107.73	MH-GIS-EP_ssMH_2604	1,097.53	171.2	0.06	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-EP_ssGM_1485	MH-GIS-EP_ssMH_2607	1,058.36	MH-GIS-EP_ssMH_2606	1,061.67	281.4	-0.012	8	Glass	0.013	71	100	5	
GM-GIS-EP_ssGM_1486	MH-GIS-EP_ssMH_2591	1,057.24	MH-GIS-EP_ssMH_2608	1,057.37	48	-0.003	8	Glass	0.013	67	100	5.5	
GM-GIS-EP_ssGM_1487	MH-GIS-EP_ssMH_2603	1,063.73	MH-GIS-EP_ssMH_2589	1,057.65	176.2	0.035	8	Glass	0.013	25	15.9	-0.6	
GM-GIS-EP_ssGM_1488	MH-GIS-EP_ssMH_2602	1,070.56	MH-GIS-EP_ssMH_2603	1,063.73	63.7	0.107	8	Glass	0.013	23	15.3	-0.6	
GM-GIS-EP_ssGM_1489	MH-GIS-EP_ssMH_2595	1,086.22	MH-GIS-EP_ssMH_2596	1,082.11	177.6	0.023	8	Glass	0.013	19	14.1	-0.6	
GM-GIS-EP_ssGM_1490	MH-GIS-MH-197	1,071.22	MH-GIS-EP_ssMH_2578	1,064.51	216.3	0.031	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-EP_ssGM_1491	MH-GIS-EP_ssMH_2608	1,057.37	MH-GIS-EP_ssMH_2607	1,058.36	169.8	-0.006	8	Glass	0.013	69	100	6	
GM-GIS-EP_ssGM_1492	MH-GIS-EP_ssMH_2582	1,062.05	MH-GIS-EP_ssMH_2606	1,061.67	40.7	-0.009	8	Glass	0.013	72	100	1.2	
GM-GIS-EP_ssGM_1493	MH-GIS-EP_ssMH_2605	1,063.65	MH-GIS-EP_ssMH_2587	1,053.88	263.1	0.037	8	Glass	0.013	88	30.6	-0.5	
GM-GIS-EP_ssGM_1494	MH-GIS-EP_ssMH_2605	1,063.65	MH-GIS-EP_ssMH_2582	1,062.05	56	-0.029	8	Glass	0.013	86	100	-0.4	
GM-GIS-EP_ssGM_1495	MH-GIS-EP_ssMH_2586	1,087.41	MH-GIS-EP_ssMH_2597	1,087.13	50.8	0.005	8	Glass	0.013	14	12.8	-0.6	
GM-GIS-EP_ssGM_1496	MH-GIS-EP_ssMH_2604	1,097.53	MH-GIS-EP_ssMH_2588	1,087.69	169.8	0.058	8	Glass	0.013	11	10.4	-0.6	
GM-GIS-EP_ssGM_1497	MH-GIS-EP_ssMH_2596	1,082.11	MH-GIS-EP_ssMH_2602	1,070.56	268	0.043	8	Glass	0.013	21	14.7	-0.6	
GM-GIS-EP_ssGM_1498	MH-GIS-EP_ssMH_2580	1,092.25	MH-GIS-EP_ssMH_2600	1,085.09	109.6	0.065	8	Glass	0.013	12	11.2	-0.6	
GM-GIS-EP_ssGM_1499	MH-GIS-EP_ssMH_2599	1,091.67	MH-GIS-EP_ssMH_2595	1,086.22	202.2	0.027	8	Glass	0.013	2	4.2	-0.6	
GM-GIS-EP_ssGM_1500	MH-GIS-MH-99	1,100.90	MH-GIS-EP_ssMH_2598	1,099.00	153.2	0.012	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-EP_ssGM_1501	MH-GIS-EP_ssMH_2597	1,087.13	MH-GIS-EP_ssMH_2595	1,086.22	167.4	0.005	8	Glass	0.013	16	13.6	-0.6	
GM-GIS-EP_ssGM_1502	MH-GIS-EP_ssMH_2588	1,087.69	MH-GIS-EP_ssMH_2586	1,087.41	51.6	0.005	8	Glass	0.013	12	12	-0.6	
GM-GIS-EP_ssGM_1503	MH-GIS-EP_ssMH_2581	1,107.73	MH-GIS-MH-75	1,110.99	48.3	0.067	8	Glass	0.013	7	8.5	2.6	
GM-GIS-EP_ssGM_1504	MH-GIS-EP_ssMH_2594	1,058.00	MH-GIS-EP_ssMH_2591	1,057.24	96.7	0.008	8	Glass	0.013	65	100	4.6	
GM-GIS-EP_ssGM_1505	MH-GIS-EP_ssMH_2593	1,066.04	MH-GIS-EP_ssMH_2592	1,062.35	170.6	0.022	8	Glass	0.013	2	4.2	-0.6	
GM-GIS-EP_ssGM_1506	MH-GIS-EP_ssMH_2589	1,057.65	MH-GIS-EP_ssMH_2590	1,059.65	134	-0.015	8	Glass	0.013	41	100	5	
GM-GIS-EP_ssGM_1507	MH-GIS-EP_ssMH_2598	1,099.00	MH-GIS-EP_ssMH_2580	1,092.25	300	0.023	8	Glass	0.013	11	10.4	-0.6	
GM-GIS-EP_ssGM_1508	MH-GIS-EP_ssMH_2578	1,064.51	MH-GIS-EP_ssMH_2582	1,062.05	102.8	0.024	8	Glass	0.013	12	11.2	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-EP_ssGM_1509	MH-GIS-EP_ssMH_2583	1,079.32	MH-GIS-EP_ssMH_2579	1,063.97	155	0.099	8	Glass	0.013	16	12.7	-0.6	
GM-GIS-EP_ssGM_1510	MH-GIS-EP_ssMH_2609	1,046.79	MH-GIS-EP_ssMH_2587	1,053.88	157	0.045	8	Glass	0.013	108	33.8	6.6	
GM-GIS-EP_ssGM_1511	MH-GIS-EP_ssMH_2571	1,044.00	MH-GIS-EP_ssMH_2609	1,046.79	131.3	0.021	8	Glass	0.013	109	34.1	2.4	
GM-GIS-FW_ssGM_189	MH-GIS-FW_ssMH_1607	894	MH-GIS-FW_ssMH_1606	891.15	175.4	0.016	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_208	MH-GIS-FW_ssMH_1603	862.78	MH-GIS-NE_ssMH_1604	868.35	299.1	0.019	8	PVC	0.01	10	10	5	
GM-GIS-FW_ssGM_209	MH-IS-39	847.91	MH-GIS-FW_ssMH_1603	862.78	345.5	0.043	8	PVC	0.01	11	10.5	14.3	
GM-GIS-FW_ssGM_215	MH-GIS-FW_ssMH_1595	881.15	MH-GIS-FW_ssMH_1596	871.76	240.9	0.039	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-FW_ssGM_216	MH-GIS-FW_ssMH_1593	890.23	MH-GIS-FW_ssMH_1594	885.7	170.8	0.027	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-FW_ssGM_217	MH-GIS-FW_ssMH_1594	885.7	MH-GIS-FW_ssMH_1595	881.15	150.1	0.03	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-FW_ssGM_223	MH-GIS-FW_ssMH_1606	891.15	MH-GIS-FW_ssMH_1608	884.67	299.5	0.022	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_228	MH-GIS-FW_ssMH_1592	894	MH-GIS-FW_ssMH_1593	890.23	150.8	0.025	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-FW_ssGM_291	MH-GIS-FW_ssMH_1664	844	MH-GIS-FW_ssMH_1661	843.39	111.7	0.005	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-FW_ssGM_292	MH-GIS-FW_ssMH_1661	843.39	MH-GIS-FW_ssMH_1660	841.89	222.3	0.007	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-FW_ssGM_293	MH-GIS-FW_ssMH_1663	844.21	MH-GIS-FW_ssMH_1664	844	48.7	0.004	8	PVC	0.01	2	5.3	-0.6	
GM-GIS-FW_ssGM_294	MH-GIS-FW_ssMH_1662	848.3	MH-GIS-FW_ssMH_1664	844	201.1	0.021	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_295	MH-GIS-FW_ssMH_1908	837.79	MH-GIS-FW_ssMH_1659	831.2	153	0.043	8	PVC	0.01	7	8.7	-0.6	
GM-GIS-FW_ssGM_296	MH-GIS-FW_ssMH_1658	813.49	MH-GIS-GC_ssMH_1612	813.35	165.1	9E-04	8	PVC	0.01	13	17.2	-0.6	
GM-GIS-FW_ssGM_297	MH-GIS-FW_ssMH_1659	831.2	MH-GIS-FW_ssMH_1658	813.49	343.4	0.052	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-FW_ssGM_298	MH-GIS-FW_ssMH_1660	841.89	MH-GIS-FW_ssMH_1908	837.79	155.5	0.026	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-FW_ssGM_299	MH-GIS-FW_ssMH_1666	864.43	MH-GIS-FW_ssMH_1665	860.56	113.6	0.034	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_300	MH-GIS-FW_ssMH_1656	827.21	MH-GIS-FW_ssMH_1657	815.87	190.5	0.06	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-FW_ssGM_301	MH-GIS-MH-145	834.18	MH-GIS-FW_ssMH_1656	827.21	106.8	0.065	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_302	MH-GIS-FW_ssMH_1655	846.35	MH-GIS-FW_ssMH_1656	827.21	365	0.052	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_303	MH-GIS-FW_ssMH_1654	855.98	MH-GIS-FW_ssMH_1655	846.35	162.5	0.059	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_304	MH-GIS-FW_ssMH_1657	815.87	MH-GIS-FW_ssMH_1658	813.49	143.4	0.017	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-FW_ssGM_305	MH-GIS-FW_ssMH_1665	860.56	MH-GIS-FW_ssMH_1663	844.21	222	0.074	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_306	MH-GIS-MH-147	842.69	MH-GIS-FW_ssMH_1908	837.79	114.4	0.043	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_307	MH-GIS-FW_ssMH_1676	876.82	MH-GIS-FW_ssMH_1675	875	235.7	0.008	8	PVC	0.01	541	78	-0.1	
GM-GIS-FW_ssGM_308	MH-GIS-FW_ssMH_1675	875	MH-IS-MH-4	873	401.1	0.005	8	PVC	0.01	542	100	0.2	
GM-GIS-FW_ssGM_309	MH-GIS-FW_ssMH_1667	887.28	MH-GIS-FW_ssMH_1668	884	391	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_313	MH-GIS-FW_ssMH_1669	875.37	MH-GIS-FW_ssMH_1670	872.88	75.7	0.033	8	PVC	0.01	2	5	-0.6	
GM-GIS-FW_ssGM_314	MH-GIS-FW_ssMH_1670	872.88	MH-IS-43	861.48	302.9	0.038	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-FW_ssGM_315	MH-GIS-MH-187	877.48	MH-GIS-FW_ssMH_1670	872.88	158.3	0.029	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_316	MH-GIS-FW_ssMH_1668	884	MH-GIS-FW_ssMH_1669	875.37	351.6	0.025	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-GC_ssGM_192	MH-GIS-MH-29	797.76	MH-GIS-GC_ssMH_1578	798	18.4	-0.013	8	Glass	0.013	1	100	5.4	
GM-GIS-GC_ssGM_193	MH-GIS-MH-65	798.64	MH-GIS-GC_ssMH_1578	798	43.3	0.015	8	Glass	0.013	1	100	4.5	
GM-GIS-GC_ssGM_194	MH-GIS-GC_ssMH_1578	798	MH-GIS-GC_ssMH_1579	799.91	132.6	-0.014	8	PVC	0.01	4	100	5.2	
GM-GIS-GC_ssGM_195	MH-GIS-GC_ssMH_1579	799.91	MH-GIS-GC_ssMH_1580	803.06	194.9	-0.016	8	PVC	0.01	5	100	3.3	
GM-GIS-GC_ssGM_196	MH-GIS-GC_ssMH_1580	803.06	MH-GIS-GC_ssMH_1581	803.72	261.4	-0.003	8	PVC	0.01	7	100	0.1	
GM-GIS-GC_ssGM_197	MH-GIS-GC_ssMH_1581	803.72	MH-GIS-GC_ssMH_1582	792.63	287.3	0.039	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-GC_ssGM_198	MH-GIS-GC_ssMH_1582	792.63	MH-GIS-GC_ssMH_1583	794	172.4	-0.008	8	PVC	0.01	9	100	0.8	
GM-GIS-GC_ssGM_205	MH-GIS-GC_ssMH_1583	794	MH-GIS-GC_ssMH_1588	794	57.2	0	8	PVC	0.01	11	20	-0.5	
GM-GIS-GC_ssGM_206	MH-GIS-GC_ssMH_1591	822.34	MH-GIS-GC_ssMH_1589	804.13	208.7	0.087	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-GC_ssGM_210	MH-GIS-GC_ssMH_1589	804.13	MH-GIS-GC_ssMH_1588	794	233.8	0.043	8	PVC	0.01	12	11	-0.6	
GM-GIS-GC_ssGM_232	MH-GIS-GC_ssMH_1612	813.35	MH-IS-40	811.95	77.2	0.018	8	PVC	0.01	14	12	-0.6	
GM-GIS-GC_ssGM_1080	MH-GIS-GC_ssMH_2208	780.56	MH-IS-38	767.46	246.4	0.053	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-GS_ssGM_779	MH-GIS-GS_ssMH_1470	411.77	MH-IS-193	407.54	62.7	0.067	8	Concrete	0.013	10	10	-0.6	
GM-GIS-GS_ssGM_780	MH-GIS-GS_ssMH_1493	414	MH-IS-134	408.52	284.5	0.019	8	Concrete	0.013	3	5.8	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-GS_ssGM_883	MH-GIS-GS_ssMH_2090	414.88	MH-GIS-GS_ssMH_2091	415.82	47.9	-0.02	8	Concrete	0.013	23	100	3	SM4
GM-GIS-GS_ssGM_884	MH-GIS-GS_ssMH_1528	416.02	MH-GIS-GS_ssMH_2090	414.88	196.2	0.006	8	PVC	0.01	3	100	1.9	
GM-GIS-GS_ssGM_885	MH-GIS-MH-206	419	MH-GIS-GS_ssMH_2091	415.82	258.5	0.012	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-GS_ssGM_886	MH-GIS-GS_ssMH_2091	415.82	MH-GIS-GS_ssMH_1476	418.34	176.4	-0.014	8	Concrete	0.013	30	100	2.1	SM4
GM-GIS-GS_ssGM_887	MH-GIS-GS_ssMH_1476	418.34	MH-IS-257	414.64	242.3	0.015	8	Concrete	0.013	33	18.5	-0.5	SM4
GM-GIS-GS_ssGM_888	MH-GIS-GS_ssMH_2092	417.72	MH-IS-266	415.38	344.4	0.007	8	Concrete	0.013	3	6.2	-0.6	
GM-GIS-GS_ssGM_909	MH-GIS-MB_ssMH_1461	416	MH-GIS-GS_ssMH_1468	415.12	249.2	0.004	8	Concrete	0.013	135	45.2	-0.4	
GM-GIS-GS_ssGM_910	MH-GIS-GS_ssMH_1468	415.12	MH-GIS-GS_ssMH_1467	414.38	299.4	0.002	8	Concrete	0.013	138	50.8	-0.3	
GM-GIS-GS_ssGM_911	MH-GIS-GS_ssMH_1477	412.88	MH-GIS-GS_ssMH_1478	412.68	30.6	0.007	8	Concrete	0.013	148	40	-0.4	
GM-GIS-GS_ssGM_913	MH-GIS-GS_ssMH_1478	412.68	MH-GIS-GS_ssMH_2101	411.66	353.3	0.003	8	Concrete	0.013	152	51.2	-0.3	
GM-GIS-GS_ssGM_914	MH-GIS-GS_ssMH_2101	411.66	MH-IS-GS_ssMH_1480	408.77	302.7	0.01	8	Concrete	0.013	155	41	-0.4	
GM-GIS-GS_ssGM_918	MH-GIS-GS_ssMH_2106	414.79	MH-GIS-GS_ssMH_2105	414.08	177.7	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-GS_ssGM_919	MH-GIS-GS_ssMH_2105	414.08	MH-IS-GS_ssMH_1480	408.77	152.8	0.035	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-GS_ssGM_973	MH-GIS-GS_ssMH_2104	418.06	MH-GIS-GS_ssMH_2154	416.74	329.4	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-GS_ssGM_979	MH-GIS-GS_ssMH_2089	415.97	MH-GIS-GS_ssMH_2090	414.88	302.3	0.004	8	PVC	0.01	10	100	1.9	
GM-GIS-GS_ssGM_980	MH-GIS-MC_ssMH_2159	417.2	MH-GIS-GS_ssMH_2089	415.97	267	0.005	8	Ductile Iron	0.013	7	100	0.7	
GM-GIS-GS_ssGM_981	MH-GIS-MH-21	417.4	MH-GIS-MC_ssMH_2159	417.2	11.7	0.017	8	Ductile Iron	0.013	3	100	0.5	
GM-GIS-GS_ssGM_982	MH-GIS-GS_ssMH_2153	414.94	MH-IS-135	409.66	297.3	0.018	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-GS_ssGM_983	MH-GIS-GS_ssMH_2103	416.1	MH-GIS-GS_ssMH_2153	414.94	291	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-GS_ssGM_1000	MH-GIS-GS_ssMH_1467	414.38	MH-GIS-GS_ssMH_2172	413.45	139.3	0.007	8	Concrete	0.013	142	39.1	-0.4	
GM-GIS-GS_ssGM_1001	MH-GIS-GS_ssMH_2172	413.45	MH-GIS-GS_ssMH_1477	412.88	163.6	0.003	8	Concrete	0.013	145	47.3	-0.4	
GM-GIS-GS_ssGM_1004	MH-GIS-GS_ssMH_2102	414	MH-GIS-GS_ssMH_1470	411.77	363.2	0.006	8	Concrete	0.013	7	8.7	-0.6	
GM-GIS-GS_ssGM_1005	MH-GIS-MH-176	414.6	MH-GIS-GS_ssMH_2102	414	148.8	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-GS_ssGM_1021	MH-GIS-MH-79	415.21	MH-GIS-GS_ssMH_2090	414.88	83.3	0.004	8	Concrete	0.013	7	100	2.7	
GM-GIS-GS_ssGM_1022	MH-GIS-MH-78	416.02	MH-GIS-MH-79	415.21	49.5	0.016	8	PVC	0.01	3	100	1.9	
GM-GIS-IR_ssGM_249	MH-GIS-MH-14	605.02	MH-GIS-MH-41	593.77	28.2	0.399	6	Glass	0.013	12	15.7	-0.4	
GM-GIS-IR_ssGM_250	MH-GIS-MH-13	605.89	MH-GIS-MH-14	605.02	4	0.219	6	Glass	0.013	11	15.1	-0.4	
GM-GIS-IR_ssGM_251	MH-GIS-MH-51	606.69	MH-GIS-MH-13	605.89	97.2	0.008	6	Glass	0.013	10	14.5	-0.4	
GM-GIS-IR_ssGM_252	MH-GIS-IR_ssMH_1623	608.04	MH-GIS-MH-51	606.69	36.1	0.037	6	Glass	0.013	9	13.9	-0.4	
GM-GIS-IR_ssGM_253	MH-GIS-MH-133	618.69	MH-GIS-IR_ssMH_1623	608.04	98	0.109	6	Glass	0.013	8	13.2	-0.4	
GM-GIS-IR_ssGM_254	MH-GIS-MH-137	631.94	MH-GIS-MH-133	618.69	101.2	0.131	6	Glass	0.013	7	12.5	-0.4	
GM-GIS-IR_ssGM_255	MH-GIS-MH-136	641.15	MH-GIS-MH-137	631.94	100	0.092	6	Glass	0.013	7	11.8	-0.4	
GM-GIS-IR_ssGM_256	MH-GIS-MH-138	649.38	MH-GIS-MH-136	641.15	100	0.082	6	Glass	0.013	6	11	-0.4	
GM-GIS-IR_ssGM_257	MH-GIS-MH-61	657.01	MH-GIS-MH-138	649.38	100	0.076	6	Glass	0.013	5	10.2	-0.4	
GM-GIS-IR_ssGM_258	MH-GIS-IR_ssMH_1624	662.95	MH-GIS-MH-61	657.01	41	0.145	6	Glass	0.013	4	9.3	-0.5	
GM-GIS-IR_ssGM_259	MH-GIS-MH-111	676.44	MH-GIS-IR_ssMH_1624	662.95	83.4	0.162	6	Glass	0.013	3	8.3	-0.5	
GM-GIS-IR_ssGM_260	MH-GIS-MH-110	685.5	MH-GIS-MH-111	676.44	73.4	0.123	6	Glass	0.013	2	7.2	-0.5	
GM-GIS-IR_ssGM_261	MH-GIS-MH-23	684.07	MH-GIS-MH-110	685.5	82.7	-0.017	6	Glass	0.013	2	100	1	
GM-GIS-IR_ssGM_262	MH-GIS-MH-22	685.57	MH-GIS-MH-23	684.07	12.3	0.122	6	Glass	0.013	1	4.1	-0.5	
GM-GIS-IR_ssGM_674	MH-GIS-IR_ssMH_1695	661.78	MH-GIS-IR_ssMH_1946	658.6	73.5	0.043	8	Glass	0.013	27	16.8	-0.6	
GM-GIS-IR_ssGM_675	MH-GIS-IR_ssMH_1954	720.01	MH-GIS-IR_ssMH_1948	718.96	30.1	0.035	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_676	MH-GIS-IR_ssMH_1973	674.31	MH-GIS-IR_ssMH_1977	664.88	122.9	0.077	8	Glass	0.013	7	8.2	-0.6	
GM-GIS-IR_ssGM_677	MH-GIS-IR_ssMH_1946	658.6	MH-GIS-IR_ssMH_1979	644.64	157.8	0.088	8	Glass	0.013	28	17.1	-0.6	
GM-GIS-IR_ssGM_678	MH-GIS-IR_ssMH_1949	685.69	MH-GIS-IR_ssMH_1976	677.81	118.5	0.066	8	Glass	0.013	17	13	-0.6	
GM-GIS-IR_ssGM_679	MH-GIS-IR_ssMH_1952	723.4	MH-GIS-IR_ssMH_1954	720.01	183.1	0.019	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_680	MH-GIS-IR_ssMH_1953	717.36	MH-GIS-IR_ssMH_1954	720.01	224.3	-0.012	8	Glass	0.013	1	100	2	
GM-GIS-IR_ssGM_681	MH-GIS-IR_ssMH_1980	639	MH-GIS-IR_ssMH_1981	641.5	151.6	-0.016	8	Glass	0.013	38	100	2.1	
GM-GIS-IR_ssGM_682	MH-GIS-IR_ssMH_1979	644.64	MH-GIS-IR_ssMH_1980	639	160	0.035	8	Glass	0.013	37	19.7	-0.5	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-IR_ssGM_683	MH-GIS-IR_ssMH_1978	655.71	MH-GIS-IR_ssMH_1979	644.64	169.4	0.065	8	Glass	0.013	8	9.2	-0.6	
GM-GIS-IR_ssGM_684	MH-GIS-IR_ssMH_1977	664.88	MH-GIS-IR_ssMH_1978	655.71	171	0.054	8	Glass	0.013	7	8.7	-0.6	
GM-GIS-IR_ssGM_685	MH-GIS-IR_ssMH_1955	707.87	MH-GIS-IR_ssMH_1956	701.78	99	0.062	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-IR_ssGM_686	MH-GIS-IR_ssMH_1948	718.96	MH-GIS-IR_ssMH_1955	707.87	140.9	0.079	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_687	MH-GIS-IR_ssMH_1958	705.64	MH-GIS-IR_ssMH_1959	693	126.7	0.1	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-IR_ssGM_688	MH-GIS-IR_ssMH_1957	730.49	MH-GIS-IR_ssMH_1958	705.64	262.3	0.095	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_689	MH-GIS-IR_ssMH_1959	693	MH-GIS-IR_ssMH_1968	689.98	121.5	0.025	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_690	MH-GIS-IR_ssMH_1962	747.5	MH-GIS-IR_ssMH_1963	734.42	162.3	0.081	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_691	MH-GIS-IR_ssMH_1961	767.17	MH-GIS-IR_ssMH_1962	747.5	255.4	0.077	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_692	MH-GIS-IR_ssMH_1960	766.86	MH-GIS-IR_ssMH_1961	767.17	73.7	-0.004	8	Glass	0.013	2	56.6	-0.3	
GM-GIS-IR_ssGM_693	MH-GIS-MH-114	770.66	MH-GIS-IR_ssMH_1960	766.86	75.3	0.05	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_694	MH-GIS-IR_ssMH_1947	757.4	MH-GIS-IR_ssMH_1969	741.39	147.1	0.109	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_695	MH-GIS-IR_ssMH_1963	734.42	MH-GIS-IR_ssMH_1964	717.96	217.8	0.076	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-IR_ssGM_696	MH-GIS-IR_ssMH_1964	717.96	MH-GIS-IR_ssMH_1965	709.36	93.4	0.092	8	Glass	0.013	5	7.2	-0.6	
GM-GIS-IR_ssGM_697	MH-GIS-IR_ssMH_1965	709.36	MH-GIS-IR_ssMH_1966	701.3	85.6	0.094	8	Glass	0.013	6	7.6	-0.6	
GM-GIS-IR_ssGM_698	MH-GIS-IR_ssMH_1966	701.3	MH-GIS-IR_ssMH_1967	695.27	91.3	0.066	8	Glass	0.013	12	10.9	-0.6	
GM-GIS-IR_ssGM_699	MH-GIS-IR_ssMH_1956	701.78	MH-GIS-IR_ssMH_1966	701.3	64.4	0.007	8	Glass	0.013	5	7.3	-0.6	
GM-GIS-IR_ssGM_700	MH-GIS-IR_ssMH_1967	695.27	MH-GIS-IR_ssMH_1968	689.98	197.5	0.027	8	Glass	0.013	12	11.2	-0.6	
GM-GIS-IR_ssGM_701	MH-GIS-IR_ssMH_1968	689.98	MH-GIS-IR_ssMH_1949	685.69	158.1	0.027	8	Glass	0.013	16	12.7	-0.6	
GM-GIS-IR_ssGM_702	MH-GIS-IR_ssMH_1969	741.39	MH-GIS-IR_ssMH_1970	713.33	255.2	0.11	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-IR_ssGM_703	MH-GIS-IR_ssMH_1970	713.33	MH-GIS-IR_ssMH_1971	692.5	189.8	0.11	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_704	MH-GIS-IR_ssMH_1971	692.5	MH-GIS-IR_ssMH_1972	677.86	142.1	0.103	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_705	MH-GIS-IR_ssMH_1972	677.86	MH-GIS-IR_ssMH_1973	674.31	55.7	0.064	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-IR_ssGM_706	MH-GIS-IR_ssMH_1974	674	MH-GIS-IR_ssMH_1973	674.31	76.9	-0.004	8	Glass	0.013	2	55.5	-0.3	
GM-GIS-IR_ssGM_707	MH-GIS-IR_ssMH_1975	677.11	MH-GIS-IR_ssMH_1974	674	145.1	0.021	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_708	MH-GIS-IR_ssMH_1981	641.5	MH-GIS-IR_ssMH_1982	609.69	301.6	0.105	8	Glass	0.013	39	20.1	-0.5	
GM-GIS-IR_ssGM_709	MH-GIS-IR_ssMH_1976	677.81	MH-GIS-IR_ssMH_1951	667.09	127.6	0.084	8	Glass	0.013	17	13.4	-0.6	
GM-GIS-IR_ssGM_710	MH-GIS-IR_ssMH_1951	667.09	MH-IS-129	645.79	117.2	0.182	8	Glass	0.013	18	13.7	-0.6	
GM-GIS-IR_ssGM_735	MH-GIS-IR_ssMH_1982	609.69	MH-IS-48	588.13	104.8	0.206	8	Glass	0.013	40	20.3	-0.5	
GM-GIS-JH_ssGM_1102	MH-GIS-MH-74	466.99	MH-IS-16	465.97	48.5	0.021	8	Ductile Iron	0.013	220	49.1	-0.3	
GM-GIS-KC_ssGM_747	MH-GIS-MH-188	418.46	MH-GIS-MH-189	417.83	158.6	0.004	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-KC_ssGM_748	MH-GIS-MH-189	417.83	MH-GIS-KC_ssMH_2009	417.17	163.9	0.004	8	PVC	0.01	5	7.7	-0.6	
GM-GIS-KC_ssGM_749	MH-GIS-KC_ssMH_2009	417.17	MH-GIS-MH-155	416.67	125.3	0.004	8	PVC	0.01	8	9.3	-0.6	
GM-GIS-KC_ssGM_750	MH-GIS-MH-155	416.67	Pump Station No. 6 Wetwell	415	213.3	0.008	8	PVC	0.01	11	49.6	-0.3	
GM-GIS-KC_ssGM_857	MH-GIS-MH-209	418.15	MH-IS-30	415.36	355.8	0.008	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-KC_ssGM_860	MH-GIS-MH-76	418.62	MH-GIS-KC_ssMH_1509	417.94	49.3	0.014	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-KC_ssGM_861	MH-GIS-KC_ssMH_1509	417.94	MH-IS-24	416.67	281.1	0.005	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-KC_ssGM_870	MH-GIS-KC_ssMH_2084	482.14	MH-GIS-KC_ssMH_2083	463.1	295.4	0.064	8	PVC	0.01	333	61.1	-0.3	
GM-GIS-KC_ssGM_871	MH-GIS-KC_ssMH_2083	463.1	MH-GIS-KC_ssMH_2082	440.53	345.7	0.065	8	PVC	0.01	342	61.9	-0.3	
GM-GIS-KC_ssGM_872	MH-GIS-KC_ssMH_2082	440.53	MH-IS-57	425.87	240.2	0.061	8	PVC	0.01	351	62.8	-0.2	
GM-GIS-KC_ssGM_891	MH-GIS-MH-195	522.26	MH-GIS-KC_ssMH_2084	482.14	281.4	0.143	8	PVC	0.01	45	21.5	-0.5	
GM-GIS-KC_ssGM_892	MH-GIS-MH-199	557.17	MH-GIS-MH-195	522.26	183	0.191	8	PVC	0.01	27	16.6	-0.6	
GM-GIS-KC_ssGM_893	MH-GIS-MH-165	569.29	MH-GIS-MH-199	557.17	203.7	0.06	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-KC_ssGM_894	MH-GIS-MH-164	577.65	MH-GIS-MH-165	569.29	138.8	0.06	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-KC_ssGM_895	MH-GIS-MH-194	561.05	MH-GIS-MH-195	522.26	173.8	0.223	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-KC_ssGM_922	MH-GIS-KC_ssMH_2108	1,027.84	MH-GIS-KC_ssMH_2109	1,006.90	270.9	0.077	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_923	MH-GIS-KC_ssMH_2109	1,006.90	MH-GIS-KC_ssMH_2111	970.9	297.5	0.121	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-KC_ssGM_924	MH-GIS-KC_ssMH_2111	970.9	MH-GIS-KC_ssMH_2110	961.14	117.7	0.083	8	PVC	0.01	26	16.4	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-KC_ssGM_925	MH-GIS-KC_ssMH_2110	961.14	MH-GIS-KC_ssMH_2112	946.39	98.7	0.149	8	PVC	0.01	35	18.9	-0.5	
GM-GIS-KC_ssGM_926	MH-GIS-KC_ssMH_2112	946.39	MH-GIS-KC_ssMH_2113	926.05	298.9	0.068	8	PVC	0.01	44	21.3	-0.5	
GM-GIS-KC_ssGM_927	MH-GIS-KC_ssMH_2113	926.05	MH-GIS-MH-123	906.59	236.2	0.082	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-KC_ssGM_928	MH-GIS-MH-123	906.59	MH-GIS-KC_ssMH_2115	900.25	83.5	0.076	8	PVC	0.01	61	25.3	-0.5	
GM-GIS-KC_ssGM_929	MH-GIS-KC_ssMH_2115	900.25	MH-GIS-KC_ssMH_2116	887.69	229.2	0.055	8	PVC	0.01	70	27	-0.5	
GM-GIS-KC_ssGM_930	MH-GIS-KC_ssMH_2116	887.69	MH-GIS-KC_ssMH_2117	874.03	141.2	0.097	8	PVC	0.01	78	28.8	-0.5	
GM-GIS-KC_ssGM_931	MH-GIS-KC_ssMH_2117	874.03	MH-GIS-KC_ssMH_2118	847.41	300.1	0.089	8	PVC	0.01	87	30.4	-0.5	
GM-GIS-KC_ssGM_932	MH-GIS-KC_ssMH_2118	847.41	MH-GIS-KC_ssMH_2119	790.79	349.9	0.162	8	PVC	0.01	96	31.9	-0.5	
GM-GIS-KC_ssGM_933	MH-GIS-KC_ssMH_2119	790.79	MH-GIS-KC_ssMH_2122	729.26	389.2	0.158	8	PVC	0.01	105	33.4	-0.4	
GM-GIS-KC_ssGM_934	MH-GIS-KC_ssMH_2122	729.26	MH-GIS-KC_ssMH_2196	707.3	203.5	0.108	8	PVC	0.01	113	34.8	-0.4	
GM-GIS-KC_ssGM_935	MH-GIS-KC_ssMH_2196	707.3	MH-GIS-KC_ssMH_2197	701.32	62.5	0.096	8	PVC	0.01	122	36.2	-0.4	
GM-GIS-KC_ssGM_936	MH-GIS-KC_ssMH_2197	701.32	MH-GIS-KC_ssMH_2123	691.09	106.9	0.096	8	PVC	0.01	131	37.5	-0.4	
GM-GIS-KC_ssGM_937	MH-GIS-KC_ssMH_2123	691.09	MH-GIS-KC_ssMH_2124	686.29	81	0.059	8	PVC	0.01	139	38.7	-0.4	
GM-GIS-KC_ssGM_938	MH-GIS-KC_ssMH_2124	686.29	MH-GIS-KC_ssMH_2125	653.86	85.6	0.379	8	Ductile Iron	0.013	148	40	-0.4	
GM-GIS-KC_ssGM_939	MH-GIS-KC_ssMH_2125	653.86	MH-GIS-KC_ssMH_2126	651.73	144	0.015	8	PVC	0.01	157	41.2	-0.4	
GM-GIS-KC_ssGM_940	MH-GIS-KC_ssMH_2126	651.73	MH-GIS-KC_ssMH_2168	644.03	103.7	0.074	8	PVC	0.01	166	42.4	-0.4	
GM-GIS-KC_ssGM_941	MH-GIS-KC_ssMH_2168	644.03	MH-GIS-KC_ssMH_2127	641.46	315.3	0.008	8	PVC	0.01	174	43.5	-0.4	
GM-GIS-KC_ssGM_942	MH-GIS-KC_ssMH_2127	641.46	MH-GIS-KC_ssMH_2128	634.26	66.3	0.109	8	PVC	0.01	183	44.6	-0.4	
GM-GIS-KC_ssGM_943	MH-GIS-KC_ssMH_2128	634.26	MH-GIS-KC_ssMH_2129	611.91	210.3	0.106	8	PVC	0.01	192	45.8	-0.4	
GM-GIS-KC_ssGM_944	MH-GIS-KC_ssMH_2129	611.91	MH-GIS-KC_ssMH_2130	603.73	76.9	0.106	8	PVC	0.01	201	46.8	-0.4	
GM-GIS-KC_ssGM_945	MH-GIS-KC_ssMH_2130	603.73	MH-GIS-KC_ssMH_2131	592.15	108.9	0.106	8	PVC	0.01	209	47.9	-0.3	
GM-GIS-KC_ssGM_946	MH-GIS-KC_ssMH_2131	592.15	MH-GIS-KC_ssMH_2132	561.7	286.5	0.106	8	PVC	0.01	218	48.9	-0.3	
GM-GIS-KC_ssGM_947	MH-GIS-KC_ssMH_2132	561.7	MH-GIS-KC_ssMH_2133	549	131.6	0.096	8	PVC	0.01	227	49.9	-0.3	
GM-GIS-KC_ssGM_948	MH-GIS-KC_ssMH_2133	549	MH-GIS-KC_ssMH_2134	535.47	176.1	0.077	8	PVC	0.01	235	50.9	-0.3	
GM-GIS-KC_ssGM_949	MH-GIS-KC_ssMH_2134	535.47	MH-GIS-KC_ssMH_2135	534.13	43.6	0.031	8	PVC	0.01	244	51.9	-0.3	
GM-GIS-KC_ssGM_950	MH-GIS-KC_ssMH_2135	534.13	MH-GIS-KC_ssMH_2120	521.21	135.8	0.095	8	PVC	0.01	253	52.9	-0.3	
GM-GIS-KC_ssGM_984	MH-GIS-KC_ssMH_2084	482.14	MH-GIS-KC_ssMH_2160	482.58	9.6	0.046	8	PVC	0.01	280	55.8	0.1	
GM-GIS-KC_ssGM_987	MH-GIS-KC_ssMH_2121	507.3	MH-GIS-KC_ssMH_2160	482.58	373.8	0.066	8	PVC	0.01	271	54.8	-0.3	
GM-GIS-KC_ssGM_988	MH-GIS-KC_ssMH_2120	521.21	MH-GIS-KC_ssMH_2121	507.3	184.9	0.075	8	PVC	0.01	262	53.9	-0.3	
GM-GIS-KR_ssGM_29	MH-GIS-KR_ssMH_1445	579.09	MH-GIS-KR_ssMH_1442	570.02	120.4	0.075	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-KR_ssGM_34	MH-GIS-KR_ssMH_1442	570.02	MH-GIS-KR_ssMH_1441	558.99	117.6	0.094	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-KR_ssGM_35	MH-GIS-KR_ssMH_1441	558.99	MH-GIS-KR_ssMH_1439	565.63	153.6	-0.043	8	PVC	0.01	17	100	6.1	
GM-GIS-KR_ssGM_36	MH-GIS-KR_ssMH_1439	565.63	MH-GIS-KR_ssMH_1431	552.59	70.1	0.186	8	PVC	0.01	19	14	-0.6	
GM-GIS-KR_ssGM_554	MH-GIS-MH-88	587.38	MH-IS-89	577.39	54.9	0.182	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_557	MH-GIS-MH-41	593.77	MH-IS-89	577.39	124.3	0.132	6	PVC	0.01	12	16.2	-0.4	
GM-GIS-KR_ssGM_610	MH-GIS-MH-43	553.07	MH-GIS-KR_ssMH_1900	546.6	29.5	0.219	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-KR_ssGM_611	MH-GIS-KR_ssMH_1899	550.74	MH-GIS-KR_ssMH_1898	549.33	161.7	0.009	8	PVC	0.01	54	23.8	-0.5	
GM-GIS-KR_ssGM_612	MH-GIS-KR_ssMH_1431	552.59	MH-GIS-KR_ssMH_1899	550.74	181.5	0.01	8	PVC	0.01	53	23.6	-0.5	
GM-GIS-KR_ssGM_613	MH-GIS-KR_ssMH_1898	549.33	MH-GIS-KR_ssMH_1901	548.1	163.4	0.008	8	PVC	0.01	55	24	-0.5	
GM-GIS-KR_ssGM_614	MH-GIS-KR_ssMH_1901	548.1	MH-GIS-KR_ssMH_1900	546.6	141.6	0.011	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-KR_ssGM_615	MH-GIS-KR_ssMH_1900	546.6	MH-GIS-KR_ssMH_1897	535.33	181.1	0.062	8	PVC	0.01	58	24.5	-0.5	
GM-GIS-KR_ssGM_616	MH-GIS-KR_ssMH_1897	535.33	MH-GIS-KR_ssMH_1896	518.29	184.2	0.093	8	PVC	0.01	58	24.7	-0.5	
GM-GIS-KR_ssGM_617	MH-GIS-KR_ssMH_1896	518.29	MH-GIS-KR_ssMH_1902	515.25	160.9	0.019	8	PVC	0.01	179	44.1	-0.4	
GM-GIS-KR_ssGM_618	MH-GIS-KR_ssMH_1902	515.25	MH-GIS-KR_ssMH_1903	513.28	230.4	0.009	8	PVC	0.01	179	44.2	-0.4	
GM-GIS-KR_ssGM_619	MH-GIS-KR_ssMH_1903	513.28	MH-GIS-KR_ssMH_1904	511.5	192.5	0.009	8	PVC	0.01	180	44.3	-0.4	
GM-GIS-KR_ssGM_620	MH-GIS-KR_ssMH_1904	511.5	MH-IS-128	510.28	158.6	0.008	8	PVC	0.01	181	44.4	-0.4	
GM-GIS-KR_ssGM_621	MH-GIS-MH-31	528.89	MH-GIS-KR_ssMH_1896	518.29	19.3	0.55	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_642	MH-GIS-MH-20	570.83	MH-GIS-KR_ssMH_1442	570.02	10.2	0.08	8	Glass	0.013	2	4.1	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-KR_ssGM_643	MH-GIS-MH-151	579.54	MH-GIS-MH-20	570.83	118.6	0.073	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_644	MH-GIS-KR_ssMH_1916	559.83	MH-GIS-KR_ssMH_1439	565.63	104.6	-0.055	8	PVC	0.01	1	100	5.2	
GM-GIS-KR_ssGM_645	MH-GIS-KR_ssMH_1917	585.29	MH-GIS-KR_ssMH_1439	565.63	256.8	0.077	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_536	MH-IS-MH-2	408.8	MH-GIS-KV_ssMH_1913	417.96	20.6	0.444	8	PVC	0.01	2	4.9	8.5	
GM-GIS-KV_ssGM_539	MH-GIS-KV_ssMH_2205	458.37	MH-IS-82	448.73	44.8	0.215	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_558	MH-GIS-MH-108	504.12	MH-IS-121	498.94	71.9	0.072	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_752	MH-GIS-AR_ssMH_2017	517.96	MH-IS-154	499.58	185.3	0.099	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-KV_ssGM_970	MH-GIS-KV_ssMH_2150	418.31	MH-GIS-KV_ssMH_1913	417.96	87.6	0.004	8	PVC	0.01	2	4.4	-0.6	
GM-GIS-KV_ssGM_971	MH-GIS-KV_ssMH_2151	419.18	MH-GIS-KV_ssMH_2150	418.31	217.1	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-KV_ssGM_1063	MH-GIS-KV_ssMH_2190	449.99	MH-IS-81	438.64	73.2	0.155	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-KV_ssGM_1064	MH-GIS-KV_ssMH_2191	450.77	MH-GIS-KV_ssMH_2190	449.99	196.2	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-KV_ssGM_1088	MH-GIS-KV_ssMH_2186	457	MH-IS-82	448.73	154.5	0.054	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-MB_ssGM_842	MH-GIS-MB_ssMH_2062	417.89	MH-GIS-MB_ssMH_1459	415.85	296.9	0.007	8	Glass	0.013	12	11.4	-0.6	
GM-GIS-MB_ssGM_843	MH-GIS-MB_ssMH_1459	415.85	MH-GIS-MB_ssMH_1460	414.21	235.7	0.007	8	Concrete	0.013	37	19.6	-0.5	
GM-GIS-MB_ssGM_844	MH-GIS-MB_ssMH_1458	415.48	MH-GIS-MB_ssMH_1459	415.85	258.2	-0.001	8	Glass	0.013	12	79.6	-0.1	
GM-GIS-MB_ssGM_845	MH-GIS-MB_ssMH_1457	416.2	MH-GIS-MB_ssMH_1458	415.48	257.9	0.003	8	Glass	0.013	8	11.7	-0.6	
GM-GIS-MB_ssGM_846	MH-GIS-MB_ssMH_1460	414.21	MH-GIS-MB_ssMH_2063	415.06	147.3	-0.006	8	Glass	0.013	45	100	0.6	
GM-GIS-MB_ssGM_847	MH-GIS-MB_ssMH_2063	415.06	MH-GIS-MB_ssMH_2064	415.09	272.7	-1E-04	8	Concrete	0.013	54	60.2	-0.3	
GM-GIS-MB_ssGM_848	MH-GIS-MB_ssMH_2064	415.09	MH-GIS-MB_ssMH_2066	412.31	270.3	0.01	8	Concrete	0.013	58	24.6	-0.5	
GM-GIS-MB_ssGM_849	MH-GIS-MB_ssMH_2066	412.31	MH-GIS-MB_ssMH_2065	405.51	52.5	0.129	8	Concrete	0.013	62	25.5	-0.5	SM2
GM-GIS-MB_ssGM_850	MH-GIS-MB_ssMH_2065	405.51	MH-GIS-MB_ssMH_2067	408.72	220.6	-0.015	8	Concrete	0.013	66	100	5.6	SM2
GM-GIS-MB_ssGM_851	MH-GIS-MB_ssMH_2068	416.46	MH-GIS-MB_ssMH_2063	415.06	293	0.005	8	Concrete	0.013	4	7.4	-0.6	
GM-GIS-MB_ssGM_852	MH-GIS-MB_ssMH_2070	414	MH-GIS-MB_ssMH_2069	416.57	297.5	-0.009	8	Concrete	0.013	21	100	2.9	
GM-GIS-MB_ssGM_853	MH-GIS-MB_ssMH_2071	414.51	MH-GIS-MB_ssMH_2070	414	236.3	0.002	8	Concrete	0.013	4	100	2.4	
GM-GIS-MB_ssGM_854	MH-GIS-MB_ssMH_2072	417.27	MH-GIS-MB_ssMH_2073	409.91	101.6	0.072	8	Concrete	0.013	54	23.6	-0.5	
GM-GIS-MB_ssGM_896	MH-GIS-MB_ssMH_2073	409.91	MH-GIS-MB_ssMH_2096	411.42	87.3	-0.017	8	PVC	0.01	58	100	1.1	
GM-GIS-MB_ssGM_897	MH-GIS-MB_ssMH_2097	415.13	MH-GIS-MB_ssMH_1460	414.21	432.2	0.002	8	Concrete	0.013	4	51.8	-0.3	
GM-GIS-MB_ssGM_898	MH-GIS-MH-150	418.93	MH-GIS-MB_ssMH_2098	418.47	117	0.004	8	Glass	0.013	4	7.7	-0.6	
GM-GIS-MB_ssGM_899	MH-GIS-MB_ssMH_2098	418.47	MH-GIS-MB_ssMH_2062	417.89	143.9	0.004	8	Vitrified Clay	0.013	8	10.7	-0.6	
GM-GIS-MB_ssGM_902	MH-GIS-MB_ssMH_1456	414	MH-GIS-MB_ssMH_1455	414	185.5	0	8	Concrete	0.013	4	100	2.9	
GM-GIS-MB_ssGM_903	MH-GIS-MB_ssMH_1455	414	MH-GIS-MB_ssMH_2070	414	256.9	0	8	Concrete	0.013	12	100	2.9	
GM-GIS-MB_ssGM_904	MH-GIS-MB_ssMH_2069	416.57	MH-GIS-MB_ssMH_1463	415.51	204.1	0.005	8	Concrete	0.013	33	100	0.4	
GM-GIS-MB_ssGM_905	MH-GIS-MB_ssMH_1463	415.51	MH-GIS-MB_ssMH_1462	414	146.3	0.01	8	Concrete	0.013	37	100	1.4	
GM-GIS-MB_ssGM_906	MH-GIS-MB_ssMH_1462	414	MH-GIS-MB_ssMH_2099	414	152.2	0	8	Concrete	0.013	41	100	2.9	
GM-GIS-MB_ssGM_907	MH-GIS-MB_ssMH_2099	414	MH-GIS-MB_ssMH_2100	412.94	189.2	0.006	8	Concrete	0.013	45	100	2.9	
GM-GIS-MB_ssGM_908	MH-GIS-MB_ssMH_2100	412.94	MH-GIS-MB_ssMH_2072	417.27	140.4	-0.031	8	Concrete	0.013	49	100	3.9	
GM-GIS-MB_ssGM_912	MH-GIS-MH-180	414	MH-GIS-MB_ssMH_1455	414	154	0	8	Concrete	0.013	4	100	2.9	
GM-GIS-MB_ssGM_921	MH-GIS-MB_ssMH_2152	416.16	MH-GIS-MB_ssMH_2069	416.57	399	-0.001	8	Concrete	0.013	8	100	0.8	
GM-GIS-MB_ssGM_997	MH-GIS-MB_ssMH_2170	417.01	MH-GIS-MB_ssMH_1459	415.85	163.5	0.007	8	Concrete	0.013	8	9.3	-0.6	
GM-GIS-MB_ssGM_998	MH-GIS-MB_ssMH_2171	417.99	MH-GIS-MB_ssMH_2170	417.01	263	0.004	8	Concrete	0.013	4	7.9	-0.6	
GM-GIS-MB_ssGM_999	MH-GIS-MH-141	416.19	MH-GIS-MB_ssMH_1457	416.2	101	-1E-04	8	Concrete	0.013	4	17.5	-0.5	
GM-GIS-MB_ssGM_1014	MH-GIS-MB_ssMH_2096	411.42	PS4WW	399.83	3.1	3.713	8	Cast iron	0.013	132	37.6	-0.4	
GM-GIS-MB_ssGM_1017	MH-GIS-MB_ssMH_2067	408.72	MH-GIS-MB_ssMH_2096	411.42	21.2	-0.127	8	Concrete	0.013	70	100	2.3	SM2
GM-GIS-MB_ssGM_1089	MH-GIS-MH-143	417.14	MH-GIS-MB_ssMH_2152	416.16	103.1	0.01	8	Concrete	0.013	4	67.5	-0.2	
GM-GIS-MU_ssGM_332	MH-GIS-MH-130	824.65	MH-GIS-MH-28	822.32	100	0.023	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_333	MH-GIS-MH-129	830.87	MH-GIS-MH-130	824.65	90	0.069	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_334	MH-GIS-MH-201	814.99	MH-GIS-MH-80	819.26	202.5	-0.021	8	PVC	0.01	1	100	6	
GM-GIS-MU_ssGM_335	MH-GIS-MH-204	820.15	MH-GIS-MH-201	814.99	221.1	0.023	8	PVC	0.01	1	100	0.2	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-MU_ssGM_336	MH-GIS-MH-80	819.26	MH-GIS-MU_ssMH_1810	821.61	50	-0.047	8	PVC	0.01	2	100	1.8	
GM-GIS-MU_ssGM_406	MH-GIS-MU_ssMH_1797	844.97	MH-GIS-MU_ssMH_1798	840.84	109.8	0.038	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_407	MH-GIS-MU_ssMH_1798	840.84	MH-GIS-MU_ssMH_1799	841.52	151.2	-0.005	8	PVC	0.01	2	100	0.1	
GM-GIS-MU_ssGM_408	MH-GIS-MU_ssMH_1799	841.52	MH-GIS-MU_ssMH_1809	832.29	149	0.062	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-MU_ssGM_409	MH-GIS-MU_ssMH_1801	839	MH-GIS-MU_ssMH_1800	831.63	206.8	0.036	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_410	MH-GIS-MU_ssMH_1800	831.63	MH-GIS-MU_ssMH_1802	829	42.5	0.062	8	PVC	0.01	1	100	0.1	
GM-GIS-MU_ssGM_411	MH-GIS-MU_ssMH_1803	828.62	MH-GIS-MU_ssMH_1809	832.29	198.9	-0.018	8	PVC	0.01	4	100	3.1	
GM-GIS-MU_ssGM_412	MH-GIS-MU_ssMH_1802	829	MH-GIS-MU_ssMH_1804	827.72	137.6	0.009	8	PVC	0.01	2	100	2.7	
GM-GIS-MU_ssGM_413	MH-GIS-MU_ssMH_1804	827.72	MH-GIS-MU_ssMH_1803	828.62	93.8	-0.01	8	PVC	0.01	3	100	4	
GM-GIS-MU_ssGM_414	MH-GIS-MU_ssMH_1806	845.55	MH-GIS-MU_ssMH_1807	837.51	116.7	0.069	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_415	MH-GIS-MU_ssMH_1807	837.51	MH-GIS-MU_ssMH_1808	836.34	107.4	0.011	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_416	MH-GIS-MU_ssMH_1808	836.34	MH-GIS-MU_ssMH_1809	832.29	160.6	0.025	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-MU_ssGM_417	MH-GIS-MU_ssMH_1811	818.4	MH-GIS-MU_ssMH_1805	809.96	80.2	0.105	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-MU_ssGM_418	MH-GIS-MU_ssMH_1811	818.4	MH-GIS-MH-28	822.32	17.9	0.219	8	PVC	0.01	2	4.7	3.3	
GM-GIS-MU_ssGM_419	MH-GIS-MU_ssMH_1812	841.15	MH-GIS-MU_ssMH_1799	841.52	68.1	-0.005	8	PVC	0.01	1	63	-0.2	
GM-GIS-MU_ssGM_420	MH-GIS-MH-146	844.16	MH-GIS-MU_ssMH_1812	841.15	109.6	0.027	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_421	MH-GIS-MH-131	847.51	MH-GIS-MU_ssMH_1797	844.97	94.4	0.027	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_422	MH-GIS-MU_ssMH_1810	821.61	MH-GIS-MU_ssMH_1811	818.4	327.2	0.01	8	PVC	0.01	15	12.2	-0.6	
GM-GIS-MU_ssGM_423	MH-GIS-MU_ssMH_1813	831.08	MH-GIS-MU_ssMH_1810	821.61	160.2	0.059	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-MU_ssGM_424	MH-GIS-MU_ssMH_1809	832.29	MH-GIS-MU_ssMH_1813	831.08	32.4	0.037	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-NC_ssGM_713	MH-GIS-MH-159	411.85	MH-GIS-NC_ssMH_1983	411.33	129.6	0.004	8	Glass	0.013	2	5.9	-0.6	
GM-GIS-NC_ssGM_714	MH-GIS-NC_ssMH_1983	411.33	MH-IS-188	407.79	180.3	0.02	8	Glass	0.013	5	6.9	-0.6	
GM-GIS-NC_ssGM_715	MH-GIS-NC_ssMH_1984	411.05	MH-IS-148	404.7	271.6	0.023	8	Concrete	0.013	40	20.4	-0.5	
GM-GIS-NC_ssGM_716	MH-GIS-NC_ssMH_1985	413.81	MH-GIS-NC_ssMH_1984	411.05	237.1	0.012	8	Concrete	0.013	38	19.8	-0.5	
GM-GIS-NC_ssGM_717	MH-GIS-NC_ssMH_1987	414	MH-GIS-NC_ssMH_1990	414	75	0	8	Concrete	0.013	31	35.1	-0.4	
GM-GIS-NC_ssGM_718	MH-GIS-NC_ssMH_1990	414	MH-GIS-NC_ssMH_1991	413.35	127.3	0.005	8	Concrete	0.013	33	19.8	-0.5	
GM-GIS-NC_ssGM_719	MH-GIS-NC_ssMH_1991	413.35	MH-GIS-NC_ssMH_1985	413.81	73	-0.006	8	Concrete	0.013	35	99.8	0	SM4
GM-GIS-NC_ssGM_720	MH-GIS-NC_ssMH_1986	413.35	MH-GIS-NC_ssMH_1987	414	143.2	-0.005	8	Concrete	0.013	5	100	0.2	
GM-GIS-NC_ssGM_721	MH-GIS-MH-156	410.7	MH-GIS-NC_ssMH_1986	413.35	127.2	-0.021	8	Concrete	0.013	2	100	2.9	
GM-GIS-NC_ssGM_722	MH-GIS-NC_ssMH_1988	414	MH-GIS-NC_ssMH_1987	414	14.9	0	8	Concrete	0.013	24	35.7	-0.4	
GM-GIS-NC_ssGM_723	MH-GIS-NC_ssMH_1989	414	MH-GIS-NC_ssMH_1988	414	49.7	0	8	Concrete	0.013	21	37.2	-0.4	
GM-GIS-NC_ssGM_724	MH-GIS-NC_ssMH_1993	414	MH-GIS-NC_ssMH_1992	414	15.9	0	8	Concrete	0.013	17	40.5	-0.4	
GM-GIS-NC_ssGM_725	MH-GIS-NC_ssMH_1992	414	MH-GIS-NC_ssMH_1989	414	172	0	8	Concrete	0.013	19	40.3	-0.4	
GM-GIS-NC_ssGM_726	MH-GIS-NC_ssMH_1995	412.09	MH-GIS-NC_ssMH_1996	413.4	161.4	-0.008	8	Concrete	0.013	7	100	1.5	
GM-GIS-NC_ssGM_727	MH-GIS-MH-109	412.69	MH-GIS-NC_ssMH_1996	413.4	72.4	-0.01	8	Concrete	0.013	2	100	0.9	
GM-GIS-NC_ssGM_728	MH-GIS-NC_ssMH_1996	413.4	MH-GIS-NC_ssMH_1994	413.99	123.2	-0.005	8	Concrete	0.013	12	100	0.2	
GM-GIS-NC_ssGM_729	MH-GIS-NC_ssMH_1994	413.99	MH-GIS-NC_ssMH_1993	414	192.4	-5E-05	8	Concrete	0.013	14	43.5	-0.4	
GM-GIS-NC_ssGM_730	MH-GIS-NC_ssMH_1998	411.16	MH-IS-248	408.21	455.2	0.006	8	Concrete	0.013	9	9.9	-0.6	
GM-GIS-NC_ssGM_732	MH-GIS-NC_ssMH_2001	414	MH-GIS-NC_ssMH_2000	410.94	267.5	0.011	8	Concrete	0.013	2	4.8	-0.6	
GM-GIS-NC_ssGM_733	MH-GIS-NC_ssMH_2000	410.94	MH-IS-214	408.1	148	0.019	8	Concrete	0.013	5	6.9	-0.6	SM4
GM-GIS-NC_ssGM_739	MH-GIS-NC_ssMH_2004	409.85	MH-GIS-NC_ssMH_1522	409.08	192.1	0.004	8	PVC	0.01	2	5.2	-0.6	
GM-GIS-NC_ssGM_740	MH-GIS-NC_ssMH_1522	409.08	MH-GIS-NC_ssMH_1521	409	164.1	5E-04	8	PVC	0.01	5	12	-0.6	
GM-GIS-NC_ssGM_741	MH-GIS-NC_ssMH_1521	409	MH-IS-144	403.08	174	0.034	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-NC_ssGM_840	MH-GIS-NC_ssMH_2061	411.3	MH-GIS-NC_ssMH_1995	412.09	441.2	-0.002	8	PVC	0.01	2	100	2.3	
GM-GIS-NC_ssGM_841	MH-GIS-MH-56	411.79	MH-GIS-NC_ssMH_1995	412.09	38.2	-0.008	8	PVC	0.01	2	100	1.8	
GM-GIS-NE_ssGM_48	MH-GIS-NE_ssMH_1315	856.39	MH-GIS-NE_ssMH_1297	857.74	45.9	0.029	8	PVC	0.01	4	6.5	0.7	
GM-GIS-NE_ssGM_49	MH-GIS-NE_ssMH_1298	854.31	MH-IS-205	845.9	55	0.153	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-NE_ssGM_50	MH-GIS-NE_ssMH_1295	854.07	MH-IS-205	845.9	36.8	0.222	8	PVC	0.01	2	5	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-NE_ssGM_51	MH-GIS-NE_ssMH_1304	862.69	MH-GIS-NE_ssMH_1297	857.74	190.1	0.026	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_52	MH-GIS-NE_ssMH_1303	862.09	MH-GIS-NE_ssMH_1304	862.69	116.7	-0.005	8	PVC	0.01	2	100	0	
GM-GIS-NE_ssGM_53	MH-GIS-NE_ssMH_1296	860.61	MH-GIS-NE_ssMH_1303	862.09	47	-0.031	8	PVC	0.01	2	100	1.5	
GM-GIS-NE_ssGM_54	MH-GIS-NE_ssMH_1300	858.22	MH-GIS-NE_ssMH_1299	857.7	102.5	0.005	8	PVC	0.01	2	5.1	-0.6	
GM-GIS-NE_ssGM_55	MH-GIS-NE_ssMH_1301	858.5	MH-GIS-NE_ssMH_1300	858.22	148.1	0.002	8	PVC	0.01	2	5.3	-0.6	
GM-GIS-NE_ssGM_56	MH-GIS-NE_ssMH_1299	857.7	MH-GIS-NE_ssMH_1298	854.31	131	0.026	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_57	MH-GIS-MH-57	859.16	MH-GIS-NE_ssMH_1301	858.5	38.4	0.017	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_58	MH-GIS-NE_ssMH_1302	857.22	MH-GIS-NE_ssMH_1295	854.07	114.7	0.027	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_59	MH-GIS-MH-124	859	MH-GIS-NE_ssMH_1302	857.22	84.3	0.021	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_60	MH-GIS-NE_ssMH_1296	860.61	MH-GIS-MH-60	857.92	40.2	-0.067	8	PVC	0.01	1	100	1.5	
GM-GIS-NE_ssGM_61	MH-GIS-NE_ssMH_1677	863	MH-GIS-NE_ssMH_1335	861.87	36.8	0.031	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_62	MH-GIS-NE_ssMH_1315	856.39	MH-GIS-NE_ssMH_1339	851.06	154.4	0.035	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_63	MH-GIS-MH-105	852.15	MH-GIS-NE_ssMH_1317	854.61	68.4	-0.036	8	PVC	0.01	1	100	1.8	
GM-GIS-NE_ssGM_64	MH-GIS-NE_ssMH_1339	851.06	MH-GIS-NE_ssMH_1316	851.91	177.9	-0.005	8	PVC	0.01	7	100	0.3	
GM-GIS-NE_ssGM_66	MH-GIS-MH-125	891.48	MH-GIS-NE_ssMH_1308	889	85.6	0.029	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_67	MH-GIS-NE_ssMH_1343	869	MH-GIS-NE_ssMH_1324	871.3	226.4	-0.01	8	PVC	0.01	5	100	1.7	
GM-GIS-NE_ssGM_68	MH-GIS-NE_ssMH_1312	876.87	MH-GIS-NE_ssMH_1328	865.28	261.4	0.044	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_69	MH-GIS-MH-126	877.34	MH-GIS-NE_ssMH_1312	876.87	85.7	0.005	8	PVC	0.01	1	3	-0.6	
GM-GIS-NE_ssGM_70	MH-GIS-NE_ssMH_1309	882.54	MH-GIS-NE_ssMH_1348	879.07	155.5	0.022	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-NE_ssGM_71	MH-GIS-DH_ssMH_1310	888.97	MH-GIS-NE_ssMH_1309	882.54	356.7	0.018	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-NE_ssGM_72	MH-GIS-NE_ssMH_1319	869	MH-GIS-NE_ssMH_1343	869	78.2	0	8	PVC	0.01	3	100	1.7	
GM-GIS-NE_ssGM_73	MH-GIS-NE_ssMH_1307	878.68	MH-GIS-NE_ssMH_1324	871.3	225.9	0.033	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_74	MH-GIS-NE_ssMH_1308	889	MH-GIS-NE_ssMH_1307	878.68	292.2	0.035	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_79	MH-GIS-NE_ssMH_1348	879.07	MH-GIS-NE_ssMH_1334	862.57	346.2	0.048	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-NE_ssGM_86	MH-GIS-NE_ssMH_1317	854.61	MH-GIS-NE_ssMH_1339	851.06	191.8	0.019	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_87	MH-GIS-NE_ssMH_1316	851.91	MH-GIS-NE_ssMH_1318	851.7	190.7	0.001	8	PVC	0.01	8	12.9	-0.6	
GM-GIS-NE_ssGM_88	MH-GIS-NE_ssMH_1336	867.41	MH-GIS-NE_ssMH_1335	861.87	386.3	0.014	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_89	MH-GIS-NE_ssMH_1335	861.87	MH-GIS-NE_ssMH_1334	862.57	149.3	-0.005	8	PVC	0.01	7	100	0.1	
GM-GIS-NE_ssGM_90	MH-GIS-NE_ssMH_1334	862.57	MH-GIS-NE_ssMH_1333	860.25	235.6	0.01	8	PVC	0.01	22	14.8	-0.6	
GM-GIS-NE_ssGM_91	MH-GIS-NE_ssMH_1333	860.25	MH-IS-276	849.3	252.6	0.043	8	PVC	0.01	22	15.2	-0.6	
GM-GIS-NE_ssGM_94	MH-GIS-NE_ssMH_1318	851.7	MH-IS-203	843.68	198.7	0.04	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-NE_ssGM_95	MH-GIS-NE_ssMH_1328	865.28	MH-GIS-NE_ssMH_1329	863.49	157	0.011	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-NE_ssGM_97	MH-GIS-NE_ssMH_1330	859	MH-IS-201	841.44	191.5	0.092	8	PVC	0.01	21	14.6	-0.6	
GM-GIS-NE_ssGM_98	MH-GIS-NE_ssMH_1329	863.49	MH-GIS-NE_ssMH_1330	859	175.2	0.026	8	PVC	0.01	19	14	-0.6	
GM-GIS-NE_ssGM_99	MH-GIS-NE_ssMH_1346	864	MH-GIS-NE_ssMH_1328	865.28	168.9	-0.008	8	PVC	0.01	15	100	0.8	
GM-GIS-NE_ssGM_100	MH-GIS-NE_ssMH_1324	871.3	MH-GIS-NE_ssMH_1325	868.22	155.7	0.02	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-NE_ssGM_101	MH-GIS-NE_ssMH_1327	864	MH-GIS-NE_ssMH_1346	864	158.8	0	8	PVC	0.01	14	100	0.8	
GM-GIS-NE_ssGM_102	MH-GIS-NE_ssMH_1326	865.7	MH-GIS-NE_ssMH_1327	864	117.8	0.014	8	PVC	0.01	10	10	-0.6	
GM-GIS-NE_ssGM_103	MH-GIS-NE_ssMH_1325	868.22	MH-GIS-NE_ssMH_1326	865.7	150.3	0.017	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-NE_ssGM_171	MH-GIS-NE_ssMH_1313	868.11	MH-GIS-NE_ssMH_1343	869	96.8	-0.009	8	PVC	0.01	1	100	2.6	
GM-GIS-NE_ssGM_173	MH-GIS-NE_ssMH_1562	831.9	MH-GIS-NE_ssMH_1563	826	111.8	0.053	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_174	MH-GIS-NE_ssMH_1563	826	MH-GIS-NE_ssMH_1564	823	53	0.057	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_175	MH-GIS-NE_ssMH_1565	822.14	MH-GIS-NE_ssMH_1567	819.88	83.3	0.027	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_176	MH-GIS-NE_ssMH_1566	828.75	MH-GIS-NE_ssMH_1565	822.14	180.5	0.037	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_177	MH-GIS-NE_ssMH_1569	831.92	MH-GIS-NE_ssMH_1566	828.75	57.8	0.055	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_178	MH-GIS-NE_ssMH_1567	819.88	MH-IS-3	797.17	107.5	0.211	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_179	MH-GIS-NE_ssMH_1564	823	MH-GIS-NE_ssMH_1565	822.14	167.6	0.005	8	PVC	0.01	2	5.1	-0.6	
GM-GIS-NE_ssGM_222	MH-GIS-FW_ssMH_1608	884.67	MH-GIS-NE_ssMH_1605	875.6	205.1	0.044	8	PVC	0.01	8	9.2	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-NE_ssGM_224	MH-GIS-MH-115	840.44	MH-IS-249	830.76	75.7	0.128	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_227	MH-GIS-NE_ssMH_1610	840.34	MH-IS-249	830.76	207.6	0.046	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-NE_ssGM_229	MH-GIS-NE_ssMH_1611	835.16	MH-GIS-NE_ssMH_1610	840.34	206.8	-0.025	8	PVC	0.01	7	100	4.7	
GM-GIS-NE_ssGM_230	MH-GIS-NE_ssMH_2184	836.06	MH-GIS-NE_ssMH_1611	835.16	43.8	0.021	8	PVC	0.01	7	100	3.8	
GM-GIS-NE_ssGM_231	MH-GIS-NE_ssMH_1605	875.6	MH-GIS-NE_ssMH_1604	868.35	211.3	0.034	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-NE_ssGM_318	MH-GIS-NE_ssMH_1679	872.8	MH-GIS-NE_ssMH_1678	871.46	225.6	0.006	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_319	MH-GIS-NE_ssMH_1680	882.57	MH-GIS-NE_ssMH_1679	872.8	205.6	0.048	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_320	MH-GIS-NE_ssMH_1683	879	MH-GIS-NE_ssMH_1682	877.35	185.7	0.009	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_321	MH-GIS-NE_ssMH_1682	877.35	MH-GIS-NE_ssMH_1681	866.6	200.5	0.054	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_322	MH-GIS-NE_ssMH_1678	871.46	MH-GIS-NE_ssMH_1681	866.6	245.7	0.02	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_323	MH-GIS-NE_ssMH_1681	866.6	MH-GIS-NE_ssMH_1677	863	87.3	0.041	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_324	MH-GIS-NE_ssMH_1689	863.6	MH-GIS-NE_ssMH_1690	859	78	0.059	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NE_ssGM_325	MH-GIS-NE_ssMH_1684	865.93	MH-GIS-NE_ssMH_1327	864	131.7	0.015	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_326	MH-GIS-NE_ssMH_1687	868.98	MH-GIS-NE_ssMH_1684	865.93	100.2	0.03	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_327	MH-GIS-NE_ssMH_1686	869.89	MH-GIS-NE_ssMH_1687	868.98	125.7	0.007	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_328	MH-GIS-NE_ssMH_1685	875.58	MH-GIS-NE_ssMH_1686	869.89	120.2	0.047	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_450	MH-GIS-NE_ssMH_1816	878.47	MH-GIS-NE_ssMH_1319	869	175.5	0.054	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_451	MH-GIS-NE_ssMH_1814	882.73	MH-GIS-NE_ssMH_1816	878.47	76.5	0.056	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_452	MH-GIS-NE_ssMH_1815	880.36	MH-GIS-NE_ssMH_1814	882.73	104.7	-0.023	8	PVC	0.01	1	100	1.7	
GM-GIS-NE_ssGM_476	MH-GIS-ST_ssMH_1541	863.36	MH-IS-70	866.12	62.4	-0.044	8	Ductile Iron	0.013	34	100	2.3	
GM-GIS-NE_ssGM_480	MH-GIS-NE_ssMH_1690	859	MH-IS-71	858.15	143.8	0.006	8	Ductile Iron	0.013	3	5.7	-0.6	
GM-GIS-NE_ssGM_481	MH-GIS-MH-98	858	MH-IS-71	858.15	62.3	-0.002	8	Ductile Iron	0.013	1	43.5	-0.4	
GM-GIS-NE_ssGM_486	MH-GIS-NE_ssMH_1847	871.21	MH-IS-70	866.12	168.5	0.03	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-NE_ssGM_487	MH-GIS-NE_ssMH_1849	881.09	MH-GIS-NE_ssMH_1848	875.96	197.5	0.026	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_488	MH-GIS-NE_ssMH_1851	886.82	MH-GIS-NE_ssMH_1849	881.09	122.4	0.047	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-NE_ssGM_489	MH-GIS-NE_ssMH_1852	891.98	MH-GIS-NE_ssMH_1851	886.82	137.9	0.037	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-NE_ssGM_490	MH-GIS-NE_ssMH_1850	896.68	MH-GIS-NE_ssMH_1852	891.98	192.4	0.024	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NE_ssGM_491	MH-GIS-NE_ssMH_1848	875.96	MH-GIS-NE_ssMH_1847	871.21	211.2	0.022	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-NE_ssGM_492	MH-GIS-NE_ssMH_1853	894	MH-IS-69	876.77	174.8	0.099	8	Ductile Iron	0.013	1	2.9	-0.6	
GM-GIS-NE_ssGM_587	MH-GIS-NE_ssMH_1688	874	MH-GIS-NE_ssMH_1312	876.87	130.5	-0.022	8	PVC	0.01	1	100	2.2	
GM-GIS-NE_ssGM_1035	MH-GIS-NE_ssMH_2177	838.01	MH-GIS-NE_ssMH_2184	836.06	62.9	0.031	8	PVC	0.01	6	100	1.8	
GM-GIS-NE_ssGM_1036	MH-GIS-NE_ssMH_2179	840.41	MH-GIS-NE_ssMH_2177	838.01	169.7	0.014	8	PVC	0.01	5	11.5	-0.6	
GM-GIS-NE_ssGM_1037	MH-GIS-NE_ssMH_2181	842.94	MH-GIS-NE_ssMH_2178	842.59	125.8	0.003	8	PVC	0.01	2	5.9	-0.6	
GM-GIS-NE_ssGM_1038	MH-GIS-NE_ssMH_2178	842.59	MH-GIS-NE_ssMH_2179	840.41	30.9	0.071	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-NE_ssGM_1039	MH-GIS-NE_ssMH_2183	844	MH-GIS-NE_ssMH_2181	842.94	122.6	0.009	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_1040	MH-GIS-NE_ssMH_2180	843.16	MH-GIS-NE_ssMH_2178	842.59	145.7	0.004	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-NE_ssGM_1041	MH-GIS-NE_ssMH_2182	846.38	MH-GIS-NE_ssMH_2183	844	123	0.019	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_1048	MH-GIS-DH_ssMH_1841	902.08	MH-GIS-NE_ssMH_1839	898.53	148.7	0.024	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-NE_ssGM_1049	MH-GIS-NE_ssMH_1839	898.53	MH-IS-69	876.77	141	0.154	8	Ductile Iron	0.013	18	13.7	-0.6	
GM-GIS-NE_ssGM_1068	MH-GIS-NE_ssMH_2195	863.72	MH-GIS-NE_ssMH_1330	859	60.5	0.078	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_1071	MH-GIS-NE_ssMH_2198	844	MH-IS-233	831.11	105.7	0.122	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_1072	MH-GIS-NE_ssMH_2199	846.87	MH-GIS-NE_ssMH_2198	844	114	0.025	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_1073	MH-GIS-NE_ssMH_2200	849	MH-GIS-NE_ssMH_2199	846.87	43	0.05	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-NE_ssGM_1074	MH-GIS-NE_ssMH_2201	853.71	MH-GIS-NE_ssMH_2200	849	114.1	0.041	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_1075	MH-GIS-NE_ssMH_2203	854	MH-GIS-NE_ssMH_2201	853.71	44.2	0.007	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_1076	MH-GIS-NE_ssMH_2202	854	MH-GIS-NE_ssMH_2203	854	45.5	0	8	PVC	0.01	2	9.1	-0.6	
GM-GIS-NE_ssGM_1077	MH-GIS-NE_ssMH_2204	854	MH-GIS-NE_ssMH_2202	854	83.8	0	8	PVC	0.01	1	9.6	-0.6	
GM-GIS-NE_ssGM_1081	MH-GIS-NE_ssMH_2176	877.99	MH-GIS-NE_ssMH_1311	872.35	59.6	0.095	6	PVC	0.01	1	4.1	-0.5	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-NE_ssGM_1082	MH-GIS-NE_ssMH_1311	872.35	MH-IS-234	862.31	64.7	0.155	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NJ_ssGM_581	MH-GIS-MH-174	854.94	MH-GIS-MH-173	852.82	148.4	0.014	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-NJ_ssGM_582	MH-GIS-MH-172	854.95	MH-GIS-MH-173	852.82	147.7	0.014	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-PA_ssGM_817	MH-GIS-PA_ssMH_2041	819.14	MH-GIS-PA_ssMH_2042	811.79	123.1	0.06	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-PA_ssGM_818	MH-GIS-PA_ssMH_2042	811.79	MH-GIS-PA_ssMH_2038	801.05	124.5	0.086	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-PA_ssGM_819	MH-GIS-PA_ssMH_2048	797.66	MH-GIS-PA_ssMH_2047	802.09	122.8	-0.036	8	Glass	0.013	3	100	3.8	
GM-GIS-PA_ssGM_820	MH-GIS-PA_ssMH_2046	800.91	MH-GIS-PA_ssMH_2060	794.84	112.5	0.054	8	Glass	0.013	5	7.2	-0.6	
GM-GIS-PA_ssGM_821	MH-GIS-PA_ssMH_2060	794.84	MH-GIS-GC_ssMH_2059	794	187.5	0.004	8	Glass	0.013	6	8.8	-0.6	
GM-GIS-PA_ssGM_822	MH-GIS-PA_ssMH_2038	801.05	MH-GIS-PA_ssMH_2048	797.66	117.6	0.029	8	Glass	0.013	2	100	0.5	
GM-GIS-PA_ssGM_823	MH-GIS-PA_ssMH_2047	802.09	MH-GIS-PA_ssMH_2046	800.91	400.3	0.003	8	Glass	0.013	4	8.3	-0.6	
GM-GIS-PA_ssGM_824	MH-GIS-GC_ssMH_2059	794	MH-GIS-MH-97	794	36.9	0	8	Glass	0.013	7	16.9	-0.6	
GM-GIS-RI_ssGM_1244	MH-GIS-EP_ssMH_2317	1,044.00	MH-GIS-RI_ssMH_2318	1,044.79	392.6	-0.002	8	PVC	0.01	113	100	0.6	
GM-GIS-RI_ssGM_1245	MH-GIS-RI_ssMH_2318	1,044.79	MH-GIS-RI_ssMH_2326	1,044.00	75.5	0.01	8	PVC	0.01	115	35	-0.4	
GM-GIS-RI_ssGM_1246	MH-GIS-RI_ssMH_2319	1,043.14	MH-GIS-RI_ssMH_2329	1,034.10	162.8	0.056	8	PVC	0.01	118	35.5	-0.4	
GM-GIS-RI_ssGM_1247	MH-GIS-RI_ssMH_2327	1,009.32	MH-GIS-RI_ssMH_2322	995.97	127.4	0.105	8	PVC	0.01	148	39.9	-0.4	
GM-GIS-RI_ssGM_1248	MH-GIS-RI_ssMH_2322	995.97	MH-GIS-RI_ssMH_2320	987.3	88.6	0.098	8	PVC	0.01	150	40.2	-0.4	
GM-GIS-RI_ssGM_1249	MH-GIS-RI_ssMH_2326	1,044.00	MH-GIS-RI_ssMH_2319	1,043.14	102.7	0.008	8	PVC	0.01	116	35.3	-0.4	
GM-GIS-RI_ssGM_1257	MH-GIS-RI_ssMH_2320	987.3	MH-GIS-CR_ssMH_2331	979.07	98.4	0.084	8	PVC	0.01	155	40.9	-0.4	
GM-GIS-RI_ssGM_1264	MH-GIS-RI_ssMH_2329	1,034.10	MH-GIS-RI_ssMH_2327	1,009.32	233.9	0.106	8	PVC	0.01	146	39.7	-0.4	
GM-GIS-RI_ssGM_1265	MH-GIS-RI_ssMH_2567	1,034.71	MH-GIS-RI_ssMH_2329	1,034.10	75	0.008	8	PVC	0.01	26	16.5	-0.6	
GM-GIS-RI_ssGM_1302	MH-GIS-RI_ssMH_2376	1,051.81	MH-GIS-RI_ssMH_2389	1,049.11	213.9	0.013	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1303	MH-GIS-RI_ssMH_2389	1,049.11	MH-GIS-RI_ssMH_2366	1,048.11	52.9	0.019	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1304	MH-GIS-RI_ssMH_2375	1,029.15	MH-GIS-RI_ssMH_2371	1,019.04	178.5	0.057	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1305	MH-GIS-RI_ssMH_2371	1,019.04	MH-GIS-RI_ssMH_2384	1,014.00	142.3	0.035	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-RI_ssGM_1306	MH-GIS-RI_ssMH_2384	1,014.00	MH-GIS-RI_ssMH_2381	1,010.84	138.8	0.023	8	PVC	0.01	14	12	-0.6	
GM-GIS-RI_ssGM_1307	MH-GIS-RI_ssMH_2377	1,003.28	MH-GIS-RI_ssMH_2378	992.3	95.6	0.115	8	PVC	0.01	40	20.5	-0.5	
GM-GIS-RI_ssGM_1308	MH-GIS-RI_ssMH_2373	1,023.44	MH-GIS-RI_ssMH_2371	1,019.04	85	0.052	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1309	MH-GIS-RI_ssMH_2368	1,044.30	MH-GIS-RI_ssMH_2369	1,017.04	363.5	0.075	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-RI_ssGM_1310	MH-GIS-RI_ssMH_2372	1,028.88	MH-GIS-RI_ssMH_2373	1,023.44	43.3	0.126	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1311	MH-GIS-RI_ssMH_2374	1,040.14	MH-GIS-RI_ssMH_2372	1,028.88	144.1	0.078	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1312	MH-GIS-RI_ssMH_2378	992.3	MH-GIS-RI_ssMH_2380	976.93	128.1	0.12	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-RI_ssGM_1313	MH-GIS-RI_ssMH_2380	976.93	MH-GIS-CR_ssMH_2379	970.91	51.8	0.116	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-RI_ssGM_1314	MH-GIS-RI_ssMH_2381	1,010.84	MH-GIS-RI_ssMH_2390	1,009.47	70.7	0.019	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-RI_ssGM_1315	MH-GIS-RI_ssMH_2390	1,009.47	MH-GIS-RI_ssMH_2377	1,003.28	62.9	0.098	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-RI_ssGM_1316	MH-GIS-RI_ssMH_2382	1,011.10	MH-GIS-RI_ssMH_2370	1,008.28	173.5	0.016	8	PVC	0.01	14	12	-0.6	
GM-GIS-RI_ssGM_1317	MH-GIS-RI_ssMH_2369	1,017.04	MH-GIS-RI_ssMH_2386	1,013.87	37.7	0.084	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-RI_ssGM_1318	MH-GIS-RI_ssMH_2370	1,008.28	MH-GIS-RI_ssMH_2383	1,007.11	182	0.006	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-RI_ssGM_1319	MH-GIS-RI_ssMH_2367	1,046.50	MH-GIS-RI_ssMH_2368	1,044.30	81.4	0.027	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-RI_ssGM_1320	MH-GIS-RI_ssMH_2366	1,048.11	MH-GIS-RI_ssMH_2367	1,046.50	162.4	0.01	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1321	MH-GIS-RI_ssMH_2385	1,019.49	MH-GIS-RI_ssMH_2384	1,014.00	81.2	0.068	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1322	MH-GIS-RI_ssMH_2386	1,013.87	MH-GIS-RI_ssMH_2382	1,011.10	71.9	0.039	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-RI_ssGM_1323	MH-GIS-RI_ssMH_2388	1,027.47	MH-GIS-RI_ssMH_2385	1,019.49	58.3	0.137	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1324	MH-GIS-RI_ssMH_2391	1,000.58	MH-GIS-RI_ssMH_2377	1,003.28	88.8	-0.03	8	PVC	0.01	21	100	2.2	
GM-GIS-RI_ssGM_1325	MH-GIS-RI_ssMH_2383	1,007.11	MH-GIS-RI_ssMH_2387	1,000.16	291.1	0.024	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-RI_ssGM_1326	MH-GIS-RI_ssMH_2387	1,000.16	MH-GIS-RI_ssMH_2391	1,000.58	44.8	-0.009	8	PVC	0.01	19	100	2.6	
GM-GIS-RI_ssGM_1327	MH-GIS-RI_ssMH_2392	1,037.74	MH-GIS-RI_ssMH_2396	1,030.17	175.3	0.043	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1328	MH-GIS-RI_ssMH_2394	1,033.48	MH-GIS-RI_ssMH_2393	1,025.56	221	0.036	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1329	MH-GIS-RI_ssMH_2566	1,032.26	MH-GIS-RI_ssMH_2395	1,034.00	142	-0.012	8	PVC	0.01	2	100	1.1	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-RI_ssGM_1330	MH-GIS-RI_ssMH_2395	1,034.00	MH-GIS-RI_ssMH_2394	1,033.48	43.7	0.012	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1331	MH-GIS-RI_ssMH_2400	1,039.67	MH-GIS-RI_ssMH_2392	1,037.74	63	0.031	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1332	MH-GIS-RI_ssMH_2399	1,037.54	MH-GIS-RI_ssMH_2392	1,037.74	77.9	-0.003	8	PVC	0.01	2	38.3	-0.4	
GM-GIS-RI_ssGM_1333	MH-GIS-RI_ssMH_2393	1,025.56	MH-GIS-RI_ssMH_2401	1,025.26	79.7	0.004	8	PVC	0.01	7	100	5	
GM-GIS-RI_ssGM_1334	MH-GIS-RI_ssMH_2401	1,025.26	MH-GIS-RI_ssMH_2404	1,026.47	33.5	-0.036	8	PVC	0.01	9	100	6.5	
GM-GIS-RI_ssGM_1335	MH-GIS-RI_ssMH_2397	1,027.19	MH-GIS-RI_ssMH_2567	1,034.71	256.3	-0.029	8	PVC	0.01	25	100	7.1	
GM-GIS-RI_ssGM_1336	MH-GIS-RI_ssMH_2398	1,033.56	MH-GIS-RI_ssMH_2396	1,030.17	81.7	0.042	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1337	MH-GIS-RI_ssMH_2396	1,030.17	MH-GIS-RI_ssMH_2402	1,028.72	62.6	0.023	8	PVC	0.01	9	100	2.4	
GM-GIS-RI_ssGM_1338	MH-GIS-RI_ssMH_2402	1,028.72	MH-GIS-RI_ssMH_2403	1,028.11	119.1	0.005	8	PVC	0.01	21	100	3.8	
GM-GIS-RI_ssGM_1339	MH-GIS-RI_ssMH_2404	1,026.47	MH-GIS-RI_ssMH_2402	1,028.72	84.5	-0.027	8	PVC	0.01	11	100	6.1	
GM-GIS-RI_ssGM_1340	MH-GIS-RI_ssMH_2403	1,028.11	MH-GIS-RI_ssMH_2397	1,027.19	39.3	0.023	8	PVC	0.01	23	100	4.4	
GM-GIS-RW_ssGM_731	MH-GIS-RW_ssMH_1999	416.83	MH-GIS-RW_ssMH_1527	415.93	225.3	0.004	8	Concrete	0.013	9	11.1	-0.6	
GM-GIS-RW_ssGM_757	MH-GIS-RW_ssMH_1506	417.71	MH-IS-97	412.47	183	0.029	8	Concrete	0.013	36	19.2	-0.5	SM4
GM-GIS-RW_ssGM_758	MH-GIS-RW_ssMH_2019	417	MH-GIS-RW_ssMH_2018	416.02	278.1	0.004	8	Glass	0.013	2	6.1	-0.6	
GM-GIS-RW_ssGM_759	MH-GIS-RW_ssMH_2018	416.02	MH-IS-245	410.33	46.7	0.122	8	Concrete	0.013	5	6.9	-0.6	
GM-GIS-RW_ssGM_772	MH-GIS-RW_ssMH_1527	415.93	MH-GIS-RW_ssMH_1526	414.56	342.1	0.004	8	Concrete	0.013	18	15.5	-0.6	
GM-GIS-RW_ssGM_773	MH-GIS-RW_ssMH_1526	414.56	MH-IS-267	409.97	102.7	0.045	8	Concrete	0.013	27	16.6	-0.6	
GM-GIS-RW_ssGM_790	MH-GIS-RW_ssMH_1486	417.09	MH-GIS-RW_ssMH_1485	415.75	164.7	0.008	8	Concrete	0.013	56	24.3	-0.5	
GM-GIS-RW_ssGM_792	MH-GIS-RW_ssMH_1469	414.1	MH-GIS-RW_ssMH_1485	415.75	250.1	-0.007	8	Concrete	0.013	3	100	1.2	SM4
GM-GIS-RW_ssGM_793	MH-GIS-RW_ssMH_1502	416.26	MH-GIS-RW_ssMH_1487	416.66	173.4	-0.002	8	Concrete	0.013	43	100	0.4	
GM-GIS-RW_ssGM_794	MH-GIS-RW_ssMH_1487	416.66	MH-GIS-RW_ssMH_1486	417.09	126.5	-0.003	8	Concrete	0.013	53	100	0	
GM-GIS-RW_ssGM_795	MH-GIS-MH-203	418.22	MH-GIS-RW_ssMH_1487	416.66	220.3	0.007	8	Concrete	0.013	3	6.1	-0.6	
GM-GIS-RW_ssGM_796	MH-GIS-RW_ssMH_1488	414.61	MH-GIS-RW_ssMH_1487	416.66	419.1	-0.005	8	Concrete	0.013	3	100	2.1	SM4
GM-GIS-RW_ssGM_797	MH-GIS-RW_ssMH_2027	414.03	MH-GIS-RW_ssMH_2028	415.82	340	-0.005	8	Concrete	0.013	13	100	2.7	
GM-GIS-RW_ssGM_798	MH-GIS-RW_ssMH_2028	415.82	MH-GIS-RW_ssMH_1502	416.26	62.1	-0.007	8	Concrete	0.013	30	100	0.9	
GM-GIS-RW_ssGM_799	MH-GIS-RW_ssMH_1500	415.02	MH-GIS-RW_ssMH_1501	415.3	35.3	-0.008	8	PVC	0.01	10	100	1.7	
GM-GIS-RW_ssGM_800	MH-GIS-RW_ssMH_1501	415.3	MH-GIS-RW_ssMH_2028	415.82	127.5	-0.004	8	PVC	0.01	13	100	1.4	
GM-GIS-RW_ssGM_801	MH-GIS-RW_ssMH_1499	414	MH-GIS-RW_ssMH_1500	415.02	153.5	-0.007	8	PVC	0.01	7	100	2.7	
GM-GIS-RW_ssGM_803	MH-GIS-MH-208	415.42	MH-GIS-RW_ssMH_1498	414	352	0.004	8	Glass	0.013	9	11.1	-0.6	
GM-GIS-RW_ssGM_811	MH-GIS-RW_ssMH_2032	419	MH-GIS-RW_ssMH_2033	415.4	230.7	0.016	8	Concrete	0.013	13	11.6	-0.6	
GM-GIS-RW_ssGM_812	MH-GIS-RW_ssMH_2033	415.4	MH-GIS-RW_ssMH_2034	414	87.2	0.016	8	Concrete	0.013	23	15.5	-0.6	
GM-GIS-RW_ssGM_814	MH-GIS-RW_ssMH_2035	417.46	MH-GIS-RW_ssMH_2032	419	228.5	-0.007	8	Concrete	0.013	7	100	1	
GM-GIS-RW_ssGM_815	MH-GIS-MH-153	419	MH-GIS-RW_ssMH_2032	419	123.5	0	8	Concrete	0.013	3	15.9	-0.6	
GM-GIS-RW_ssGM_816	MH-GIS-MH-58	417.61	MH-GIS-RW_ssMH_2035	417.46	39.9	0.004	8	Glass	0.013	3	100	0.8	
GM-GIS-RW_ssGM_873	MH-GIS-RW_ssMH_2085	418.19	MH-GIS-RW_ssMH_2086	416.31	246	0.008	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-RW_ssGM_874	MH-GIS-RW_ssMH_2086	416.31	MH-GIS-RW_ssMH_1502	416.26	83.6	6E-04	8	PVC	0.01	10	100	0.4	
GM-GIS-RW_ssGM_976	MH-GIS-RW_ssMH_2156	415.17	MH-GIS-RW_ssMH_2033	415.4	20.6	-0.011	8	PVC	0.01	7	50.6	-0.3	
GM-GIS-RW_ssGM_977	MH-GIS-RW_ssMH_2157	417.22	MH-GIS-RW_ssMH_2156	415.17	184.2	0.011	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-RW_ssGM_1006	MH-GIS-MH-181	417.73	MH-GIS-RW_ssMH_2085	418.19	154.4	-0.003	8	PVC	0.01	3	80.4	-0.1	
GM-GIS-RW_ssGM_1012	MH-GIS-RW_ssMH_2094	417.87	MH-GIS-RW_ssMH_2095	415.61	328.5	0.007	8	Concrete	0.013	18	13.6	-0.6	
GM-GIS-RW_ssGM_1032	MH-GIS-MH-35	414	MH-IS-1	413.11	23	0.039	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-RW_ssGM_1033	MH-GIS-RW_ssMH_1514	414.67	MH-GIS-MH-35	414	413.4	0.002	8	Concrete	0.013	9	13.8	-0.6	
GM-GIS-RW_ssGM_1103	MH-GIS-MH-15	414.08	MH-GIS-MH-11	414.05	4.5	0.007	8	PVC	0.01	7	100	2.6	
GM-GIS-RW_ssGM_1104	MH-GIS-RW_ssMH_2027	414.03	MH-GIS-MH-11	414.05	2.8	0.007	8	Concrete	0.013	10	100	2.7	
GM-GIS-RW_ssGM_1105	MH-GIS-MH-82	414	MH-GIS-RW_ssMH_1499	414	51.2	0	8	PVC	0.01	3	100	2.7	
GM-GIS-SC_ssGM_124	MH-GIS-SC_ssMH_1387	832.42	MH-GIS-SC_ssMH_1388	826.75	115.7	0.049	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_125	MH-GIS-SC_ssMH_1393	827.52	MH-GIS-SC_ssMH_1414	821.04	88.4	0.073	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_126	MH-GIS-SC_ssMH_1414	821.04	MH-GIS-SC_ssMH_1415	816.57	117.4	0.038	8	PVC	0.01	4	6.7	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-SC_ssGM_127	MH-GIS-SC_ssMH_1415	816.57	MH-GIS-SC_ssMH_1394	817.44	123.6	-0.007	8	PVC	0.01	7	100	2.5	
GM-GIS-SC_ssGM_128	MH-GIS-MH-64	823.45	MH-GIS-SC_ssMH_1413	818.04	42.7	0.127	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_129	MH-GIS-SC_ssMH_1409	837.73	MH-GIS-SC_ssMH_1410	826.59	124.1	0.09	8	PVC	0.01	40	20.4	-0.5	
GM-GIS-SC_ssGM_130	MH-GIS-SC_ssMH_1408	876.06	MH-GIS-SC_ssMH_1385	868.7	62	0.119	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_131	MH-GIS-SC_ssMH_1407	882.65	MH-GIS-SC_ssMH_1408	876.06	62.9	0.105	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_132	MH-GIS-SC_ssMH_1384	888.26	MH-GIS-SC_ssMH_1407	882.65	62.5	0.09	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-SC_ssGM_133	MH-GIS-SC_ssMH_1406	893.38	MH-GIS-SC_ssMH_1384	888.26	61.8	0.083	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_134	MH-GIS-SC_ssMH_1383	900.79	MH-GIS-SC_ssMH_1406	893.38	105	0.071	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_135	MH-GIS-SC_ssMH_1405	844.7	MH-GIS-SC_ssMH_1382	850.2	58.7	0.094	8	PVC	0.01	20	14.3	4.9	
GM-GIS-SC_ssGM_136	MH-GIS-SC_ssMH_1404	853.62	MH-GIS-SC_ssMH_1382	850.2	57.5	0.059	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_137	MH-GIS-SC_ssMH_1394	817.44	MH-GIS-SC_ssMH_1401	819.51	60.7	-0.034	8	PVC	0.01	33	100	1.6	
GM-GIS-SC_ssGM_138	MH-GIS-SC_ssMH_1412	821.98	MH-GIS-SC_ssMH_1401	819.51	98.4	0.025	8	PVC	0.01	47	22.1	-0.5	
GM-GIS-SC_ssGM_139	MH-GIS-SC_ssMH_1403	801.9	MH-GIS-SC_ssMH_1386	800.02	89.6	0.021	8	PVC	0.01	87	100	3.5	
GM-GIS-SC_ssGM_140	MH-GIS-SC_ssMH_1402	806.3	MH-GIS-SC_ssMH_1403	801.9	85.7	0.051	8	PVC	0.01	85	29.9	-0.5	
GM-GIS-SC_ssGM_141	MH-GIS-SC_ssMH_1401	819.51	MH-GIS-SC_ssMH_1402	806.3	135.3	0.098	8	PVC	0.01	82	29.5	-0.5	
GM-GIS-SC_ssGM_142	MH-GIS-SC_ssMH_1405	844.7	MH-GIS-SC_ssMH_1400	825.38	130.2	0.148	8	PVC	0.01	22	15.1	-0.6	
GM-GIS-SC_ssGM_143	MH-GIS-SC_ssMH_1400	825.38	MH-GIS-SC_ssMH_1394	817.44	96.3	0.082	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-SC_ssGM_144	MH-GIS-SC_ssMH_1379	808.09	MH-GIS-SC_ssMH_1399	805.62	196.3	0.013	8	PVC	0.01	111	34.5	-0.4	
GM-GIS-SC_ssGM_146	MH-GIS-SC_ssMH_1399	805.62	MH-IS-147	790.4	124.5	0.122	8	PVC	0.01	350	62.6	-0.2	
GM-GIS-SC_ssGM_151	MH-GIS-SC_ssMH_1390	815.09	MH-GIS-SC_ssMH_1391	809	119	0.051	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_152	MH-GIS-SC_ssMH_1391	809	MH-IS-235	798.05	86.9	0.126	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_153	MH-GIS-SC_ssMH_1389	821.1	MH-GIS-SC_ssMH_1390	815.09	101.1	0.059	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-SC_ssGM_154	MH-GIS-SC_ssMH_1388	826.75	MH-GIS-SC_ssMH_1389	821.1	106	0.053	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_155	MH-GIS-SC_ssMH_1411	824	MH-GIS-SC_ssMH_1412	821.98	149.8	0.013	8	PVC	0.01	45	21.5	-0.5	
GM-GIS-SC_ssGM_156	MH-GIS-SC_ssMH_1410	826.59	MH-GIS-SC_ssMH_1411	824	130.1	0.02	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-SC_ssGM_158	MH-GIS-SC_ssMH_1386	800.02	MH-GIS-SC_ssMH_1378	800.92	127.1	-0.007	8	PVC	0.01	89	100	6.3	
GM-GIS-SC_ssGM_159	MH-GIS-SC_ssMH_1385	868.7	MH-GIS-SC_ssMH_1382	850.2	167	0.111	8	PVC	0.01	13	11.7	-0.6	
GM-GIS-SC_ssGM_160	MH-GIS-SC_ssMH_1373	860.98	MH-GIS-SC_ssMH_1404	853.62	158.8	0.046	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_162	MH-GIS-SC_ssMH_1378	800.92	MH-GIS-SC_ssMH_1381	806.03	218.6	-0.023	8	PVC	0.01	91	100	6.9	
GM-GIS-SC_ssGM_163	MH-GIS-SC_ssMH_1381	806.03	MH-GIS-SC_ssMH_1380	805.45	127.1	0.005	8	PVC	0.01	94	100	1.8	
GM-GIS-SC_ssGM_164	MH-GIS-SC_ssMH_1380	805.45	MH-GIS-SC_ssMH_1379	808.09	138.7	-0.019	8	PVC	0.01	96	100	2.3	
GM-GIS-SC_ssGM_165	MH-GIS-SC_ssMH_1377	812.62	MH-GIS-SC_ssMH_1379	808.09	137.7	0.033	8	PVC	0.01	13	11.7	-0.6	
GM-GIS-SC_ssGM_166	MH-GIS-SC_ssMH_1376	817.41	MH-GIS-SC_ssMH_1377	812.62	119.1	0.04	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_167	MH-GIS-SC_ssMH_1375	823.01	MH-GIS-SC_ssMH_1376	817.41	255.8	0.022	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_168	MH-GIS-SC_ssMH_1374	818.18	MH-GIS-SC_ssMH_1375	823.01	220.3	-0.022	8	PVC	0.01	7	100	4.3	
GM-GIS-SC_ssGM_169	MH-GIS-SC_ssMH_1413	818.04	MH-GIS-SC_ssMH_1374	818.18	168.6	-8E-04	8	PVC	0.01	4	100	4.4	
GM-GIS-SF_ssGM_186	MH-GIS-SF_ssMH_2138	441.25	MH-GIS-SF_ssMH_1574	441.02	84.7	0.003	8	Concrete	0.013	93	39.7	-0.4	
GM-GIS-SF_ssGM_187	MH-GIS-SF_ssMH_1574	441.02	MH-GIS-SF_ssMH_1575	438.75	461.7	0.005	8	Concrete	0.013	96	34.3	-0.4	
GM-GIS-SF_ssGM_188	MH-GIS-SF_ssMH_1575	438.75	MH-GIS-SF_ssMH_1576	438.31	233.1	0.002	8	Concrete	0.013	99	44.9	-0.4	
GM-GIS-SF_ssGM_879	MH-GIS-SF_ssMH_1450	417.9	MH-GIS-SF_ssMH_1447	416.32	98.7	0.016	10	Glass	0.013	49	17	-0.7	
GM-GIS-SF_ssGM_880	MH-GIS-SF_ssMH_1449	419.28	MH-GIS-SF_ssMH_1450	417.9	179	0.008	10	Glass	0.013	23	11.6	-0.7	
GM-GIS-SF_ssGM_881	MH-GIS-SF_ssMH_1447	410.46	IPPS Wetwell	400.65	77.2	0.127	14	Glass	0.013	314	28.6	-0.8	
GM-GIS-SF_ssGM_882	MH-GIS-SF_ssMH_2088	429.06	MH-IS-27	424.37	121.1	0.039	8	PVC	0.01	252	52.8	-0.3	
GM-GIS-SF_ssGM_951	MH-GIS-MH-24	428.63	MH-GIS-SF_ssMH_1449	424.58	13.2	0.307	10	Ductile Iron	0.013	3	3.9	-0.8	
GM-GIS-SF_ssGM_952	MH-GIS-MH-202	430.39	MH-GIS-MH-190	429.57	206.8	0.004	8	PVC	0.01	3	5.5	-0.6	
GM-GIS-SF_ssGM_953	MH-GIS-MH-190	429.57	MH-GIS-MH-83	428.92	162.1	0.004	8	PVC	0.01	5	7.6	-0.6	
GM-GIS-SF_ssGM_954	MH-GIS-MH-83	428.92	MH-GIS-MH-84	428.71	51.9	0.004	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-SF_ssGM_955	MH-GIS-MH-134	429.8	MH-GIS-SF_ssMH_2137	429.41	98.6	0.004	8	PVC	0.01	3	5.5	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-SF_ssGM_956	MH-GIS-SF_ssMH_2137	429.41	MH-GIS-MH-84	428.71	174.2	0.004	8	PVC	0.01	5	7.6	-0.6	
GM-GIS-SF_ssGM_957	MH-GIS-MH-84	428.71	MH-GIS-SF_ssMH_2136	424.95	169	0.022	8	PVC	0.01	15	12.6	-0.6	
GM-GIS-SF_ssGM_958	MH-GIS-SF_ssMH_2136	424.95	MH-GIS-SF_ssMH_1449	424.28	139	0.005	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-SF_ssGM_959	MH-GIS-SF_ssMH_2149	477.68	MH-GIS-SF_ssMH_2148	476.43	12.3	0.101	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-SF_ssGM_960	MH-GIS-SF_ssMH_2148	476.43	MH-GIS-SF_ssMH_2147	471.41	67	0.075	8	PVC	0.01	36	19.4	-0.5	
GM-GIS-SF_ssGM_961	MH-GIS-SF_ssMH_2147	471.41	MH-GIS-SF_ssMH_2146	461.32	244.6	0.041	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-SF_ssGM_962	MH-GIS-SF_ssMH_2146	461.32	MH-GIS-SF_ssMH_2145	459.29	35.8	0.057	8	PVC	0.01	42	20.8	-0.5	
GM-GIS-SF_ssGM_963	MH-GIS-SF_ssMH_2145	459.29	MH-GIS-SF_ssMH_2141	457.36	36.5	0.053	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-SF_ssGM_964	MH-GIS-SF_ssMH_2141	457.36	MH-GIS-SF_ssMH_2140	451.88	23.7	0.231	8	PVC	0.01	86	30.1	-0.5	
GM-GIS-SF_ssGM_965	MH-GIS-SF_ssMH_2140	451.88	MH-GIS-SF_ssMH_2139	443.69	35.4	0.231	8	Concrete	0.013	88	30.6	-0.5	
GM-GIS-SF_ssGM_966	MH-GIS-SF_ssMH_2139	443.69	MH-GIS-SF_ssMH_2138	441.25	341.2	0.007	8	Concrete	0.013	91	31	-0.5	
GM-GIS-SF_ssGM_967	MH-GIS-SF_ssMH_2144	458.32	MH-GIS-SF_ssMH_2143	458.08	61.3	0.004	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-SF_ssGM_968	MH-GIS-SF_ssMH_2143	458.08	MH-GIS-SF_ssMH_2142	457.95	32.3	0.004	8	PVC	0.01	36	19.4	-0.5	
GM-GIS-SF_ssGM_969	MH-GIS-SF_ssMH_2142	457.95	MH-GIS-SF_ssMH_2141	457.36	108.4	0.005	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-SF_ssGM_1057(1)	MH-GIS-SF_ssMH_1451	419.29	MH-GIS-MH-69	419.11	31.1	0.006	10	Glass	0.013	8	7.2	-0.8	
GM-GIS-SF_ssGM_1057(2)(1)	MH-GIS-MH-69	419.11	MH-GIS-MH-63	418.7	73.7	0.006	10	Glass	0.013	13	9.2	-0.8	
GM-GIS-SF_ssGM_1057(2)(2)(1)	MH-GIS-MH-63	418.7	MH-GIS-MH-67	418.13	99.4	0.006	10	Glass	0.013	18	10.8	-0.7	
GM-GIS-SF_ssGM_1057(2)(2)(2)	MH-GIS-MH-67	418.13	MH-GIS-SF_ssMH_1450	417.9	41.1	0.006	10	Glass	0.013	23	12.1	-0.7	
GM-GIS-SF_ssGM_1058	MH-GIS-SF_ssMH_1452	423.36	MH-GIS-SF_ssMH_1451	423.29	17	0.004	8	Glass	0.013	5	8.5	-0.6	
GM-GIS-SF_ssGM_1059	MH-GIS-MH-66	419	MH-GIS-MH-67	418.13	44.6	0.019	8	Glass	0.013	3	5.1	-0.6	
GM-GIS-SF_ssGM_1060	MH-GIS-MH-68	419.29	MH-GIS-MH-69	419.11	45.6	0.004	8	Glass	0.013	3	6.2	-0.6	
GM-GIS-SF_ssGM_1061	MH-GIS-MH-62	419	MH-GIS-MH-63	418.7	43	0.007	8	Glass	0.013	3	5.4	-0.6	
GM-GIS-SF_ssGM_1062	MH-GIS-SF_ssMH_1452	423.36	MH-GIS-SF_ssMH_2224	423.37	3	0.004	8	Glass	0.013	3	7.2	-0.6	
GM-GIS-SF_ssGM_1065	MH-GIS-MH-94	427.82	MH-IS-27	424.37	61.4	0.056	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-SF_ssGM_1067	MH-GIS-MH-72	431.47	MH-GIS-SF_ssMH_2088	429.06	47.5	0.051	8	Glass	0.013	3	5.1	-0.6	
GM-GIS-SF_ssGM_1079	MH-GIS-SF_ssMH_1576	438.31	MH-GIS-SF_ssMH_2088	429.06	123.5	0.075	8	Concrete	0.013	247	52.2	-0.3	
GM-GIS-ST_ssGM_425	MH-GIS-MH-183	855.01	MH-GIS-ST_ssMH_1545	857.37	157.3	-0.015	8	PVC	0.01	1	100	7.7	
GM-GIS-ST_ssGM_426	MH-GIS-ST_ssMH_1548	860.52	MH-GIS-ST_ssMH_1546	859	76.6	0.02	8	PVC	0.01	18	100	2.2	
GM-GIS-ST_ssGM_427	MH-GIS-ST_ssMH_1547	856.62	MH-GIS-ST_ssMH_1546	859	136.9	-0.017	8	PVC	0.01	3	100	6.1	
GM-GIS-ST_ssGM_428	MH-GIS-MH-118	855.03	MH-GIS-ST_ssMH_1547	856.62	78.3	-0.02	8	PVC	0.01	1	100	6.9	
GM-GIS-ST_ssGM_429	MH-GIS-ST_ssMH_1546	859	MH-GIS-ST_ssMH_1545	857.37	140.4	0.012	8	PVC	0.01	22	100	3.7	
GM-GIS-ST_ssGM_430	MH-GIS-MH-158	859.17	MH-GIS-ST_ssMH_1545	857.37	129.6	0.014	8	PVC	0.01	1	100	3.5	
GM-GIS-ST_ssGM_431	MH-GIS-ST_ssMH_1545	857.37	MH-GIS-ST_ssMH_1544	859	146	-0.011	8	PVC	0.01	26	100	6.7	
GM-GIS-ST_ssGM_432	MH-GIS-MH-71	857.99	MH-GIS-ST_ssMH_1543	858.72	45	-0.016	8	PVC	0.01	1	100	6.1	
GM-GIS-ST_ssGM_433	MH-GIS-MH-161	854.41	MH-GIS-ST_ssMH_1549	857.28	134.8	-0.021	8	PVC	0.01	1	100	8.2	
GM-GIS-ST_ssGM_434	MH-GIS-ST_ssMH_1549	857.28	MH-GIS-ST_ssMH_1551	859.25	122.2	-0.016	8	PVC	0.01	3	100	5.4	
GM-GIS-ST_ssGM_435	MH-GIS-ST_ssMH_1550	857.16	MH-GIS-ST_ssMH_1551	859.25	176.8	-0.012	8	PVC	0.01	1	100	5.5	
GM-GIS-ST_ssGM_436	MH-GIS-ST_ssMH_1551	859.25	MH-GIS-ST_ssMH_1548	860.52	98.6	-0.013	8	PVC	0.01	5	100	3.5	
GM-GIS-ST_ssGM_437	MH-GIS-ST_ssMH_1556	870.35	MH-GIS-ST_ssMH_1554	865.14	151.1	0.034	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-ST_ssGM_438	MH-GIS-ST_ssMH_1557	873.32	MH-GIS-ST_ssMH_1556	870.35	103.9	0.029	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-ST_ssGM_439	MH-GIS-ST_ssMH_1558	875.23	MH-GIS-ST_ssMH_1557	873.32	103.4	0.018	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-ST_ssGM_440	MH-GIS-ST_ssMH_1560	882.81	MH-GIS-ST_ssMH_1559	877.89	159.8	0.031	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-ST_ssGM_441	MH-GIS-ST_ssMH_1559	877.89	MH-GIS-ST_ssMH_1558	875.23	106.9	0.025	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-ST_ssGM_442	MH-GIS-ST_ssMH_1555	871.37	MH-GIS-ST_ssMH_1554	865.14	264.7	0.024	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-ST_ssGM_443	MH-GIS-ST_ssMH_1548	860.52	MH-GIS-ST_ssMH_1552	861.96	96.3	0.015	8	PVC	0.01	12	100	2.2	
GM-GIS-ST_ssGM_444	MH-GIS-ST_ssMH_1553	864	MH-GIS-ST_ssMH_1552	861.96	112.2	0.018	8	PVC	0.01	10	10.3	-0.6	
GM-GIS-ST_ssGM_445	MH-GIS-ST_ssMH_1554	865.14	MH-GIS-ST_ssMH_1553	864	141.7	0.008	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-ST_ssGM_446	MH-GIS-ST_ssMH_1542	864	MH-GIS-ST_ssMH_1541	863.36	251.8	0.003	8	PVC	0.01	32	100	1.7	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-ST_ssGM_447	MH-GIS-ST_ssMH_1543	858.72	MH-GIS-ST_ssMH_1542	864	63	-0.084	8	PVC	0.01	31	100	6.9	
GM-GIS-ST_ssGM_448	MH-GIS-MH-157	862.37	MH-GIS-ST_ssMH_1544	859	128.5	0.026	8	PVC	0.01	1	100	1.7	
GM-GIS-ST_ssGM_449	MH-GIS-ST_ssMH_1544	859	MH-GIS-ST_ssMH_1543	858.72	178.5	0.002	8	PVC	0.01	28	100	5.1	
GM-GIS-TH_ssGM_145	MH-GIS-MH-205	810.83	MH-GIS-SC_ssMH_1399	805.62	257.5	0.02	8	PVC	0.01	236	51	-0.3	
GM-GIS-TH_ssGM_1341	MH-GIS-TH_ssMH_2410	832.92	MH-GIS-TH_ssMH_2411	845.81	261.2	-0.049	8	PVC	0.01	6	100	12.5	
GM-GIS-TH_ssGM_1342	MH-GIS-TH_ssMH_2409	831.23	MH-GIS-TH_ssMH_2410	832.92	85.5	-0.02	8	PVC	0.01	3	100	7	
GM-GIS-TH_ssGM_1343	MH-GIS-TH_ssMH_2411	845.81	MH-GIS-TH_ssMH_2427	845.8	117.2	9E-05	8	PVC	0.01	49	41.7	-0.4	
GM-GIS-TH_ssGM_1344	MH-GIS-TH_ssMH_2412	847.58	MH-GIS-TH_ssMH_2411	845.81	36.7	0.048	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1345	MH-GIS-TH_ssMH_2414	827.68	MH-GIS-TH_ssMH_2406	822.5	238.3	0.022	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1346	MH-GIS-TH_ssMH_2405	814	MH-GIS-TH_ssMH_2407	814	129.2	0	8	PVC	0.01	3	100	2.8	
GM-GIS-TH_ssGM_1347	MH-GIS-TH_ssMH_2408	818.97	MH-GIS-TH_ssMH_2407	814	237.6	0.021	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1348	MH-GIS-TH_ssMH_2406	822.5	MH-GIS-TH_ssMH_2408	818.97	219.6	0.016	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1349	MH-GIS-TH_ssMH_2415	824	MH-GIS-TH_ssMH_2416	819	239.9	0.021	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1350	MH-GIS-TH_ssMH_2416	819	MH-GIS-TH_ssMH_2417	819	71.4	0	8	PVC	0.01	6	100	3	
GM-GIS-TH_ssGM_1351	MH-GIS-TH_ssMH_2417	819	MH-GIS-TH_ssMH_2418	816.63	84	0.028	8	PVC	0.01	9	100	3	
GM-GIS-TH_ssGM_1352	MH-GIS-TH_ssMH_2407	814	MH-GIS-TH_ssMH_2419	814	171.7	0	8	PVC	0.01	15	100	2.8	
GM-GIS-TH_ssGM_1353	MH-GIS-TH_ssMH_2450	887.77	MH-GIS-TH_ssMH_2449	883.57	209	0.02	8	PVC	0.01	31	17.8	-0.5	
GM-GIS-TH_ssGM_1354	MH-GIS-TH_ssMH_2423	867.07	MH-GIS-TH_ssMH_2424	862.29	356	0.013	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1355	MH-GIS-TH_ssMH_2424	862.29	MH-GIS-TH_ssMH_2444	861.48	53.6	0.015	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1356	MH-GIS-TH_ssMH_2426	851.47	MH-GIS-TH_ssMH_2509	829	339.7	0.066	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1357	MH-GIS-TH_ssMH_2419	814	MH-GIS-TH_ssMH_2420	812.28	95.3	0.018	8	PVC	0.01	18	100	2.8	
GM-GIS-TH_ssGM_1358	MH-GIS-TH_ssMH_2418	816.63	MH-GIS-TH_ssMH_2421	817.85	62.8	-0.019	8	PVC	0.01	43	100	6.5	
GM-GIS-TH_ssGM_1359	MH-GIS-TH_ssMH_2421	817.85	MH-GIS-TH_ssMH_2429	817.77	109.3	7E-04	8	PVC	0.01	46	100	5.3	
GM-GIS-TH_ssGM_1360	MH-GIS-TH_ssMH_2429	817.77	MH-GIS-MH-127	824	199.8	-0.031	8	PVC	0.01	49	100	7.8	
GM-GIS-TH_ssGM_1361	MH-GIS-TH_ssMH_2436	878.25	MH-GIS-MH-122	882.33	165.9	-0.025	8	PVC	0.01	61	100	3.7	
GM-GIS-TH_ssGM_1362	MH-GIS-TH_ssMH_2430	874	MH-GIS-TH_ssMH_2436	878.25	265.8	-0.016	8	PVC	0.01	58	100	8	
GM-GIS-TH_ssGM_1363	MH-GIS-TH_ssMH_2431	874	MH-GIS-TH_ssMH_2430	874	62.3	0	8	PVC	0.01	55	100	5.3	
GM-GIS-TH_ssGM_1364	MH-GIS-TH_ssMH_2448	880.86	MH-GIS-TH_ssMH_2431	874	233.9	0.029	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-TH_ssGM_1365	MH-GIS-TH_ssMH_2433	889.23	MH-GIS-TH_ssMH_2432	883.44	165.9	0.035	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-TH_ssGM_1366	MH-GIS-TH_ssMH_2434	891.21	MH-GIS-TH_ssMH_2433	889.23	60.7	0.033	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1367	MH-GIS-TH_ssMH_2447	852.59	MH-GIS-TH_ssMH_2411	845.81	181.1	0.037	8	PVC	0.01	31	17.8	-0.5	
GM-GIS-TH_ssGM_1368	MH-GIS-TH_ssMH_2451	889	MH-GIS-TH_ssMH_2434	891.21	150.2	-0.015	8	PVC	0.01	6	100	1.6	
GM-GIS-TH_ssGM_1369	MH-GIS-TH_ssMH_2413	851.14	MH-GIS-TH_ssMH_2412	847.58	101	0.035	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1370	MH-GIS-TH_ssMH_2420	812.28	MH-GIS-TH_ssMH_2428	811.46	71	0.012	8	PVC	0.01	22	100	4.5	
GM-GIS-TH_ssGM_1371	MH-GIS-TH_ssMH_2428	811.46	MH-GIS-TH_ssMH_2437	813.12	87.5	-0.019	8	PVC	0.01	25	100	7	
GM-GIS-TH_ssGM_1372	MH-GIS-TH_ssMH_2438	814	MH-GIS-TH_ssMH_2418	816.63	164.2	-0.016	8	PVC	0.01	31	100	8	
GM-GIS-TH_ssGM_1373	MH-GIS-TH_ssMH_2437	813.12	MH-GIS-TH_ssMH_2438	814	71.7	-0.012	8	PVC	0.01	28	100	6.2	
GM-GIS-TH_ssGM_1374	MH-GIS-TH_ssMH_2439	851.96	MH-GIS-TH_ssMH_2413	851.14	87.8	0.009	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1375	MH-GIS-TH_ssMH_2442	862.25	MH-GIS-TH_ssMH_2443	859.08	180.9	0.018	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1376	MH-GIS-TH_ssMH_2441	863.07	MH-GIS-TH_ssMH_2442	862.25	48	0.017	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1377	MH-GIS-TH_ssMH_2440	865.19	MH-GIS-TH_ssMH_2441	863.07	53.8	0.039	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1378	MH-GIS-TH_ssMH_2445	862.69	MH-GIS-TH_ssMH_2444	861.48	101.3	0.012	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1379	MH-GIS-TH_ssMH_2446	866.93	MH-GIS-TH_ssMH_2445	862.69	116.3	0.036	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1380	MH-GIS-TH_ssMH_2444	861.48	MH-GIS-TH_ssMH_2443	859.08	57.1	0.042	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-TH_ssGM_1381	MH-GIS-TH_ssMH_2443	859.08	MH-GIS-TH_ssMH_2447	852.59	148.8	0.044	8	PVC	0.01	28	16.9	-0.6	
GM-GIS-TH_ssGM_1382	MH-GIS-TH_ssMH_2449	883.57	MH-GIS-TH_ssMH_2448	880.86	161	0.017	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-TH_ssGM_1383	MH-GIS-TH_ssMH_2432	883.44	MH-GIS-TH_ssMH_2448	880.86	77.1	0.033	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-TH_ssGM_1384	MH-GIS-MH-102	888.77	MH-GIS-TH_ssMH_2450	887.77	125.1	0.008	8	PVC	0.01	28	16.9	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-TH_ssGM_1385	MH-GIS-TH_ssMH_2422	818.06	MH-GIS-MH-107	817.34	113.5	0.006	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1386	MH-GIS-TH_ssMH_2425	853.07	MH-GIS-MH-59	852.02	244.7	0.004	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-TH_ssGM_1387	MH-GIS-TH_ssMH_2435	892.75	MH-GIS-TH_ssMH_2451	889	240.4	0.016	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1388	MH-GIS-TH_ssMH_2427	845.8	MH-GIS-MH-119	845.1	150.8	0.005	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-TH_ssGM_1389	MH-GIS-TH_ssMH_2454	822.12	MH-GIS-TH_ssMH_2452	816.34	144.8	0.04	8	PVC	0.01	224	49.7	-0.3	
GM-GIS-TH_ssGM_1390	MH-GIS-TH_ssMH_2457	829	MH-GIS-TH_ssMH_2453	824	231.3	0.022	8	PVC	0.01	163	42	-0.4	
GM-GIS-TH_ssGM_1391	MH-GIS-TH_ssMH_2452	816.34	MH-GIS-MH-205	810.83	158.4	0.035	8	PVC	0.01	234	50.8	-0.3	
GM-GIS-TH_ssGM_1392	MH-GIS-TH_ssMH_2458	881.69	MH-GIS-TH_ssMH_2465	867.84	238.2	0.058	8	PVC	0.01	68	26.6	-0.5	
GM-GIS-TH_ssGM_1393	MH-GIS-TH_ssMH_2456	863.88	MH-GIS-TH_ssMH_2459	854.04	157.3	0.063	8	PVC	0.01	74	27.8	-0.5	
GM-GIS-TH_ssGM_1394	MH-GIS-MH-107	817.34	MH-GIS-TH_ssMH_2452	816.34	71.8	0.014	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1395	MH-GIS-MH-59	852.02	MH-GIS-TH_ssMH_2464	851.09	39.9	0.023	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1396	MH-GIS-TH_ssMH_2509	829	MH-GIS-TH_ssMH_2457	829	43.6	0	8	PVC	0.01	6	42	-0.4	
GM-GIS-TH_ssGM_1397	MH-GIS-TH_ssMH_2464	851.09	MH-GIS-TH_ssMH_2460	842.8	136.1	0.061	8	PVC	0.01	86	30.2	-0.5	
GM-GIS-TH_ssGM_1398	MH-GIS-MH-119	845.1	MH-GIS-TH_ssMH_2460	842.8	78.7	0.029	8	PVC	0.01	55	24	-0.5	
GM-GIS-TH_ssGM_1399	MH-GIS-MH-127	824	MH-GIS-TH_ssMH_2453	824	85.7	0	8	PVC	0.01	52	100	1.6	
GM-GIS-TH_ssGM_1400	MH-GIS-TH_ssMH_2462	829.3	MH-GIS-TH_ssMH_2457	829	204.4	0.001	8	PVC	0.01	154	54	-0.3	
GM-GIS-TH_ssGM_1401	MH-GIS-TH_ssMH_2463	829	MH-GIS-TH_ssMH_2462	829.3	152	-0.002	8	PVC	0.01	151	100	0.1	
GM-GIS-TH_ssGM_1402	MH-GIS-TH_ssMH_2459	854.04	MH-GIS-TH_ssMH_2464	851.09	49.3	0.06	8	PVC	0.01	77	28.4	-0.5	
GM-GIS-TH_ssGM_1403	MH-GIS-TH_ssMH_2465	867.84	MH-GIS-TH_ssMH_2456	863.88	68.1	0.058	8	PVC	0.01	71	27.2	-0.5	
GM-GIS-TH_ssGM_1404	MH-GIS-MH-122	882.33	MH-GIS-TH_ssMH_2458	881.69	83.1	0.008	8	PVC	0.01	65	26	-0.5	
GM-GIS-TH_ssGM_1405	MH-GIS-TH_ssMH_2466	825.56	MH-GIS-TH_ssMH_2454	822.12	400.2	0.009	8	PVC	0.01	221	49.3	-0.3	
GM-GIS-TH_ssGM_1406	MH-GIS-TH_ssMH_2453	824	MH-GIS-TH_ssMH_2466	825.56	214.6	-0.007	8	PVC	0.01	218	100	1.6	
GM-GIS-TH_ssGM_1407	MH-GIS-TH_ssMH_2460	842.8	MH-GIS-TH_ssMH_2461	837.94	79.3	0.061	8	PVC	0.01	144	39.5	-0.4	
GM-GIS-TH_ssGM_1408	MH-GIS-TH_ssMH_2461	837.94	MH-GIS-TH_ssMH_2463	829	173.6	0.052	8	PVC	0.01	148	39.9	-0.4	
GM-GIS-TH_ssGM_1409	MH-GIS-MH-96	891.26	MH-GIS-TH_ssMH_2467	889.56	60.3	0.028	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-TH_ssGM_1410	MH-GIS-TH_ssMH_2468	886.14	MH-GIS-TH_ssMH_2467	889.56	115.7	-0.03	8	PVC	0.01	3	100	2.9	
GM-GIS-TH_ssGM_1411	MH-GIS-TH_ssMH_2467	889.56	MH-GIS-MH-102	888.77	65.6	0.012	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-TH_ssGM_1412	MH-GIS-MH-39	899.81	MH-GIS-MH-40	899.01	27.4	0.029	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1413	MH-GIS-TH_ssMH_2508	895.72	MH-GIS-MH-96	891.26	227.1	0.02	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-TH_ssGM_1414	MH-GIS-MH-40	899.01	MH-GIS-TH_ssMH_2508	895.72	166.5	0.02	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-TH_ssGM_1415	MH-GIS-TH_ssMH_2469	899.48	MH-GIS-MH-39	899.81	94.7	-0.003	8	PVC	0.01	6	63.4	-0.2	
GM-GIS-TH_ssGM_1416	MH-GIS-TH_ssMH_2470	900.98	MH-GIS-TH_ssMH_2469	899.48	61.6	0.024	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-WC_ssGM_30	MH-GIS-WC_ssMH_1443	584.4	MH-GIS-WC_ssMH_1444	576.86	105.9	0.071	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-WC_ssGM_31	MH-GIS-WC_ssMH_1430	568.76	MH-GIS-WC_ssMH_1444	576.86	119.6	-0.068	8	PVC	0.01	7	100	9.8	
GM-GIS-WC_ssGM_32	MH-GIS-WC_ssMH_1438	586.92	MH-GIS-WC_ssMH_1443	584.4	113	0.022	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-WC_ssGM_33	MH-GIS-WC_ssMH_1444	576.86	MH-GIS-KR_ssMH_1445	579.09	178.7	-0.012	8	PVC	0.01	12	100	1.7	
GM-GIS-WC_ssGM_37	MH-GIS-MH-152	645.99	MH-GIS-WC_ssMH_1433	638.58	120.9	0.061	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_38	MH-GIS-WC_ssMH_1432	627.41	MH-GIS-WC_ssMH_1434	616.89	337.6	0.031	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-WC_ssGM_39	MH-GIS-WC_ssMH_1433	638.58	MH-GIS-WC_ssMH_1432	627.41	257.8	0.043	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-WC_ssGM_40	MH-GIS-WC_ssMH_1437	570.16	MH-GIS-WC_ssMH_1430	568.76	272.9	0.005	8	PVC	0.01	7	100	3.9	
GM-GIS-WC_ssGM_41	MH-GIS-MH-170	634.14	MH-GIS-WC_ssMH_1446	626.21	147.1	0.054	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_42	MH-GIS-WC_ssMH_1446	626.21	MH-GIS-WC_ssMH_1440	607.87	280.7	0.065	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-WC_ssGM_43	MH-GIS-WC_ssMH_1440	607.87	MH-GIS-WC_ssMH_1438	586.92	304	0.069	8	PVC	0.01	2	5	-0.6	
GM-GIS-WC_ssGM_44	MH-GIS-WC_ssMH_1436	600.59	MH-GIS-WC_ssMH_1437	570.16	340.3	0.089	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-WC_ssGM_45	MH-GIS-WC_ssMH_1435	611.95	MH-GIS-WC_ssMH_1436	600.59	130.7	0.087	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-WC_ssGM_46	MH-GIS-WC_ssMH_1434	616.89	MH-GIS-WC_ssMH_1435	611.95	85.2	0.058	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-WC_ssGM_47	MH-GIS-MH-120	629.37	MH-GIS-WC_ssMH_1432	627.41	79.5	0.025	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_108	MH-GIS-WC_ssMH_1561	651.21	MH-IS-107	644.73	77.8	0.083	8	PVC	0.01	1	2.9	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-2	MH-IS-276	849.3	MH-IS-205	845.9	150.7	0.023	10	PVC	0.01	71	20.6	-0.7	
GM-IS-3	MH-IS-221	840.61	MH-IS-223	839.61	174.8	0.006	10	PVC	0.01	111	25.9	-0.6	
GM-IS-4	MH-IS-201	841.44	MH-IS-221	840.61	69.9	0.012	10	PVC	0.01	110	25.8	-0.6	
GM-IS-5	MH-IS-229	834.38	MH-IS-233	831.11	247	0.013	10	PVC	0.01	115	26.2	-0.6	
GM-IS-6	MH-IS-225	838.58	MH-IS-227	835.69	254.9	0.011	10	PVC	0.01	113	26	-0.6	
GM-IS-7	MH-IS-223	839.61	MH-IS-225	838.58	237.4	0.004	10	PVC	0.01	112	25.9	-0.6	
GM-IS-8	MH-IS-234	862.31	MH-IS-243	858.19	164.3	0.025	10	PVC	0.01	45	16.2	-0.7	
GM-IS-9	MH-IS-227	835.69	MH-IS-229	834.38	95.6	0.014	10	PVC	0.01	114	26.1	-0.6	
GM-IS-10	MH-IS-251	855.2	MH-IS-261	853.85	164.5	0.008	10	PVC	0.01	47	16.5	-0.7	
GM-IS-11	MH-IS-243	858.19	MH-IS-251	855.2	188.2	0.016	10	PVC	0.01	46	16.4	-0.7	
GM-IS-12	MH-IS-269	850.48	MH-IS-276	849.3	264.6	0.004	10	PVC	0.01	48	16.9	-0.7	
GM-IS-13	MH-IS-261	853.85	MH-IS-269	850.48	285.6	0.012	10	PVC	0.01	47	16.7	-0.7	
GM-IS-14	MH-IS-203	843.68	MH-IS-201	841.44	159.9	0.014	10	PVC	0.01	89	23	-0.6	
GM-IS-15	MH-IS-211	869.29	MH-IS-234	862.31	166	0.042	10	PVC	0.01	42	15.8	-0.7	
GM-IS-16	MH-IS-185	875.33	MH-IS-211	869.29	249.3	0.024	10	PVC	0.01	42	15.6	-0.7	
GM-IS-17	MH-IS-146	876.12	MH-IS-185	875.33	147.9	0.005	10	Ductile Iron	0.013	41	16.2	-0.7	
GM-IS-18	MH-IS-18	799.57	MH-IS-235	798.05	144.3	0.011	12	PVC	0.01	70	16.1	-0.8	
GM-IS-19	MH-IS-147	790.4	PSLWW	789.9	57.6	0.009	12	PVC	0.01	439	41.5	-0.6	
GM-IS-20	MH-IS-186	794.7	MH-IS-147	790.4	84.3	0.051	12	PVC	0.01	88	18.1	-0.8	
GM-IS-21	MH-IS-212	795.56	MH-IS-186	794.7	81.7	0.011	12	PVC	0.01	86	17.9	-0.8	
GM-IS-22	MH-IS-235	798.05	MH-IS-212	795.56	92	0.027	12	PVC	0.01	83	17.7	-0.8	
GM-IS-23	MH-IS-3	797.17	MH-IS-117	796.57	128.5	0.005	12	PVC	0.01	7	4.9	-1	
GM-IS-28	MH-IS-187	422.69	MH-IS-213	420.51	310.9	0.007	12	PVC	0.01	260	31.6	-0.7	
GM-IS-29	MH-IS-27	424.37	MH-IS-187	422.69	270.5	0.006	12	PVC	0.01	257	31.4	-0.7	
GM-IS-30	MH-IS-39	847.91	MH-IS-290	832.16	182.5	0.086	12	PVC	0.01	702	53.1	-0.5	
GM-IS-31	MH-IS-233	831.11	MH-IS-249	830.76	39.8	0.009	10	PVC	0.01	121	27	-0.6	
GM-IS-32	MH-IS-249	830.76	MH-IS-126	830.14	295.5	0.002	10	PVC	0.01	131	32.2	-0.6	
GM-IS-33	MH-IS-40	811.95	MH-IS-36	792.15	132.2	0.15	12	PVC	0.01	721	53.8	-0.5	
GM-IS-34	MH-IS-290	832.16	MH-IS-31	830.87	241	0.005	12	PVC	0.01	702	53.1	-0.5	
GM-IS-35	MH-IS-31	830.87	MH-IS-32	829.81	139.4	0.008	12	PVC	0.01	703	53.1	-0.5	
GM-IS-36	MH-IS-32	829.81	MH-IS-33	827.47	336.3	0.007	12	PVC	0.01	704	53.2	-0.5	
GM-IS-37	MH-IS-33	827.47	MH-IS-35	824.02	225.5	0.015	12	PVC	0.01	705	53.2	-0.5	
GM-IS-38	MH-IS-35	824.02	MH-IS-40	811.95	301.4	0.04	12	PVC	0.01	706	53.2	-0.5	
GM-IS-39	MH-IS-36	792.15	MH-IS-37	788.58	65.5	0.054	12	PVC	0.01	722	53.8	-0.5	
GM-IS-40	MH-IS-37	788.58	MH-IS-38	767.46	126.7	0.167	12	PVC	0.01	722	53.9	-0.5	
GM-IS-42	MH-IS-MH-3	801.7	MH-GIS-DH_ssMH_1627	801.8	292	-3E-04	10	PVC	0.01	48	45.7	-0.5	
GM-IS-43	MH-IS-MH-4	873	MH-IS-46	869.81	399.4	0.008	12	PVC	0.01	543	46.4	-0.5	
GM-IS-44	MH-IS-43	861.48	MH-IS-44	849.46	145.7	0.083	12	PVC	0.01	549	46.7	-0.5	
GM-IS-45	MH-IS-44	849.46	MH-IS-39	847.91	70.6	0.022	12	PVC	0.01	550	46.7	-0.5	
GM-IS-46	MH-IS-46	869.81	MH-IS-43	861.48	366.7	0.023	12	PVC	0.01	544	46.4	-0.5	
GM-IS-47(1)	MH-IS-198	779.52	MH-IS-MH-210	778.16	18.4	0.074	10	PVC	0.01	795	71.7	-0.2	
GM-IS-47(2)	MH-IS-MH-210	778.16	MH-IS-195	775.63	34.1	0.074	10	PVC	0.01	798	71.8	-0.2	
GM-IS-48	MH-IS-MH-5	825.27	MH-IS-54	819.68	193.9	0.029	10	PVC	0.01	807	72.2	-0.2	
GM-IS-49	MH-IS-49	804.65	MH-IS-51	801.25	273	0.012	10	PVC	0.01	67	20	-0.7	
GM-IS-50	MH-IS-51	801.25	MH-IS-50	797.44	305.3	0.012	10	PVC	0.01	69	20.2	-0.7	
GM-IS-51	MH-IS-54	819.68	MH-IS-61	800.77	221.8	0.085	10	PVC	0.01	807	72.2	-0.2	
GM-IS-52	MH-IS-50	797.44	MH-IS-198	779.52	269.6	0.066	10	PVC	0.01	73	20.7	-0.7	
GM-IS-53	MH-IS-195	775.63	PSBPWW	775.63	45.7	0	10	PVC	0.01	799	100	0.1	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-54	MH-IS-59	828.09	MH-IS-58	819.51	192.3	0.045	10	PVC	0.01	58	18.6	-0.7	
GM-IS-55	MH-IS-53	830.15	MH-IS-59	828.09	188.3	0.011	10	PVC	0.01	57	18.4	-0.7	
GM-IS-56	MH-IS-58	819.51	MH-IS-60	809.95	383.8	0.025	10	PVC	0.01	62	19.2	-0.7	
GM-IS-57	MH-IS-60	809.95	MH-IS-49	804.65	214.5	0.025	10	PVC	0.01	63	19.4	-0.7	
GM-IS-58	MH-IS-64	788.27	MH-IS-65	770.15	350.9	0.052	10	Ductile Iron	0.013	811	72.4	-0.2	
GM-IS-59	MH-IS-63	796.38	MH-IS-64	788.27	45.8	0.177	10	Ductile Iron	0.013	810	72.4	-0.2	
GM-IS-60	MH-IS-61	800.77	MH-IS-62	799.18	294.1	0.005	10	Ductile Iron	0.013	808	100	0.2	
GM-IS-61	MH-IS-65	770.15	MH-IS-116	769.83	183.2	0.002	10	Ductile Iron	0.013	812	100	0.8	
GM-IS-63	MH-IS-62	799.18	MH-IS-63	796.38	321.1	0.009	10	Ductile Iron	0.013	809	72.9	-0.2	
GM-IS-64(1)	MH-IS-152	852.91	MH-IS-BP_ssMH_2512	837.33	197.1	0.079	10	PVC	0.01	49	17	-0.7	
GM-IS-64(2)	MH-IS-BP_ssMH_2512	837.33	MH-IS-67	832.9	282.2	0.016	10	PVC	0.01	51	17.3	-0.7	
GM-IS-66	MH-IS-67	832.9	MH-IS-53	830.15	327.8	0.008	10	PVC	0.01	52	17.5	-0.7	
GM-IS-67	MH-IS-69	876.77	MH-IS-146	876.12	109.3	0.006	10	Ductile Iron	0.013	40	15.6	-0.7	
GM-IS-68	MH-IS-70	866.12	MH-IS-71	858.15	228.3	0.035	10	Ductile Iron	0.013	43	15.8	-0.7	
GM-IS-69	MH-IS-71	858.15	MH-IS-152	852.91	245.9	0.021	10	Ductile Iron	0.013	48	16.8	-0.7	
GM-IS-70	MH-IS-294	409.13	MH-IS-230	408.12	139.2	0.007	12	PVC	0.01	1	72.7	-0.3	
GM-IS-71	MH-IS-72	415.04	MH-IS-230	408.12	240.6	0.029	15	PVC	0.01	1,973	68	-0.4	
GM-IS-72	MH-IS-77	422.01	MH-IS-72	415.04	250	0.028	15	PVC	0.01	1,972	68	-0.4	
GM-IS-73	MH-IS-MH-2	408.8	MH-IS-232	406.2	302.4	0.009	36	Concrete	0.013	3,784	30.5	-2.1	
GM-IS-74	MH-IS-230	408.12	MH-IS-MH-2	408.8	32.2	-0.021	24	Concrete	0.013	1,975	86.9	-0.3	
GM-IS-75	MH-IS-81	438.64	MH-IS-78	430.27	309.1	0.027	15	PVC	0.01	1,971	67.9	-0.4	
GM-IS-76	MH-IS-82	448.73	MH-IS-81	438.64	294.7	0.034	15	PVC	0.01	1,968	67.9	-0.4	
GM-IS-77	MH-IS-76	491.15	MH-IS-75	479.82	294.7	0.038	15	PVC	0.01	1,964	67.8	-0.4	
GM-IS-78	MH-IS-74	465.04	MH-IS-82	448.73	296.4	0.055	15	PVC	0.01	1,966	67.8	-0.4	
GM-IS-79	MH-IS-75	479.82	MH-IS-74	465.04	275	0.054	15	PVC	0.01	1,965	67.8	-0.4	
GM-IS-80	MH-IS-78	430.27	MH-IS-77	422.01	303.5	0.027	15	PVC	0.01	1,971	67.9	-0.4	
GM-IS-81	MH-IS-128	510.28	MH-IS-84	509.54	45.6	0.016	12	PVC	0.01	182	26.3	-0.7	
GM-IS-82	MH-IS-154	499.58	MH-IS-121	498.94	147.4	0.004	12	PVC	0.01	5	20.7	-0.8	
GM-IS-83	MH-IS-84	509.54	MH-IS-121	498.94	356.1	0.03	15	PVC	0.01	1,957	67.7	-0.4	
GM-IS-84	MH-IS-83	573.01	MH-IS-87	563.08	301	0.033	15	PVC	0.01	1,771	64.3	-0.4	
GM-IS-85	MH-IS-87	563.08	MH-IS-86	543.15	300	0.066	15	PVC	0.01	1,772	64.3	-0.4	
GM-IS-86	MH-IS-86	543.15	MH-IS-85	525.48	251.4	0.07	15	PVC	0.01	1,773	64.3	-0.4	
GM-IS-87	MH-IS-85	525.48	MH-IS-84	509.54	296.7	0.054	15	PVC	0.01	1,774	64.4	-0.4	
GM-IS-88	MH-IS-48	588.13	MH-IS-99	587.49	150.6	0.004	12	PVC	0.01	41	16.2	-0.8	
GM-IS-89	MH-IS-90	583.48	MH-IS-89	577.39	235.4	0.026	15	PVC	0.01	1,757	64	-0.4	
GM-IS-90	MH-IS-99	587.49	MH-IS-90	583.48	306.8	0.013	15	PVC	0.01	1,756	64	-0.4	
GM-IS-91	MH-IS-101	594.05	MH-IS-99	587.49	246	0.027	15	PVC	0.01	1,714	63.2	-0.5	
GM-IS-92	MH-IS-89	577.39	MH-IS-83	573.01	316.6	0.014	15	PVC	0.01	1,771	64.3	-0.4	
GM-IS-93	MH-IS-121	498.94	MH-IS-76	491.15	268.4	0.029	15	PVC	0.01	1,963	67.8	-0.4	
GM-IS-94	MH-IS-112	687.28	MH-IS-111	668.45	304.2	0.062	15	PVC	0.01	1,689	62.7	-0.5	
GM-IS-95	MH-IS-113	708.48	MH-IS-112	687.28	306.5	0.069	15	PVC	0.01	1,688	62.7	-0.5	
GM-IS-96	MH-IS-117	796.57	MH-IS-116	769.83	386.7	0.069	15	PVC	0.01	148	17.8	-1	
GM-IS-97	MH-IS-118	807.25	MH-IS-117	796.57	109.3	0.098	12	PVC	0.01	140	23	-0.8	
GM-IS-98	MH-IS-119	829.53	MH-IS-118	807.25	297.4	0.075	12	PVC	0.01	139	22.9	-0.8	
GM-IS-99	MH-IS-120	850.27	MH-IS-119	829.53	297.3	0.07	12	PVC	0.01	6	4.6	-1	
GM-IS-100	MH-IS-123	863.89	MH-IS-120	850.27	318.5	0.043	12	PVC	0.01	5	4.2	-1	
GM-IS-101	MH-IS-124	870.98	MH-IS-123	863.89	227.3	0.031	12	PVC	0.01	2	3	-1	
GM-IS-102	MH-IS-125	874.79	MH-IS-124	870.98	247.6	0.015	12	PVC	0.01	2	2.5	-1	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-103	MH-IS-129	645.79	MH-IS-107	644.73	147.5	0.007	12	PVC	0.01	19	8.4	-0.9	
GM-IS-104	MH-IS-296	797.56	MH-IS-117	796.57	70.4	0.014	12	PVC	0.01	1	1.7	-1	
GM-IS-105	MH-IS-116	769.83	MH-IS-115	750.98	298.9	0.063	15	PVC	0.01	960	46.7	-0.7	
GM-IS-106	MH-IS-291	874.15	MH-IS-125	874.79	46.8	-0.014	12	PVC	0.01	1	67.3	-0.3	
GM-IS-107	MH-IS-111	668.45	MH-IS-108	657.51	300.5	0.036	15	PVC	0.01	1,690	62.8	-0.5	
GM-IS-108	MH-IS-108	657.51	MH-IS-107	644.73	299.4	0.043	15	PVC	0.01	1,691	62.8	-0.5	
GM-IS-109	MH-IS-107	644.73	MH-IS-106	632.04	300.6	0.042	15	PVC	0.01	1,712	63.2	-0.5	
GM-IS-110	MH-IS-106	632.04	MH-IS-105	612.67	299.9	0.065	15	PVC	0.01	1,713	63.2	-0.5	
GM-IS-111	MH-IS-115	750.98	MH-IS-114	728.11	298.5	0.077	15	PVC	0.01	1,687	62.7	-0.5	
GM-IS-112	MH-IS-114	728.11	MH-IS-113	708.48	305.3	0.064	15	PVC	0.01	1,688	62.7	-0.5	
GM-IS-113	MH-IS-126	830.14	MH-IS-119	829.53	121.4	0.005	12	PVC	0.01	132	22.3	-0.8	
GM-IS-114	MH-IS-127	755.09	MH-IS-115	750.98	63.4	0.065	12	PVC	0.01	726	54	-0.5	
GM-IS-115	MH-IS-102	756.47	MH-IS-127	755.09	85.5	0.016	12	PVC	0.01	725	54	-0.5	
GM-IS-116	MH-IS-105	612.67	MH-IS-101	594.05	299.6	0.062	15	PVC	0.01	1,713	63.2	-0.5	
GM-IS-117	MH-IS-214	408.1	MH-IS-188	407.79	51	0.006	10	Concrete	0.013	17	10.1	-0.7	SM4
GM-IS-118	MH-IS-188	407.79	MH-IS-148	404.7	143.4	0.022	10	Concrete	0.013	24	11.7	-0.7	SM4
GM-IS-119	MH-IS-238	409.5	MH-IS-214	408.1	378.8	0.004	10	Concrete	0.013	9	8.8	-0.8	
GM-IS-120	MH-IS-148	404.7	MH-IS-145	404.12	72.9	0.008	10	Concrete	0.013	66	19.8	-0.7	SM4
GM-IS-121	MH-IS-145	404.12	MH-IS-144	403.08	80.2	0.013	10	Concrete	0.013	69	20.2	-0.7	SM4
GM-IS-122	MH-IS-144	403.08	PS2WW	399.5	22.6	0.159	10	Concrete	0.013	78	21.5	-0.7	SM4
GM-IS-124	MH-IS-192	405.19	PS1WW	401	69.8	0.06	18	PVC	0.01	1,806	51.2	-0.7	SM3A
GM-IS-125	MH-IS-242	406.96	MH-IS-218	405.44	302.2	0.005	18	PVC	0.01	1,770	50.7	-0.7	SM3A
GM-IS-126	MH-IS-218	405.44	MH-IS-192	405.19	294	9E-04	18	PVC	0.01	1,779	73.2	-0.4	SM3A
GM-IS-127	MH-IS-248	408.21	MH-IS-242	406.96	304.1	0.004	18	PVC	0.01	1,762	50.5	-0.7	SM3A
GM-IS-128	MH-IS-245	410.33	MH-IS-238	409.5	339.2	0.002	10	Concrete	0.013	7	8.4	-0.8	
GM-IS-130	MH-IS-162	413.59	MH-IS-156	413.09	173.5	0.003	12	Concrete	0.013	446	51.3	-0.5	
GM-IS-131	MH-IS-278	412.1	MH-IS-271	410.4	374.1	0.005	12	Concrete	0.013	464	45.9	-0.5	
GM-IS-132	MH-IS-156	413.09	MH-IS-278	412.1	264.7	0.004	12	Concrete	0.013	455	47.9	-0.5	
GM-IS-134	MH-IS-140	409.52	MH-IS-256	408.25	330.5	0.004	18	PVC	0.01	1,735	50.1	-0.7	SM3A
GM-IS-135	MH-IS-256	408.25	MH-IS-248	408.21	330.4	1E-04	18	PVC	0.01	1,744	85.9	-0.2	SM3A
GM-IS-136	MH-IS-MH-6	414.56	MH-IS-267	409.97	156.9	0.029	10	Concrete	0.013	87	22.8	-0.6	
GM-IS-137	MH-IS-134	408.52	MH-IS-193	407.54	156	0.006	10	Concrete	0.013	139	29	-0.6	
GM-IS-139	MH-IS-193	407.54	MH-IS-155	406.97	73.7	0.008	10	Concrete	0.013	407	50.7	-0.4	
GM-IS-140	MH-IS-155	406.97	PS3WW	402.5	38.7	0.116	10	Concrete	0.013	411	50.9	-0.4	
GM-IS-141	MH-IS-136	409.7	MH-IS-134	408.52	183.2	0.006	10	Concrete	0.013	133	28.3	-0.6	
GM-IS-142	MH-IS-167	414.72	MH-IS-162	413.59	394.7	0.003	12	Concrete	0.013	438	50.7	-0.5	
GM-IS-143	MH-IS-170	415.38	MH-IS-167	414.72	402.9	0.002	12	Concrete	0.013	429	59.4	-0.4	
GM-IS-144	MH-IS-172	416.48	MH-IS-170	415.38	421.1	0.003	12	Concrete	0.013	420	50.8	-0.5	SM3B
GM-IS-145	MH-IS-138	409.59	MH-IS-136	409.7	170.6	-6E-04	10	Concrete	0.013	123	64.8	-0.3	
GM-IS-146	MH-IS-139	410.69	MH-IS-138	409.59	287.4	0.004	10	Concrete	0.013	116	29.6	-0.6	
GM-IS-147	MH-IS-30	415.33	MH-IS-168	415.07	234.8	0.001	12	PVC	0.01	815	87.4	-0.1	SM1A
GM-IS-148	MH-IS-28	415.51	MH-IS-30	415.38	32	0.004	12	PVC	0.01	797	71.7	-0.3	SM1A
GM-IS-149	MH-IS-26	415.99	MH-IS-28	415.52	243.8	0.002	12	PVC	0.01	788	71.5	-0.3	SM1A
GM-IS-150	MH-IS-24	416.67	MH-IS-26	415.99	247.7	0.003	12	PVC	0.01	779	62.6	-0.4	SM1B
GM-IS-151	MH-IS-23	417.17	MH-IS-24	416.67	121	0.004	12	PVC	0.01	753	55	-0.4	SM1B
GM-IS-152	MH-IS-21	417.29	MH-IS-23	417.17	10.7	0.011	12	PVC	0.01	744	54.7	-0.5	SM1B
GM-IS-153	MH-IS-19	418.18	MH-IS-21	417.29	400.3	0.002	12	PVC	0.01	735	64.6	-0.4	SM1B
GM-IS-154	MH-IS-14	419.81	MH-IS-19	418.18	399.8	0.004	12	PVC	0.01	726	54	-0.5	SM1C

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-155	MH-IS-122	420.49	MH-IS-14	419.81	271.6	0.003	12	PVC	0.01	717	61	-0.4	SM1C
GM-IS-156	MH-IS-110	420.69	MH-IS-122	420.49	37.8	0.005	10	PVC	0.01	708	67.6	-0.3	
GM-IS-157	MH-IS-98	421.68	MH-IS-110	420.69	269.9	0.004	10	PVC	0.01	699	74.4	-0.2	
GM-IS-158	MH-IS-80	422.48	MH-IS-98	421.68	122	0.007	10	PVC	0.01	690	66.7	-0.3	
GM-IS-162	MH-IS-213	410.46	MH-GIS-SF_ssMH_1447	410.46	125.9	0	48	Glass	0.013	262	10.2	-3.6	
GM-IS-166	MH-IS-266	415.38	MH-IS-253	412.61	351	0.008	10	Concrete	0.013	10	7.6	-0.8	
GM-IS-167	MH-IS-253	412.61	MH-IS-137	411.83	356.6	0.002	10	Concrete	0.013	66	25.7	-0.6	
GM-IS-168	MH-IS-260	419.11	MH-IS-259	418.07	388.7	0.003	10	Concrete	0.013	3	5.8	-0.8	
GM-IS-169	MH-IS-259	418.07	MH-SUR-5103	416.7	121.3	0.011	10	Concrete	0.013	7	6.2	-0.8	
GM-IS-170(1)	MH-IS-135	409.66	MH-IS-GS_ssMH_1480	408.77	316.2	0.003	10	Concrete	0.013	90	28	-0.6	SM4
GM-IS-171	MH-IS-237	410.7	MH-IS-135	409.66	244	0.004	10	Concrete	0.013	80	23.8	-0.6	
GM-IS-172	MH-IS-137	411.83	MH-IS-237	410.7	353.6	0.003	10	Concrete	0.013	76	25	-0.6	SM4
GM-IS-174	MH-IS-0	414.12	MH-IS-253	412.61	403.5	0.004	10	Concrete	0.013	53	20.1	-0.7	
GM-IS-175	MH-IS-257	414.64	MH-IS-0	414.12	186.8	0.003	10	Concrete	0.013	50	20.9	-0.7	
GM-IS-185	MH-IS-274	415.08	MH-IS-266	415.38	300.2	-1E-03	10	Concrete	0.013	3	46.5	-0.4	
GM-IS-187(1)	MH-SUR-5103	416.7	MH-SUR-5001	414.95	586.6	0.003	10	Concrete	0.013	10	9.4	-0.8	
GM-IS-187(2)	MH-SUR-5001	414.95	MH-IS-257	414.64	53.7	0.006	10	Concrete	0.013	13	9.3	-0.8	
GM-IS-191	MH-IS-232	406.2	KCPSWW	405.5	50.1	0.014	36	Concrete	0.013	3,785	30.5	-2.1	
GM-IS-192	MH-IS-168	414.99	MH-IS-166	414.65	213.7	0.002	12	PVC	0.01	824	78.5	-0.2	
GM-IS-193	MH-IS-166	414.65	MH-IS-161	413.96	200.6	0.003	12	PVC	0.01	833	60.7	-0.4	
GM-IS-194	MH-IS-161	413.96	MH-IS-1	413.11	256.6	0.003	12	PVC	0.01	842	61.9	-0.4	
GM-IS-198	MH-IS-132	430.98	MH-IS-57	425.87	109.1	0.047	10	PVC	0.01	321	44.7	-0.5	
GM-IS-199	MH-IS-4	435.34	MH-IS-132	430.98	200.3	0.022	10	PVC	0.01	316	44.3	-0.5	
GM-IS-200	MH-IS-5	436.69	MH-IS-4	435.34	150.2	0.009	10	PVC	0.01	307	43.7	-0.5	
GM-IS-201	MH-IS-6	446.59	MH-IS-5	436.69	299.9	0.033	10	PVC	0.01	298	43	-0.5	
GM-IS-202	MH-IS-7	454.62	MH-IS-6	446.59	271.1	0.03	10	PVC	0.01	289	42.4	-0.5	
GM-IS-203	MH-IS-8	461.15	MH-IS-7	454.62	331.7	0.02	10	PVC	0.01	281	41.7	-0.5	
GM-IS-204	MH-IS-9	462.21	MH-IS-8	461.15	263.7	0.004	10	Ductile Iron	0.013	272	46.2	-0.4	
GM-IS-205	MH-IS-10	462.79	MH-IS-9	462.21	184.3	0.003	10	Ductile Iron	0.013	263	48.6	-0.4	
GM-IS-206	MH-IS-11	463.53	MH-IS-10	462.79	260.7	0.003	10	Ductile Iron	0.013	255	49.2	-0.4	
GM-IS-207	MH-IS-12	464.55	MH-IS-11	463.53	301.3	0.003	10	PVC	0.01	246	39.6	-0.5	
GM-IS-208	MH-IS-13	465.69	MH-IS-12	464.55	286.9	0.004	10	PVC	0.01	237	38.2	-0.5	
GM-IS-209	MH-IS-16	465.97	MH-IS-13	465.69	190.1	0.001	10	Ductile Iron	0.013	228	56.4	-0.4	
GM-IS-302	MH-IS-205	845.9	MH-IS-203	843.68	158.3	0.014	10	PVC	0.01	79	21.7	-0.7	
GM-IS-306	MH-IS-38	767.46	MH-IS-102	756.47	256.2	0.043	12	PVC	0.01	724	53.9	-0.5	
GM-IS-500	MH-IS-1	413.11	MH-IS-96	412.74	165.9	0.002	12	PVC	0.01	868	72.8	-0.3	
GM-IS-501	MH-IS-96	412.74	MH-IS-95	411.63	253.7	0.004	12	PVC	0.01	913	60.9	-0.4	
GM-IS-502	MH-IS-95	411.63	MH-IS-94	411.22	254.7	0.002	15	PVC	0.01	922	56.4	-0.5	
GM-IS-503	MH-IS-94	411.22	MH-IS-93	410.62	358.1	0.002	15	PVC	0.01	984	57.9	-0.5	
GM-IS-504	MH-IS-93	410.62	MH-IS-92	409.88	276.6	0.003	15	PVC	0.01	1,068	53	-0.6	
GM-IS-505	MH-IS-92	409.88	MH-IS-140	409.52	236.8	0.002	18	PVC	0.01	1,199	50.1	-0.7	
GM-IS-506	MH-IS-267	409.97	MH-IS-92	409.88	18	0.005	15	PVC	0.01	123	53.2	-0.6	
GM-IS-507	MH-IS-97	412.47	MH-IS-94	411.22	158.6	0.008	10	Concrete	0.013	53	17.8	-0.7	SM4
GM-IS-508	MH-IS-275	417.67	MH-IS-97	412.47	203.5	0.026	10	Concrete	0.013	9	7.2	-0.8	
GM-IS-509(1)	MH-GIS-DT_ssMH_2513	414.27	MH-IS-277	413.81	32.9	0.014	10	Concrete	0.013	9	7.2	-0.8	
GM-RD-SSGM-CO-6	GM-RD-MH-7	902.6	MH-GIS-NJ_ssMH_2565	895.08	195.7	0.038	12		0.013	159	24.5	-0.8	
GM-RD-SSGM-CO-7	GM-RD-MH-8	909.76	GM-RD-MH-7	902.6	223	0.032	12		0.013	157	24.4	-0.8	
GM-RD-SSGM-CO-8	GM-RD-MH-9	910.89	GM-RD-MH-8	909.76	54.1	0.021	12		0.013	133	22.5	-0.8	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-RD-SSGM-CO-9	GM-RD-MH-10	920.14	GM-RD-MH-9	910.89	217.2	0.043	12		0.013	132	22.3	-0.8	
GM-RD-SSGM-CO-10	GM-RD-MH-11	928.71	GM-RD-MH-10	920.14	99.4	0.086	12		0.013	130	22.2	-0.8	
GM-RD-SSGM-CO-11	GM-RD-MH-11	928.71	GM-RD-MH-12	955.39	204.3	0.131	12		0.013	83	17.6	25.9	
GM-RD-SSGM-CO-12	GM-RD-MH-12	955.39	GM-RD-MH-13	973.11	125.1	0.142	12		0.013	81	17.4	16.9	
GM-RD-SSGM-CO-13	GM-RD-MH-13	973.11	GM-RD-MH-14	980.3	57.9	0.124	12		0.013	30	10.5	6.3	
GM-RD-SSGM-CO-14	GM-RD-MH-14	980.3	GM-RD-MH-15	1,011.97	230.2	0.138	12		0.013	28	10.2	30.8	
GM-RD-SSGM-CO-15	GM-RD-MH-15	1,011.97	GM-RD-MH-16	1,025.99	104.2	0.135	12		0.013	26	9.8	13.1	
GM-RD-SSGM-CO-16	GM-RD-MH-16	1,025.99	GM-RD-MH-17	1,043.99	150	0.12	12		0.013	25	9.5	17.1	
GM-RD-SSGM-CO-17	GM-RD-MH-17	1,043.99	GM-RD-MH-18	1,053.31	89.7	0.104	12		0.013	23	9.1	8.4	
GM-RD-SSGM-CO-18	GM-RD-MH-18	1,053.31	GM-RD-MH-19	1,065.28	121.3	0.099	12		0.013	21	8.8	11.1	
GM-RD-SSGM-CO-19	GM-RD-MH-19	1,065.28	GM-RD-MH-20	1,090.77	317.5	0.08	12		0.013	9	5.7	24.5	
GM-RD-SSGM-CO-20	GM-RD-MH-20	1,090.77	GM-RD-MH-21	1,092.07	86.3	0.015	8		0.013	7	8.5	0.7	
GM-RD-SSGM-CO-21	GM-RD-MH-21	1,092.07	GM-RD-MH-22	1,106.43	133.2	0.108	8		0.013	5	7.3	13.7	
GM-RD-SSGM-CO-22	GM-RD-MH-22	1,106.43	GM-RD-MH-23	1,119.30	193.9	0.066	8		0.013	4	6	12.2	
GM-RD-SSGM-CO-23	GM-RD-MH-23	1,119.30	GM-RD-MH-24	1,128.16	217.4	0.041	8		0.013	2	4.2	8.2	
GM-RD-SSGM-CO-24	GM-RD-MH-25	1,128.84	GM-RD-MH-26	1,126.66	170	0.013	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-25	GM-RD-MH-26	1,126.66	GM-RD-MH-27	1,115.27	187.2	0.061	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-26	GM-RD-MH-27	1,115.27	GM-RD-MH-28	1,044.72	264.2	0.267	8		0.013	7	8.5	-0.6	
GM-RD-SSGM-CO-27	GM-RD-MH-28	1,044.72	GM-RD-MH-29	1,026.74	124.6	0.144	8		0.013	9	9.4	-0.6	
GM-RD-SSGM-CO-28	GM-RD-MH-29	1,026.74	GM-RD-MH-30	1,018.26	68.8	0.123	8		0.013	11	10.4	-0.6	
GM-RD-SSGM-CO-29	GM-RD-MH-30	1,018.26	GM-RD-MH-31	1,006.12	259	0.047	8		0.013	14	12	-0.6	
GM-RD-SSGM-CO-30	GM-RD-MH-31	1,006.12	GM-RD-MH-32	999.84	80.1	0.078	8		0.013	39	20	-0.5	
GM-RD-SSGM-CO-31	GM-RD-MH-32	999.84	GM-RD-MH-33	994	75	0.078	8		0.013	40	20.5	-0.5	
GM-RD-SSGM-CO-32	GM-RD-MH-33	994	GM-RD-MH-34	989	71.9	0.07	8		0.013	42	20.9	-0.5	
GM-RD-SSGM-CO-33	GM-RD-MH-34	989	GM-RD-MH-35	983.13	219.9	0.027	8		0.013	44	21.4	-0.5	
GM-RD-SSGM-CO-34	GM-RD-MH-35	983.13	GM-RD-MH-36	979.25	64.8	0.06	8		0.013	46	21.8	-0.5	
GM-RD-SSGM-CO-35	GM-RD-MH-36	979.25	GM-RD-MH-37	973.65	81.8	0.068	8		0.013	47	22.2	-0.5	
GM-RD-SSGM-CO-36	GM-RD-MH-37	973.65	GM-RD-MH-13	973.11	55.4	0.01	8		0.013	49	22.6	-0.5	
GM-RD-SSGM-CO-37	GM-RD-MH-38	1,018.43	GM-RD-MH-30	1,018.26	88.7	0.002	8		0.013	2	6.1	-0.6	
GM-RD-SSGM-CO-38	GM-RD-MH-39	1,073.12	GM-RD-MH-40	1,069.72	58.7	0.058	8		0.013	2	4.2	-0.6	
GM-RD-SSGM-CO-39	GM-RD-MH-40	1,069.72	GM-RD-MH-41	1,067.73	67.4	0.03	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-40	GM-RD-MH-41	1,067.73	GM-RD-MH-42	1,064.52	194.6	0.016	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-41	GM-RD-MH-42	1,064.52	GM-RD-MH-43	1,045.23	230.8	0.084	8		0.013	16	12.7	-0.6	
GM-RD-SSGM-CO-42	GM-RD-MH-43	1,045.23	GM-RD-MH-44	1,036.63	67.3	0.128	8		0.013	18	13.4	-0.6	
GM-RD-SSGM-CO-43	GM-RD-MH-44	1,036.63	GM-RD-MH-45	1,025.54	81.4	0.136	8		0.013	19	14.1	-0.6	
GM-RD-SSGM-CO-44	GM-RD-MH-45	1,025.54	GM-RD-MH-46	1,015.06	80.5	0.13	8		0.013	21	14.7	-0.6	
GM-RD-SSGM-CO-45	GM-RD-MH-46	1,015.06	GM-RD-MH-31	1,006.12	139.9	0.064	8		0.013	23	15.3	-0.6	
GM-RD-SSGM-CO-46	GM-RD-MH-47	1,109.18	GM-RD-MH-48	1,098.20	120	0.091	8		0.013	2	4.2	-0.6	
GM-RD-SSGM-CO-47	GM-RD-MH-48	1,098.20	GM-RD-MH-49	1,084.11	175.3	0.08	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-48	GM-RD-MH-49	1,084.11	GM-RD-MH-50	1,072.16	112.2	0.107	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-49	GM-RD-MH-50	1,072.16	GM-RD-MH-51	1,067.51	71.6	0.065	8		0.013	7	8.5	-0.6	
GM-RD-SSGM-CO-50	GM-RD-MH-51	1,067.51	GM-RD-MH-42	1,064.52	83.4	0.036	8		0.013	9	9.4	-0.6	
GM-RD-SSGM-CO-51	GM-RD-MH-11	928.71	GM-RD-MH-52	932.05	49.2	0.068	12		0.013	46	13	2.5	
GM-RD-SSGM-CO-52	GM-RD-MH-52	932.05	GM-RD-MH-53	942.75	83.4	0.128	8		0.013	44	21.4	10.2	
GM-RD-SSGM-CO-53	GM-RD-MH-53	942.75	GM-RD-MH-54	941.38	109.6	-0.013	8		0.013	42	100	-0.4	
GM-RD-SSGM-CO-54	GM-RD-MH-54	941.38	GM-RD-MH-55	945.93	125.1	0.036	8		0.013	40	20.5	4	
GM-RD-SSGM-CO-55	GM-RD-MH-55	945.93	GM-RD-MH-56	951.31	95.3	0.056	8		0.013	39	20	4.8	
GM-RD-SSGM-CO-56	GM-RD-MH-56	951.31	GM-RD-MH-57	951.46	124.2	0.001	8		0.013	37	30	-0.3	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-RD-SSGM-CO-57	GM-RD-MH-57	951.46	GM-RD-MH-58	954.56	111.1	0.028	8		0.013	35	19	2.6	
GM-RD-SSGM-CO-58	GM-RD-MH-58	954.56	GM-RD-MH-59	955.5	50	0.019	8		0.013	33	18.6	0.4	
GM-RD-SSGM-CO-59	GM-RD-MH-59	955.5	GM-RD-MH-60	956.79	162.2	0.008	8		0.013	32	18.1	0.7	
GM-RD-SSGM-CO-60	GM-RD-MH-60	956.79	GM-RD-MH-61	956.83	60.7	7E-04	8		0.013	30	29.3	-0.4	
GM-RD-SSGM-CO-61	GM-RD-MH-61	956.83	GM-RD-MH-62	959.5	45.9	0.058	8		0.013	28	17	2.1	
GM-RD-SSGM-CO-62	GM-RD-MH-62	959.5	GM-RD-MH-63	965.81	54	0.117	8		0.013	26	16.5	5.8	
GM-RD-SSGM-CO-63	GM-RD-MH-63	965.81	GM-RD-MH-64	974.99	51	0.18	8		0.013	25	15.9	8.6	
GM-RD-SSGM-CO-64	GM-RD-MH-64	974.99	GM-RD-MH-65	980.22	31.5	0.166	8		0.013	23	15.3	4.7	
GM-RD-SSGM-CO-65	GM-RD-MH-65	980.22	GM-RD-MH-66	984.57	48.7	0.089	8		0.013	5	7.3	3.7	
GM-RD-SSGM-CO-66	GM-RD-MH-66	984.57	GM-RD-MH-67	985.09	49	0.011	8		0.013	4	6	-0.1	
GM-RD-SSGM-CO-67	GM-RD-MH-67	985.09	GM-RD-MH-68	986.37	112.9	0.011	8		0.013	2	4.2	0.6	
GM-RD-SSGM-CO-68	GM-RD-MH-65	980.22	GM-RD-MH-69	983.64	29.6	0.116	8		0.013	16	12.7	2.8	
GM-RD-SSGM-CO-69	GM-RD-MH-69	983.64	GM-RD-MH-70	996.1	49.5	0.252	8		0.013	14	12	11.9	
GM-RD-SSGM-CO-70	GM-RD-MH-70	996.1	GM-RD-MH-71	1,022.88	97.9	0.273	8		0.013	12	11.2	26.2	
GM-RD-SSGM-CO-71	GM-RD-MH-71	1,022.88	GM-RD-MH-72	1,021.26	29.9	-0.054	8		0.013	5	100	-0.6	
GM-RD-SSGM-CO-72	GM-RD-MH-72	1,021.26	GM-RD-MH-73	1,021.56	157.3	0.002	8		0.013	4	100	1	
GM-RD-SSGM-CO-73	GM-RD-MH-73	1,021.56	GM-RD-MH-74	1,021.12	97.7	-0.005	8		0.013	2	100	0.7	
GM-RD-SSGM-CO-74	GM-RD-MH-71	1,022.88	GM-RD-MH-75	1,020.90	83.5	-0.024	8		0.013	5	100	-0.6	
GM-RD-SSGM-CO-75	GM-RD-MH-75	1,020.90	GM-RD-MH-76	1,026.26	80.9	0.066	8		0.013	4	6	4.7	
GM-RD-SSGM-CO-76	GM-RD-MH-76	1,026.26	GM-RD-MH-77	1,030.33	30.7	0.133	8		0.013	2	4.2	3.4	
GM-RD-SSGM-CO-77	GM-RD-MH-19	1,065.28	GM-RD-MH-78	1,067.51	67.3	0.033	12		0.013	11	6.2	1.3	
GM-RD-SSGM-CO-78	GM-RD-MH-78	1,067.51	GM-RD-MH-79	1,071.77	88.8	0.048	12		0.013	9	5.7	3.3	
GM-RD-SSGM-CO-79	GM-RD-MH-79	1,071.77	GM-RD-MH-80	1,088.22	247.9	0.066	12		0.013	7	5.1	15.5	
GM-RD-SSGM-CO-80	GM-RD-MH-80	1,088.22	GM-RD-MH-81	1,097.92	142	0.068	12		0.013	5	4.4	8.7	
GM-RD-SSGM-CO-81	MH-GIS-EP_ssMH_2584	1,074.61	GM-RD-MH-82	1,079.02	76.1	0.058	12		0.013	14	7.2	3.5	
GM-RD-SSGM-CO-82	GM-RD-MH-82	1,079.02	GM-RD-MH-83	1,085.84	121	0.056	12		0.013	12	6.7	5.9	
GM-RD-SSGM-CO-83	GM-RD-MH-83	1,085.84	GM-RD-MH-84	1,093.77	148	0.054	12		0.013	11	6.2	7	
GM-RD-SSGM-CO-84	GM-RD-MH-84	1,093.77	GM-RD-MH-85	1,102.24	156.9	0.054	12		0.013	9	5.7	7.5	
GM-RD-SSGM-CO-85	GM-RD-MH-85	1,102.24	GM-RD-MH-86	1,106.41	149.2	0.028	12		0.013	7	5.1	3.2	
GM-RD-SSGM-CO-86	GM-RD-MH-86	1,106.41	GM-RD-MH-87	1,108.92	95.6	0.026	8		0.013	5	7.3	1.9	
GM-RD-SSGM-CO-87	GM-RD-MH-87	1,108.92	GM-RD-MH-88	1,109.78	86.5	0.01	8		0.013	4	6	0.2	
GM-RD-SSGM-CO-88	GM-RD-MH-88	1,109.78	GM-RD-MH-89	1,109.94	125.1	0.001	8		0.013	2	6.8	-0.5	
GM-RD-SSGM-CO-89	MH-GIS-MH-197	1,071.22	GM-RD-MH-90	1,081.74	199.5	0.053	8		0.013	7	8.5	9.9	
GM-RD-SSGM-CO-90	GM-RD-MH-90	1,081.74	GM-RD-MH-91	1,096.59	307.4	0.048	8		0.013	5	7.3	14.2	
GM-RD-SSGM-CO-91	GM-RD-MH-91	1,096.59	GM-RD-MH-92	1,102.46	128.9	0.046	8		0.013	4	6	5.2	
GM-RD-SSGM-CO-92	GM-RD-MH-92	1,102.46	GM-RD-MH-93	1,108.54	143.4	0.042	8		0.013	2	4.2	5.4	
GM-RD-SSGM-CO-93	GM-RD-MH-94	1,108.82	MH-GIS-MH-99	1,100.90	141.1	0.056	8		0.013	7	8.5	-0.6	
GM-RD-SSGM-CO-94	GM-RD-MH-95	1,118.63	GM-RD-MH-94	1,108.82	155.1	0.063	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-95	GM-RD-MH-96	1,123.41	GM-RD-MH-95	1,118.63	101.1	0.047	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-96	GM-RD-MH-97	1,128.94	GM-RD-MH-96	1,123.41	140.5	0.039	8		0.013	2	4.2	-0.6	
GM-RD-SSGM-CO-97	GM-RD-MH-99	978.38	GM-RD-MH-98	985.89	85.6	0.088	8		0.013	1	3.1	6.9	
GM-RD-SSGM-CO-98	GM-RD-MH-100	977.51	GM-RD-MH-99	978.38	95.9	0.009	8		0.013	2	4.4	0.2	
GM-RD-SSGM-CO-99	GM-RD-MH-101	971.18	GM-RD-MH-100	977.51	141.5	0.045	8		0.013	3	5.4	5.7	
GM-RD-SSGM-CO-100	GM-RD-MH-102	968.37	GM-RD-MH-101	971.18	122.5	0.023	8		0.013	4	6.3	2.2	
GM-RD-SSGM-CO-101	GM-RD-MH-103	965.89	GM-RD-MH-102	968.37	138.9	0.018	8		0.013	5	100	2.6	
GM-RD-SSGM-CO-102	GM-RD-MH-104	969.05	GM-RD-MH-103	965.89	103.3	-0.031	8		0.013	6	100	-0.5	
GM-RD-SSGM-CO-103	GM-RD-MH-105	962.62	GM-RD-MH-104	969.05	193.1	0.033	8		0.013	7	8.2	5.8	
GM-RD-SSGM-CO-104	GM-RD-MH-106	958.2	GM-RD-MH-105	962.62	161.8	0.027	8		0.013	8	8.8	3.8	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-RD-SSGM-CO-105	GM-RD-MH-107	961.88	GM-RD-MH-106	958.2	108.8	-0.034	8		0.013	9	100	-0.5	
GM-RD-SSGM-CO-106	GM-RD-MH-108	962.13	GM-RD-MH-107	961.88	36.4	0.007	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-107	GM-RD-MH-109	965.58	GM-RD-MH-108	962.13	43.9	0.079	8		0.013	4	6.3	-0.6	
GM-RD-SSGM-CO-108	GM-RD-MH-110	975.13	GM-RD-MH-109	965.58	64	0.149	8		0.013	3	5.4	-0.6	
GM-RD-SSGM-CO-109	GM-RD-MH-111	977.36	GM-RD-MH-110	975.13	149.8	0.015	8		0.013	2	4.4	-0.6	
GM-RD-SSGM-CO-110	GM-RD-MH-112	977.65	GM-RD-MH-111	977.36	81.3	0.004	8		0.013	1	4	-0.6	
GM-RD-SSGM-CO-113	GM-RD-MH-107	961.88	Hospital PS-WW	958	13.6	0.284	8		0.013	14	12.1	-0.6	
GM-RD-SSGM-CO-114	GM-RD-MH-113	884	PSS12A-WW	871.69	17.5	0.704	8		0.013	20	14.3	-0.6	
GM-RD-SSGM-CO-115	GM-RD-MH-114	884.05	GM-RD-MH-113	884	37.5	0.001	8		0.013	18	20.3	-0.5	
GM-RD-SSGM-CO-116	GM-RD-MH-115	884.22	GM-RD-MH-114	884.05	131.6	0.001	8		0.013	16	19.6	-0.5	
GM-RD-SSGM-CO-117	GM-RD-MH-116	884.37	GM-RD-MH-115	884.22	121.1	0.001	8		0.013	14	18.5	-0.5	
GM-RD-SSGM-CO-118	GM-RD-MH-117	884.76	GM-RD-MH-116	884.37	97.6	0.004	8		0.013	13	13.1	-0.6	
GM-RD-SSGM-CO-119	GM-RD-MH-118	886.88	GM-RD-MH-117	884.76	146.4	0.014	8		0.013	11	10.5	-0.6	
GM-RD-SSGM-CO-120	GM-RD-MH-119	888.51	GM-RD-MH-118	886.88	176.8	0.009	8		0.013	9	9.6	-0.6	
GM-RD-SSGM-CO-121	GM-RD-MH-120	890.76	GM-RD-MH-119	888.51	178.6	0.013	8		0.013	7	8.6	-0.6	
GM-RD-SSGM-CO-122	GM-RD-MH-121	891.95	GM-RD-MH-120	890.76	79.1	0.015	8		0.013	5	7.4	-0.6	
GM-RD-SSGM-CO-123	GM-RD-MH-122	892.48	GM-RD-MH-121	891.95	164.2	0.003	8		0.013	4	7.6	-0.6	
GM-RD-SSGM-CO-124	GM-RD-MH-123	892.86	GM-RD-MH-122	892.48	116.5	0.003	8		0.013	2	5.5	-0.6	
GM-RD-SSGM-CO-125	GM-RD-MH-8	909.76	GM-RD-MH-124	905.29	53.2	-0.084	8		0.013	22	100	-0.4	
GM-RD-SSGM-CO-127	GM-RD-MH-25	1,128.84	GM-RD-MH-125	1,134.00	185.7	0.028	8		0.013	2	4.2	4.5	
GM-RD-SSGM-CO-128	GM-RD-MH-81	1,097.92	GM-RD-MH-126	1,114.04	236.1	0.068	12		0.013	4	3.6	15.2	
GM-RD-SSGM-CO-129	GM-RD-MH-126	1,114.04	GM-RD-MH-127	1,130.57	225.3	0.073	12		0.013	2	2.5	15.6	
GM-RD-SSGM-CO-130	GM-RD-MH-128	1,124.84	MH-GIS-MH-75	1,110.99	148.4	0.093	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-131	GM-RD-MH-129	1,134.00	GM-RD-MH-128	1,124.84	196.7	0.047	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-132	GM-RD-MH-130	1,134.71	GM-RD-MH-129	1,134.00	177.5	0.004	8		0.013	2	5.2	-0.6	
GM-SUR-304	MH-IS-57	425.87	MH-IS-80	422.48	336.3	0.01	10	Ductile Iron	0.013	681	66.3	-0.3	
GM-SUR-5001	MH-IS-271	410.4	MH-SUR-5002	410.5	88.2	-0.001	12	Concrete	0.013	491	81.4	-0.2	
GM-SUR-5002	MH-SUR-5002	410.5	MH-IS-140	409.52	29.8	0.033	12	Concrete	0.013	499.90	44.4	-0.6	

2030 (10-year) with Proposed Improvements - Peak Hour Flow - Wet Well Table

Label	Ground Elevation (ft)	Maximum Elevation (ft)	Initial Elevation (ft)	Minimum Elevation (ft)	Base Elevation (ft)	Flow In (gpm)	Flow Out (gpm)	Net Flow In (gpm)
Hospital PS-WW	968	3.75	1.7	0	958	14	225	-210
IPPS Wetwell	430.65	4	2.5	0	400.65	314	4,852	-4538
KCPSWW	428.11	14	0.6	0	399.5	3,785	9,079	-5294
PS1WW	419.19	7.6	5	0	394.33	1,806	2,066	-259
PS2WW	415.2	4.25	2	0	395.25	78	499	-421
PS3WW	418.23	5.15	2.85	0	401.67	411	756	-345
PS4WW	417.46	4.2	3	0	399.83	132	243	-111
PSBPWW	796.77	9.7	4.5	0	765.5	799	1,039	-240
PSEWW	762.77	6.5	3.5	0	736.5	140	280	-140
PSFWW	721.2	4	2.5	0	704	47	272	-224
PSK3-WW	818.91	7.1	3.1	0	793	101	241	-140
PSLWW	807.37	11.1	5.6	0	777.9	439	493	-54
PSS12A-WW	886.8	4.1	2.1	0	871.69	20	123	-104
Pump Station K2 (Burke St) Wetwell	698.45	6.6	3.1	0	688.45	45	89	-44
Pump Station N6 Wetwell	727.14	4.4	2.9	0	717.14	18	120	-102
Pump Station No. 6 Wetwell	425	4	2	0	415	11	0	11
Pump Station Z (Gala) Wetwell	537.95	7.1	3.5	0	527.95	34	84	-50

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
CO-28	MH-GIS-MH-36	749.5	PSEWW	736.5	15.4	0.847	8	PVC	0.01	84	29.8	-0.5	
CO-30	MH-GIS-MH-77	756.31	PSEWW	736.5	8.8	2.263	8	PVC	0.01	57	24.3	-0.5	
GM-GIS-AC_ssGM_1255	MH-GIS-AC_ssMH_2569	987.01	MH-GIS-RI_ssMH_2320	987.3	60	-0.005	8	PVC	0.01	4	84.4	-0.1	
GM-GIS-AC_ssGM_1266	MH-GIS-AC_ssMH_2570	966.73	MH-GIS-CR_ssMH_2321	968.83	100.7	-0.021	8	PVC	0.01	77	100	1.8	
GM-GIS-AC_ssGM_1419	MH-GIS-AC_ssMH_2543	957.94	MH-GIS-AC_ssMH_2522	961.45	68	0.052	8	PVC	0.01	5	59.5	3.2	
GM-GIS-AC_ssGM_1420	MH-GIS-AC_ssMH_2522	961.45	MH-GIS-AC_ssMH_2530	980.95	400	0.049	8	PVC	0.01	4	6	18.9	
GM-GIS-AC_ssGM_1421	MH-GIS-AC_ssMH_2533	955.84	MH-GIS-AC_ssMH_2521	970.9	260	0.058	8	PVC	0.01	5	7.3	14.4	
GM-GIS-AC_ssGM_1422	MH-GIS-AC_ssMH_2521	970.9	MH-GIS-AC_ssMH_2529	986.8	240	0.066	8	PVC	0.01	4	6	15.3	
GM-GIS-AC_ssGM_1423	MH-GIS-AC_ssMH_2537	990.52	MH-GIS-AC_ssMH_2529	986.8	137.1	0.027	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1424	MH-GIS-AC_ssMH_2539	981.15	MH-GIS-AC_ssMH_2527	977.75	175.8	0.019	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1425	MH-GIS-AC_ssMH_2540	975.33	MH-GIS-AC_ssMH_2544	973.78	90.9	0.017	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1426	MH-GIS-AC_ssMH_2518	963.48	MH-GIS-AC_ssMH_2514	975.79	158.5	0.078	8	PVC	0.01	12	11.2	11.7	
GM-GIS-AC_ssGM_1427	MH-GIS-AC_ssMH_2514	975.79	MH-GIS-AC_ssMH_2534	992.06	244.7	0.066	8	PVC	0.01	5	7.3	15.7	
GM-GIS-AC_ssGM_1428	MH-GIS-AC_ssMH_2569	987.01	MH-GIS-AC_ssMH_2517	987.35	74.8	0.005	8	PVC	0.01	2	33.4	-0.1	
GM-GIS-AC_ssGM_1429	MH-GIS-AC_ssMH_2523	960.92	MH-GIS-AC_ssMH_2524	964.82	121.6	-0.032	8	PVC	0.01	72	100	7.6	
GM-GIS-AC_ssGM_1430	MH-GIS-AC_ssMH_2525	957.38	MH-GIS-AC_ssMH_2535	965.08	175.4	0.044	8	PVC	0.01	33	18.5	7.2	
GM-GIS-AC_ssGM_1431	MH-GIS-AC_ssMH_2535	965.08	MH-GIS-AC_ssMH_2527	977.75	300.5	0.042	8	PVC	0.01	5	7.3	12.1	
GM-GIS-AC_ssGM_1432	MH-GIS-AC_ssMH_2524	964.82	MH-GIS-AC_ssMH_2526	966.2	72.7	-0.019	8	PVC	0.01	74	100	3.7	
GM-GIS-AC_ssGM_1433	MH-GIS-AC_ssMH_2526	966.2	MH-GIS-AC_ssMH_2570	966.73	37.3	-0.014	8	PVC	0.01	75	100	2.3	
GM-GIS-AC_ssGM_1434	MH-GIS-AC_ssMH_2531	960.07	MH-GIS-AC_ssMH_2546	971.34	240.5	0.047	8	PVC	0.01	24	15.8	10.7	
GM-GIS-AC_ssGM_1435	MH-GIS-AC_ssMH_2528	957.15	MH-GIS-AC_ssMH_2525	957.38	35.4	0.006	8	PVC	0.01	35	100	4	
GM-GIS-AC_ssGM_1436	MH-GIS-AC_ssMH_2523	960.92	MH-GIS-AC_ssMH_2532	960.88	126.7	-3E-04	8	PVC	0.01	70	100	5.3	
GM-GIS-AC_ssGM_1437	MH-GIS-AC_ssMH_2532	960.88	MH-GIS-AC_ssMH_2519	957.9	120.4	-0.025	8	PVC	0.01	54	100	5.3	
GM-GIS-AC_ssGM_1438	MH-GIS-AC_ssMH_2519	957.9	MH-GIS-AC_ssMH_2533	955.84	123.8	-0.017	8	PVC	0.01	52	100	5.3	
GM-GIS-AC_ssGM_1439	MH-GIS-AC_ssMH_2520	956.8	MH-GIS-AC_ssMH_2533	955.84	270	0.004	8	PVC	0.01	45	100	4.4	
GM-GIS-AC_ssGM_1440	MH-GIS-AC_ssMH_2515	981.51	MH-GIS-AC_ssMH_2516	977.36	84.2	0.049	8	PVC	0.01	4	6	-0.6	
GM-GIS-AC_ssGM_1441	MH-GIS-AC_ssMH_2518	963.48	MH-GIS-AC_ssMH_2532	960.88	90.8	0.029	8	PVC	0.01	14	100	2.7	
GM-GIS-AC_ssGM_1442	MH-GIS-AC_ssMH_2528	957.15	MH-GIS-AC_ssMH_2520	956.8	244.1	0.001	8	PVC	0.01	37	100	4	
GM-GIS-AC_ssGM_1443	MH-GIS-AC_ssMH_2515	981.51	MH-GIS-AC_ssMH_2536	986.72	122.9	0.042	8	PVC	0.01	2	4.2	4.6	
GM-GIS-AC_ssGM_1444	MH-GIS-AC_ssMH_2538	982.94	MH-GIS-AC_ssMH_2530	980.95	159.3	0.012	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1445	MH-GIS-AC_ssMH_2535	965.08	MH-GIS-AC_ssMH_2531	960.07	276	-0.018	8	PVC	0.01	26	100	-0.5	
GM-GIS-AC_ssGM_1446	MH-GIS-AC_ssMH_2542	992.86	MH-GIS-AC_ssMH_2534	992.06	87.2	0.009	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1447	MH-GIS-AC_ssMH_2516	977.36	MH-GIS-AC_ssMH_2514	975.79	71.6	0.022	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-AC_ssGM_1448	MH-GIS-MH-86	993.66	MH-GIS-AC_ssMH_2534	992.06	54	0.03	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1449	MH-GIS-MH-55	976.71	MH-GIS-AC_ssMH_2527	977.75	37.6	-0.028	8	PVC	0.01	2	100	0.4	
GM-GIS-AC_ssGM_1450	MH-GIS-AC_ssMH_2520	956.8	MH-GIS-AC_ssMH_2543	957.94	32	0.036	8	PVC	0.01	7	100	4.4	
GM-GIS-AC_ssGM_1451	MH-GIS-AC_ssMH_2544	973.78	MH-GIS-AC_ssMH_2545	972.76	41.9	0.024	8	PVC	0.01	4	6	-0.6	
GM-GIS-AC_ssGM_1452	MH-GIS-AC_ssMH_2546	971.34	MH-GIS-AC_ssMH_2545	972.76	53.2	0.027	8	PVC	0.01	23	15.2	0.9	
GM-GIS-AC_ssGM_1453	MH-GIS-AC_ssMH_2547	974.61	MH-GIS-AC_ssMH_2545	972.76	39.9	0.046	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-AC_ssGM_1454	MH-GIS-AC_ssMH_2541	978.1	MH-GIS-AC_ssMH_2547	974.61	162	0.022	8	PVC	0.01	16	12.6	-0.6	
GM-GIS-AC_ssGM_1455	MH-GIS-MH-46	977.43	MH-GIS-AC_ssMH_2541	978.1	30	-0.022	8	PVC	0.01	14	100	0.1	
GM-GIS-AR_ssGM_751	MH-GIS-AR_ssMH_2012	534.92	MH-GIS-AR_ssMH_2015	531.19	92.4	0.04	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AR_ssGM_753	MH-GIS-AR_ssMH_2015	531.19	MH-GIS-AR_ssMH_2017	517.96	169.4	0.078	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-AR_ssGM_754	MH-GIS-AR_ssMH_2014	539.39	MH-GIS-AR_ssMH_2015	531.19	249.8	0.033	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AR_ssGM_755	MH-GIS-AR_ssMH_2013	551.42	MH-GIS-AR_ssMH_2015	531.19	287.7	0.07	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AU_ssGM_218	MH-GIS-AU_ssMH_1599	866.04	MH-GIS-AU_ssMH_1600	851.08	203.6	0.073	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-AU_ssGM_219	MH-GIS-FW_ssMH_1596	871.76	MH-GIS-AU_ssMH_1599	866.04	192.1	0.03	8	PVC	0.01	4	6.1	-0.6	
GM-GIS-AU_ssGM_220	MH-GIS-AU_ssMH_1600	851.08	MH-GIS-DH_ssMH_1601	841.46	194.5	0.049	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-AU_ssGM_367	MH-GIS-AU_ssMH_1767	885.96	MH-GIS-FW_ssMH_1608	884.67	106.1	0.012	8	PVC	0.01	6	7.6	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-AU_ssGM_368	MH-GIS-AU_ssMH_1765	892.62	MH-GIS-AU_ssMH_1766	889	127.1	0.028	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-AU_ssGM_369	MH-GIS-AU_ssMH_1764	894	MH-GIS-AU_ssMH_1765	892.62	263.7	0.005	8	PVC	0.01	2	5	-0.6	
GM-GIS-AU_ssGM_370	MH-GIS-AU_ssMH_1768	892.9	MH-GIS-AU_ssMH_1764	894	127	-0.009	8	PVC	0.01	1	100	0.5	
GM-GIS-AU_ssGM_371	MH-GIS-MH-166	894	MH-GIS-AU_ssMH_1764	894	139.4	0	8	PVC	0.01	1	8.5	-0.6	
GM-GIS-AU_ssGM_372	MH-GIS-MH-191	894	MH-GIS-AU_ssMH_1765	892.62	162.7	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AU_ssGM_373	MH-GIS-AU_ssMH_1766	889	MH-GIS-AU_ssMH_1767	885.96	213.5	0.014	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-AU_ssGM_374	MH-GIS-AU_ssMH_1761	877.23	MH-GIS-AU_ssMH_1760	876.04	130.6	0.009	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-AU_ssGM_375	MH-GIS-AU_ssMH_1762	882.91	MH-GIS-AU_ssMH_1761	877.23	279.6	0.02	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AU_ssGM_376	MH-GIS-AU_ssMH_1760	876.04	MH-GIS-AU_ssMH_1600	851.08	129.2	0.193	8	PVC	0.01	4	6.1	-0.6	
GM-GIS-AU_ssGM_377	MH-GIS-AU_ssMH_1769	889.03	MH-GIS-AU_ssMH_1763	885.95	170	0.018	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-AU_ssGM_378	MH-GIS-AU_ssMH_1763	885.95	MH-GIS-AU_ssMH_1762	882.91	118.2	0.026	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-AU_ssGM_379	MH-GIS-AU_ssMH_1770	856.12	MH-GIS-AU_ssMH_1771	842.97	132.6	0.099	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-AU_ssGM_380	MH-GIS-AU_ssMH_1771	842.97	MH-GIS-DH_ssMH_1773	832.79	221.5	0.046	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AU_ssGM_382	MH-GIS-MH-85	861.23	MH-GIS-AU_ssMH_1770	856.12	52.7	0.097	6	PVC	0.01	1	3.9	-0.5	
GM-GIS-AZ_ssGM_1106	MH-GIS-AZ_ssMH_2479	751.27	MH-GIS-AZ_ssMH_2495	736.45	117	0.127	8	PVC	0.01	14	12	-0.6	
GM-GIS-AZ_ssGM_1107	MH-GIS-AZ_ssMH_2472	826.5	MH-GIS-AZ_ssMH_2471	823.93	56.8	0.045	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-AZ_ssGM_1108	MH-GIS-AZ_ssMH_2474	822.64	MH-GIS-AZ_ssMH_2475	825.15	283.1	-0.009	8	PVC	0.01	11	100	2	
GM-GIS-AZ_ssGM_1109	MH-GIS-AZ_ssMH_2473	822.85	MH-GIS-AZ_ssMH_2474	822.64	39.4	0.005	8	PVC	0.01	9	100	1.8	
GM-GIS-AZ_ssGM_1110	MH-GIS-AZ_ssMH_2475	825.15	MH-GIS-AZ_ssMH_2485	809.69	332.1	0.047	8	PVC	0.01	16	12.6	-0.6	
GM-GIS-AZ_ssGM_1111	MH-GIS-AZ_ssMH_2483	790.7	MH-GIS-AZ_ssMH_2477	788.86	75.8	0.024	8	PVC	0.01	5	7.4	-0.6	
GM-GIS-AZ_ssGM_1112	MH-GIS-AZ_ssMH_2478	770.13	MH-GIS-AZ_ssMH_2479	751.27	144.5	0.13	8	PVC	0.01	10	9.9	-0.6	
GM-GIS-AZ_ssGM_1113	MH-GIS-AZ_ssMH_2480	725.46	MH-GIS-AZ_ssMH_2481	722.02	56.6	0.061	8	PVC	0.01	16	12.9	-0.6	
GM-GIS-AZ_ssGM_1114	MH-GIS-AZ_ssMH_2505	771.4	MH-GIS-AZ_ssMH_2504	770.86	66.9	0.008	8	PVC	0.01	14	11.8	-0.6	
GM-GIS-AZ_ssGM_1115	MH-GIS-AZ_ssMH_2476	814.59	MH-GIS-AZ_ssMH_2477	788.86	314.7	0.082	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1116	MH-GIS-AZ_ssMH_2498	814.65	MH-GIS-AZ_ssMH_2482	806.69	220.5	0.036	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-AZ_ssGM_1117	MH-GIS-AZ_ssMH_2503	748.41	MH-GIS-AZ_ssMH_2488	733.3	174	0.087	8	PVC	0.01	23	15.2	-0.6	
GM-GIS-AZ_ssGM_1118	MH-GIS-AZ_ssMH_2488	733.3	MH-GIS-AZ_ssMH_2486	724.31	122	0.074	8	PVC	0.01	24	15.6	-0.6	
GM-GIS-AZ_ssGM_1119	MH-GIS-AZ_ssMH_2506	777.34	MH-GIS-AZ_ssMH_2505	771.4	145.7	0.041	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-AZ_ssGM_1120	MH-GIS-AZ_ssMH_2482	806.69	MH-GIS-AZ_ssMH_2484	799.77	225.1	0.031	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1121	MH-GIS-AZ_ssMH_2492	802.29	MH-GIS-AZ_ssMH_2483	790.7	192.3	0.06	8	PVC	0.01	4	6.6	-0.6	
GM-GIS-AZ_ssGM_1122	MH-GIS-AZ_ssMH_2489	806.65	MH-IS-18	799.57	257.4	0.028	8	PVC	0.01	68	26.7	-0.5	
GM-GIS-AZ_ssGM_1123	MH-GIS-AZ_ssMH_2471	823.93	MH-GIS-AZ_ssMH_2473	822.85	148	0.007	8	PVC	0.01	7	100	0.7	
GM-GIS-AZ_ssGM_1124	MH-GIS-AZ_ssMH_2477	788.86	MH-GIS-AZ_ssMH_2478	770.13	151.6	0.124	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-AZ_ssGM_1125	MH-GIS-AZ_ssMH_2485	809.69	MH-GIS-AZ_ssMH_2491	807.92	226.7	0.008	8	PVC	0.01	63	25.8	-0.5	
GM-GIS-AZ_ssGM_1126	MH-GIS-AZ_ssMH_2491	807.92	MH-GIS-AZ_ssMH_2489	806.65	193.7	0.007	8	PVC	0.01	65	26.2	-0.5	
GM-GIS-AZ_ssGM_1127	MH-GIS-AZ_ssMH_2481	722.02	MH-GIS-AZ_ssMH_2486	724.31	231.9	-0.01	8	PVC	0.01	17	100	1.8	
GM-GIS-AZ_ssGM_1128	MH-GIS-AZ_ssMH_2507	793.93	MH-GIS-AZ_ssMH_2506	777.34	311.8	0.053	8	PVC	0.01	5	6.8	-0.6	
GM-GIS-AZ_ssGM_1129	MH-GIS-AZ_ssMH_2484	799.77	MH-GIS-AZ_ssMH_2492	802.29	112.1	-0.022	8	PVC	0.01	3	100	1.9	
GM-GIS-AZ_ssGM_1130	MH-GIS-AZ_ssMH_2504	770.86	MH-GIS-AZ_ssMH_2503	748.41	196.1	0.114	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-AZ_ssGM_1131	MH-GIS-AZ_ssMH_2493	760.45	MH-GIS-AZ_ssMH_2479	751.27	163.2	0.056	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-AZ_ssGM_1132	MH-GIS-AZ_ssMH_2494	777.45	MH-GIS-AZ_ssMH_2493	760.45	193.7	0.088	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1133	MH-GIS-AZ_ssMH_2495	736.45	MH-GIS-AZ_ssMH_2480	725.46	123.1	0.089	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-AZ_ssGM_1134	MH-GIS-AZ_ssMH_2496	827.6	MH-GIS-AZ_ssMH_2475	825.15	82	0.03	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1135	MH-GIS-AZ_ssMH_2497	817.01	MH-GIS-AZ_ssMH_2476	814.59	110.9	0.022	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-AZ_ssGM_1136	MH-GIS-AZ_ssMH_2499	783.08	MH-GIS-AZ_ssMH_2494	777.45	94.7	0.059	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-AZ_ssGM_1137	MH-GIS-AZ_ssMH_2486	724.31	MH-GIS-AZ_ssMH_2500	713.38	121.3	0.09	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-AZ_ssGM_1138	MH-GIS-AZ_ssMH_2500	713.38	MH-GIS-AZ_ssMH_2487	707.6	37.2	0.155	8	PVC	0.01	43	21.2	-0.5	
GM-GIS-AZ_ssGM_1139	MH-GIS-AZ_ssMH_2487	707.6	MH-GIS-AZ_ssMH_2502	691.99	195.9	0.08	8	PVC	0.01	44	21.5	-0.5	
GM-GIS-AZ_ssGM_1140	MH-GIS-AZ_ssMH_2502	691.99	ump Station K2 (Burke St) Wetw	688.45	7.8	0.453	8	PVC	0.01	45	21.7	-0.5	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-AZ_ssGM_1417	MH-GIS-AZ_ssMH_2501	832.13	MH-GIS-AZ_ssMH_2472	826.5	177.9	0.032	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-BA_ssGM_622	MH-GIS-BR_ssMH_1261	547.04	MH-GIS-BR_ssMH_1256	547.29	34.7	-0.007	8	Glass	0.013	29	63.9	-0.2	
GM-GIS-BA_ssGM_623	MH-GIS-BR_ssMH_1258	534.86	MH-GIS-BR_ssMH_1257	532.52	21.3	0.11	8	Glass	0.013	32	18.1	-0.5	
GM-GIS-BA_ssGM_624	MH-GIS-BR_ssMH_1257	532.52	Pump Station Z (Gala) Wetwell	527.95	6.8	0.676	8	Glass	0.013	34	18.6	-0.5	
GM-GIS-BA_ssGM_625	MH-GIS-BR_ssMH_1262	543.07	MH-GIS-BR_ssMH_1261	547.04	112.7	-0.035	8	Glass	0.013	27	100	3.7	
GM-GIS-BA_ssGM_626	MH-GIS-BR_ssMH_1258	534.86	MH-GIS-BR_ssMH_1256	547.29	123.7	0.1	8	Glass	0.013	30	17.7	11.9	
GM-GIS-BA_ssGM_627	MH-GIS-BR_ssMH_1275	560.87	MH-GIS-BR_ssMH_1274	553.5	109.5	0.067	8	Glass	0.013	3	5.8	-0.6	
GM-GIS-BA_ssGM_628	MH-GIS-BR_ssMH_1260	564	MH-GIS-BR_ssMH_1275	560.87	106.8	0.029	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-BA_ssGM_629	MH-GIS-BR_ssMH_1259	564	MH-GIS-BR_ssMH_1263	564	153.3	0	8	Glass	0.013	2	12.9	-0.6	
GM-GIS-BA_ssGM_630	MH-GIS-BR_ssMH_1269	551.44	MH-GIS-BR_ssMH_1265	548.23	68.3	0.047	8	Glass	0.013	8	100	1.1	
GM-GIS-BA_ssGM_631	MH-GIS-BR_ssMH_1265	548.23	MH-GIS-BR_ssMH_1264	547.25	116.7	0.008	8	Glass	0.013	10	100	4.4	
GM-GIS-BA_ssGM_632	MH-GIS-BR_ssMH_1264	547.25	MH-GIS-BR_ssMH_1266	552.11	140.5	-0.035	8	Glass	0.013	12	100	10.2	
GM-GIS-BA_ssGM_633	MH-GIS-BR_ssMH_1266	552.11	MH-GIS-BR_ssMH_1267	559.23	115.6	-0.062	8	Glass	0.013	13	100	7.7	
GM-GIS-BA_ssGM_634	MH-GIS-BR_ssMH_1267	559.23	MH-GIS-BR_ssMH_1268	560.34	122.1	-0.009	8	Glass	0.013	15	100	0.6	
GM-GIS-BA_ssGM_635	MH-GIS-BR_ssMH_1268	560.34	MH-GIS-BR_ssMH_1272	557.8	102.3	0.025	8	Glass	0.013	17	13.1	-0.6	
GM-GIS-BA_ssGM_636	MH-GIS-BR_ssMH_1270	552.27	MH-GIS-BR_ssMH_1269	551.44	328	0.003	8	Glass	0.013	7	100	0.3	
GM-GIS-BA_ssGM_637	MH-GIS-BR_ssMH_1263	564	MH-GIS-BR_ssMH_1271	563.3	116.1	0.006	8	Glass	0.013	3	6.4	-0.6	
GM-GIS-BA_ssGM_638	MH-GIS-BR_ssMH_1271	563.3	MH-GIS-BR_ssMH_1272	557.8	111.4	0.049	8	Glass	0.013	5	7.1	-0.6	
GM-GIS-BA_ssGM_639	MH-GIS-BR_ssMH_1272	557.8	MH-GIS-BR_ssMH_1273	544	227.8	0.061	8	Glass	0.013	23	15.6	-0.6	
GM-GIS-BA_ssGM_640	MH-GIS-BR_ssMH_1273	544	MH-GIS-BR_ssMH_1262	543.07	92.4	0.01	8	Glass	0.013	25	100	2.8	
GM-GIS-BA_ssGM_641	MH-GIS-BR_ssMH_1274	553.5	MH-GIS-BR_ssMH_1270	552.27	52.5	0.023	8	Glass	0.013	5	7.1	-0.6	
GM-GIS-BA_ssGM_646	MH-GIS-BA_ssMH_1930	789.51	MH-GIS-BA_ssMH_1942	788.17	202.8	0.007	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_647	MH-GIS-BA_ssMH_1919	830.9	MH-GIS-BA_ssMH_1923	831.44	93.5	-0.006	8	PVC	0.01	1	88.3	-0.1	
GM-GIS-BA_ssGM_648	MH-GIS-BA_ssMH_1925	830.88	MH-GIS-BA_ssMH_1924	830.07	46.9	0.017	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-BA_ssGM_649	MH-GIS-BA_ssMH_1926	768.21	MH-GIS-BA_ssMH_1927	766.81	90.4	0.015	8	PVC	0.01	54	23.6	-0.5	
GM-GIS-BA_ssGM_650	MH-GIS-BA_ssMH_1924	830.07	MH-GIS-BA_ssMH_1933	829.47	40.8	0.015	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-BA_ssGM_651	MH-GIS-BA_ssMH_1936	844	MH-GIS-BA_ssMH_1929	839.27	124	0.038	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-BA_ssGM_652	MH-GIS-BA_ssMH_1928	769.11	MH-GIS-BA_ssMH_1926	768.21	59.2	0.015	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-BA_ssGM_653	MH-GIS-BA_ssMH_1931	809	MH-GIS-BA_ssMH_1940	804.21	206.8	0.023	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_654	MH-GIS-BA_ssMH_1941	821.69	MH-GIS-BA_ssMH_1939	818.4	207.3	0.016	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_655	MH-GIS-BA_ssMH_1932	824.81	MH-GIS-BA_ssMH_1939	818.4	116.8	0.055	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-BA_ssGM_656	MH-GIS-BA_ssMH_1938	828.53	MH-GIS-BA_ssMH_1932	824.81	83.3	0.045	8	PVC	0.01	20	14.2	-0.6	
GM-GIS-BA_ssGM_657	MH-GIS-BA_ssMH_1921	829	MH-GIS-BA_ssMH_1933	829.47	61.7	-0.008	8	PVC	0.01	1	80.3	-0.1	
GM-GIS-BA_ssGM_658	MH-GIS-BA_ssMH_1933	829.47	MH-GIS-BA_ssMH_1934	829	90.8	0.005	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-BA_ssGM_659	MH-GIS-BA_ssMH_1920	830.84	MH-GIS-BA_ssMH_1925	830.88	59.2	-7E-04	8	PVC	0.01	1	14.2	-0.6	
GM-GIS-BA_ssGM_660	MH-GIS-BA_ssMH_1918	843.65	MH-GIS-BA_ssMH_1922	842.94	39.7	0.018	8	PVC	0.01	1	65.2	-0.2	
GM-GIS-BA_ssGM_661	MH-GIS-BA_ssMH_1922	842.94	MH-GIS-BA_ssMH_1935	843.62	53.1	-0.013	8	PVC	0.01	3	100	0.5	
GM-GIS-BA_ssGM_662	MH-GIS-BA_ssMH_1940	804.21	MH-GIS-BA_ssMH_1942	788.17	247.1	0.065	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-BA_ssGM_663	MH-GIS-BA_ssMH_1939	818.4	MH-GIS-BA_ssMH_1940	804.21	255.2	0.056	8	PVC	0.01	24	15.6	-0.6	
GM-GIS-BA_ssGM_664	MH-GIS-BA_ssMH_1937	832.81	MH-GIS-BA_ssMH_1938	828.53	82.4	0.052	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-BA_ssGM_665	MH-GIS-BA_ssMH_1934	829	MH-GIS-BA_ssMH_1938	828.53	113.6	0.004	8	PVC	0.01	11	10.5	-0.6	
GM-GIS-BA_ssGM_666	MH-GIS-BA_ssMH_1935	843.62	MH-GIS-BA_ssMH_1936	844	104.4	-0.004	8	PVC	0.01	4	69.7	-0.2	
GM-GIS-BA_ssGM_667	MH-GIS-BA_ssMH_1929	839.27	MH-GIS-BA_ssMH_1937	832.81	135.3	0.048	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-BA_ssGM_668	MH-GIS-BA_ssMH_1923	831.44	MH-GIS-BA_ssMH_1925	830.88	44.1	0.013	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-BA_ssGM_669	MH-GIS-BA_ssMH_1942	788.17	MH-GIS-BA_ssMH_1943	785.61	60.7	0.042	8	PVC	0.01	29	17.3	-0.6	
GM-GIS-BA_ssGM_670	MH-GIS-BA_ssMH_1943	785.61	MH-GIS-BA_ssMH_1944	781.15	85.3	0.052	8	PVC	0.01	30	17.7	-0.5	
GM-GIS-BA_ssGM_671	MH-GIS-BA_ssMH_1944	781.15	MH-GIS-BA_ssMH_1945	769.62	120.7	0.096	8	PVC	0.01	32	18.1	-0.5	
GM-GIS-BA_ssGM_672	MH-GIS-BA_ssMH_1927	766.81	MH-GIS-BA_ssMH_1284	764.62	108.8	0.02	8	PVC	0.01	55	23.9	-0.5	
GM-GIS-BA_ssGM_673	MH-GIS-BA_ssMH_1945	769.62	MH-GIS-BA_ssMH_1928	769.11	70.6	0.007	8	PVC	0.01	51	23.1	-0.5	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-BP_ssGM_2	MH-GIS-BP_ssMH_1535	839.22	MH-GIS-BP_ssMH_1536	840.96	86.2	-0.02	8	PVC	0.01	3	100	1.1	
GM-GIS-BP_ssGM_3	MH-GIS-BP_ssMH_1536	840.96	MH-IS-53	830.15	89	0.122	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-BP_ssGM_4	MH-GIS-BP_ssMH_1534	855.03	MH-GIS-BP_ssMH_1535	839.22	259.3	0.061	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_5	MH-GIS-BP_ssMH_1537	828.7	MH-GIS-BP_ssMH_1538	830.07	85	-0.016	8	PVC	0.01	1	100	0.8	
GM-GIS-BP_ssGM_6	MH-GIS-BP_ssMH_1539	828.73	MH-GIS-BP_ssMH_1540	825.06	130.9	0.028	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_7	MH-GIS-BP_ssMH_1540	825.06	MH-IS-49	804.65	232	0.088	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_340	MH-GIS-BP_ssMH_1753	780.94	MH-IS-198	779.52	38.9	0.037	8	Ductile Iron	0.013	721	88.2	-0.1	
GM-GIS-BP_ssGM_341	MH-GIS-BP_ssMH_1538	830.07	MH-IS-58	819.51	38	0.278	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_342	MH-GIS-BP_ssMH_1737	845.7	MH-GIS-BP_ssMH_1738	838.64	302.4	0.023	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_345	MH-GIS-BP_ssMH_1741	809	MH-IS-50	797.44	95.4	0.121	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_347	MH-GIS-MH-44	791.82	MH-IS-MH-210	778.16	30	0.456	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_357(1)	MH-GIS-BP_ssMH_1738	838.64	MH-GIS-MH-90	835.24	264	0.013	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-BP_ssGM_357(2)	MH-GIS-MH-90	835.24	MH-IS-MH-5	825.27	73.1	0.136	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-BP_ssGM_359	MH-GIS-BP_ssMH_1755	801.95	MH-GIS-BP_ssMH_1758	796.09	160.6	0.036	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_360	MH-GIS-BP_ssMH_1754	788.61	MH-GIS-BP_ssMH_1753	780.94	210	0.037	8	Ductile Iron	0.013	720	88.1	-0.1	
GM-GIS-BP_ssGM_361	MH-GIS-BP_ssMH_1756	807.02	MH-GIS-BP_ssMH_1755	801.95	251.4	0.02	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_362	MH-GIS-BP_ssMH_1757	792.54	MH-GIS-BP_ssMH_1754	788.61	107.5	0.037	8	PVC	0.01	719	88.1	-0.1	
GM-GIS-BP_ssGM_363	MH-GIS-BP_ssMH_1758	796.09	MH-GIS-BP_ssMH_1757	792.54	146.8	0.024	8	PVC	0.01	717	88	-0.1	
GM-GIS-BP_ssGM_571	MH-GIS-MH-113	877.1	MH-IS-123	863.89	73.8	0.179	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_572	MH-GIS-MH-171	870.05	MH-IS-123	863.89	147.4	0.042	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_1083	MH-GIS-MH-89	836.77	MH-GIS-MH-90	835.24	56.1	0.027	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-BP_ssGM_1084	MH-GIS-BP_ssMH_2211	840.99	MH-GIS-MH-162	839	182.5	0.011	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_1085	MH-GIS-MH-162	839	MH-GIS-BP_ssMH_2210	838.36	135.2	0.005	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-BP_ssGM_1086	MH-GIS-BP_ssMH_2210	838.36	MH-GIS-BP_ssMH_2209	838.39	119.5	-3E-04	8	PVC	0.01	2	15.8	-0.6	
GM-GIS-BP_ssGM_1087	MH-GIS-BP_ssMH_2209	838.39	MH-GIS-MH-89	836.77	47.3	0.034	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-BP_ssGM_1283	MH-GIS-BP_ssMH_2352	835.22	MH-GIS-BP_ssMH_2354	825.07	150.8	0.067	8	PVC	0.01	283	56.1	-0.3	
GM-GIS-BP_ssGM_1284	MH-GIS-BP_ssMH_2354	825.07	MH-GIS-BP_ssMH_2353	824.9	43.2	0.004	8	PVC	0.01	622	100	0.1	
GM-GIS-BP_ssGM_1298	MH-GIS-BP_ssMH_2362	814.43	MH-GIS-BP_ssMH_2361	808.69	309	0.019	8	PVC	0.01	710	87.7	-0.1	
GM-GIS-BP_ssGM_1299	MH-GIS-BP_ssMH_2353	824.9	MH-GIS-BP_ssMH_2362	814.43	168	0.062	8	PVC	0.01	708	87.6	-0.1	
GM-GIS-BP_ssGM_1300	MH-GIS-BP_ssMH_2361	808.69	MH-GIS-BP_ssMH_2363	800.67	342.5	0.023	8	PVC	0.01	712	87.8	-0.1	
GM-GIS-BP_ssGM_1301	MH-GIS-BP_ssMH_2363	800.67	MH-GIS-BP_ssMH_1758	796.09	385.8	0.012	8	PVC	0.01	714	87.8	-0.1	
GM-GIS-BP_ssGM_1458	MH-GIS-MH-70	809.18	MH-GIS-BP_ssMH_1741	809	44.2	0.004	8	PVC	0.01	1	4	-0.6	
GM-GIS-CO-22	MH-GIS-DY_ssMH_2561	721.57	Pump Station N6 Wetwell	717.14	10.7	0.415	8	Glass	0.013	18	13.6	-0.6	
GM-GIS-CO-126	MH-IS-GS_ssMH_1480	408.77	MH-IS-193	407.54	235	0.005	10	Concrete	0.013	256	41.5	-0.5	SM4
GM-GIS-CO_ssGM_109	MH-GIS-CO_ssMH_1372	904.88	MH-GIS-CO_ssMH_1428	902.68	138.3	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_110	MH-GIS-CO_ssMH_1428	902.68	MH-GIS-CO_ssMH_1427	902.11	85.1	0.007	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_111	MH-GIS-CO_ssMH_1371	905.28	MH-GIS-CO_ssMH_1427	902.11	193.4	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_113	MH-GIS-CO_ssMH_1426	899	MH-GIS-CO_ssMH_1419	896.39	127.3	0.021	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_114	MH-GIS-CO_ssMH_1425	904.06	MH-GIS-CO_ssMH_1426	899	134.1	0.038	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_115	MH-GIS-CO_ssMH_1423	887.13	MH-GIS-CO_ssMH_1424	884.92	121.8	0.018	8	PVC	0.01	33	18.6	-0.5	
GM-GIS-CO_ssGM_116	MH-GIS-CO_ssMH_1422	891.5	MH-GIS-CO_ssMH_1423	887.13	123.9	0.035	8	PVC	0.01	31	17.9	-0.5	
GM-GIS-CO_ssGM_117	MH-GIS-CO_ssMH_1429	894	MH-GIS-CO_ssMH_1422	891.5	153	0.016	8	PVC	0.01	29	17.3	-0.6	
GM-GIS-CO_ssGM_118	MH-GIS-CO_ssMH_1421	894	MH-GIS-CO_ssMH_1429	894	82.7	0	8	PVC	0.01	18	25.9	-0.5	
GM-GIS-CO_ssGM_119	MH-GIS-CO_ssMH_1420	896.71	MH-GIS-CO_ssMH_1421	894	96.8	0.028	8	PVC	0.01	16	12.6	-0.6	
GM-GIS-CO_ssGM_120	MH-GIS-CO_ssMH_1419	896.39	MH-GIS-CO_ssMH_1420	896.71	68.2	-0.005	8	PVC	0.01	13	66.8	-0.2	
GM-GIS-CO_ssGM_121	MH-GIS-CO_ssMH_1418	899.03	MH-GIS-CO_ssMH_1419	896.39	177	0.015	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-CO_ssGM_122	MH-GIS-CO_ssMH_1417	899.91	MH-GIS-CO_ssMH_1418	899.03	45.7	0.019	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_123	MH-GIS-CO_ssMH_1416	902.07	MH-GIS-CO_ssMH_1417	899.91	129.1	0.017	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_157	MH-GIS-CO_ssMH_1395	851.41	MH-GIS-SC_ssMH_1409	837.73	140.2	0.098	8	PVC	0.01	38	19.8	-0.5	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CO_ssGM_161	MH-GIS-CO_ssMH_1427	902.11	MH-GIS-CO_ssMH_1429	894	234.2	0.035	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-CO_ssGM_170	MH-GIS-CO_ssMH_1424	884.92	MH-GIS-CO_ssMH_1395	851.41	229.8	0.146	8	PVC	0.01	36	19.2	-0.5	
GM-GIS-CO_ssGM_453	MH-GIS-CO_ssMH_1820	903.4	MH-GIS-CO_ssMH_1831	899	138.2	0.032	8	Ductile Iron	0.013	7	8.2	-0.6	
GM-GIS-CO_ssGM_454	MH-GIS-CO_ssMH_1821	909	MH-GIS-CO_ssMH_1820	903.4	227.7	0.025	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-CO_ssGM_455	MH-GIS-CO_ssMH_1822	900.21	MH-GIS-CO_ssMH_1831	899	115.9	0.01	8	Ductile Iron	0.013	12	11.2	-0.6	
GM-GIS-CO_ssGM_456	MH-GIS-CO_ssMH_1830	902.92	MH-GIS-CO_ssMH_1822	900.21	132	0.021	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-CO_ssGM_457	MH-GIS-CO_ssMH_1823	899	MH-GIS-CO_ssMH_1829	901.61	169.9	-0.015	8	PVC	0.01	1	100	3.4	
GM-GIS-CO_ssGM_458	MH-GIS-CO_ssMH_1824	905.92	MH-GIS-CO_ssMH_1832	907.32	89	-0.016	8	PVC	0.01	2	100	0.8	
GM-GIS-CO_ssGM_459	MH-GIS-CO_ssMH_1825	905.89	MH-GIS-CO_ssMH_1830	902.92	282	0.011	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-CO_ssGM_460	MH-GIS-CO_ssMH_1832	907.32	MH-GIS-CO_ssMH_1825	905.89	145.1	0.01	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-CO_ssGM_461	MH-GIS-CO_ssMH_1826	901.33	MH-GIS-CO_ssMH_1827	901.05	166.8	0.002	8	PVC	0.01	1	100	1	
GM-GIS-CO_ssGM_462	MH-GIS-CO_ssMH_1836	902.92	MH-GIS-CO_ssMH_1828	901.53	175.2	0.008	8	PVC	0.01	3	16.3	-0.6	
GM-GIS-CO_ssGM_463	MH-GIS-MH-163	905.76	MH-GIS-CO_ssMH_1827	901.05	138	0.034	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-CO_ssGM_464	MH-GIS-CO_ssMH_1828	901.53	MH-GIS-CO_ssMH_1829	901.61	126.4	-6E-04	8	PVC	0.01	5	100	0.8	
GM-GIS-CO_ssGM_465	MH-GIS-MH-169	904.03	MH-GIS-CO_ssMH_1828	901.53	147	0.017	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-CO_ssGM_466	MH-GIS-CO_ssMH_1829	901.61	MH-GIS-CO_ssMH_1830	902.92	210.1	-0.006	8	PVC	0.01	7	100	0.8	
GM-GIS-CO_ssGM_467	MH-GIS-CO_ssMH_1831	899	MH-IS-69	876.77	261.2	0.085	8	Ductile Iron	0.013	20	14.3	-0.6	
GM-GIS-CO_ssGM_468	MH-GIS-MH-182	905.23	MH-GIS-CO_ssMH_1833	907.18	156.4	-0.012	8	PVC	0.01	1	100	1.5	
GM-GIS-CO_ssGM_469	MH-GIS-CO_ssMH_1835	909	MH-GIS-CO_ssMH_1821	909	149.3	0	8	PVC	0.01	1	9.1	-0.6	
GM-GIS-CO_ssGM_470	MH-GIS-CO_ssMH_1834	908.47	MH-GIS-CO_ssMH_1818	908.92	68.1	-0.007	8	PVC	0.01	2	95.5	0	
GM-GIS-CO_ssGM_471	MH-GIS-MH-192	905.9	MH-GIS-CO_ssMH_1834	908.47	163.1	-0.016	8	PVC	0.01	1	100	2.5	
GM-GIS-CO_ssGM_472	MH-GIS-CO_ssMH_1833	907.18	MH-GIS-CO_ssMH_1824	905.92	93.4	0.013	8	PVC	0.01	2	31.6	-0.5	
GM-GIS-CO_ssGM_473	MH-GIS-CO_ssMH_1827	901.05	MH-GIS-CO_ssMH_1836	902.92	42	-0.045	8	PVC	0.01	2	100	1.3	
GM-GIS-CO_ssGM_1050	MH-GIS-CO_ssMH_1819	909	MH-GIS-CO_ssMH_1821	909	93.9	0	8	PVC	0.01	4	15.2	-0.6	
GM-GIS-CO_ssGM_1051	MH-GIS-CO_ssMH_1818	908.92	MH-GIS-CO_ssMH_1819	909	146.6	-6E-04	8	PVC	0.01	3	28	-0.5	
GM-GIS-CO_ssGM_1052	MH-GIS-CO_ssMH_1817	909	MH-GIS-CO_ssMH_1818	908.92	112.5	7E-04	8	PVC	0.01	1	16	-0.6	
GM-GIS-CR_ssGM_1194	MH-GIS-DP_ssMH_2281	901.58	MH-GIS-DP_ssMH_2302	898.53	183.1	0.017	8	PVC	0.01	322	59.9	-0.3	
GM-GIS-CR_ssGM_1250	MH-GIS-CR_ssMH_2568	970.75	MH-GIS-CR_ssMH_2321	968.83	67	0.029	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-CR_ssGM_1251	MH-GIS-MH-167	916.76	MH-GIS-DP_ssMH_2281	901.58	141.9	0.107	8	PVC	0.01	320	59.8	-0.3	
GM-GIS-CR_ssGM_1252	MH-GIS-DP_ssMH_2328	919	MH-GIS-MH-167	916.76	57.8	0.039	8	PVC	0.01	318	59.6	-0.3	
GM-GIS-CR_ssGM_1254	MH-GIS-CR_ssMH_2323	955.99	MH-GIS-CR_ssMH_2330	955.7	161.5	0.002	8	PVC	0.01	248	69.5	-0.2	
GM-GIS-CR_ssGM_1256	MH-GIS-CR_ssMH_2331	979.07	MH-GIS-CR_ssMH_2321	968.83	146.8	0.07	8	PVC	0.01	157	41.2	-0.4	
GM-GIS-CR_ssGM_1258	MH-GIS-CR_ssMH_2321	968.83	MH-GIS-CR_ssMH_2332	960.9	145.9	0.054	8	PVC	0.01	243	51.7	-0.3	
GM-GIS-CR_ssGM_1259	MH-GIS-CR_ssMH_2332	960.9	MH-GIS-CR_ssMH_2333	955.94	143.9	0.034	8	PVC	0.01	244	51.9	-0.3	
GM-GIS-CR_ssGM_1260	MH-GIS-CR_ssMH_2333	955.94	MH-GIS-CR_ssMH_2323	955.99	126.1	-4E-04	8	PVC	0.01	246	100	0	
GM-GIS-CR_ssGM_1261	MH-GIS-DP_ssMH_2335	934.79	MH-GIS-DP_ssMH_2336	925.87	60.5	0.147	8	PVC	0.01	315	59.2	-0.3	
GM-GIS-CR_ssGM_1262	MH-GIS-DP_ssMH_2336	925.87	MH-GIS-DP_ssMH_2328	919	152.7	0.045	8	PVC	0.01	316	59.4	-0.3	
GM-GIS-CR_ssGM_1263	MH-GIS-CR_ssMH_2334	943.18	MH-GIS-DP_ssMH_2335	934.79	90.3	0.093	8	PVC	0.01	313	59.1	-0.3	
GM-GIS-CR_ssGM_1267	MH-GIS-CR_ssMH_2337	958.27	MH-GIS-CR_ssMH_2338	941.9	203	0.081	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-CR_ssGM_1268	MH-GIS-CR_ssMH_2379	970.91	MH-GIS-CR_ssMH_2337	958.27	101.6	0.124	8	PVC	0.01	46	21.8	-0.5	
GM-GIS-CR_ssGM_1269	MH-GIS-CR_ssMH_2338	941.9	MH-GIS-CR_ssMH_2339	940.05	67.1	0.028	8	PVC	0.01	58	100	1	
GM-GIS-CR_ssGM_1270	MH-GIS-CR_ssMH_2339	940.05	MH-GIS-CR_ssMH_2334	943.18	174.8	-0.018	8	PVC	0.01	60	100	2.9	
GM-GIS-CR_ssGM_1271	MH-GIS-CR_ssMH_2330	955.7	MH-GIS-CR_ssMH_2340	948.55	204.8	0.035	8	PVC	0.01	250	52.5	-0.3	
GM-GIS-CR_ssGM_1272	MH-GIS-CR_ssMH_2340	948.55	MH-GIS-CR_ssMH_2334	943.18	94.8	0.057	8	PVC	0.01	251	52.7	-0.3	
GM-GIS-CR_ssGM_1877	MH-GIS-CR_ssMH_2978	979.6	MH-GIS-CR_ssMH_2568	970.75	77	0.115	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CR_ssGM_1878	MH-GIS-CR_ssMH_2979	986.08	MH-GIS-CR_ssMH_2978	979.6	75.6	0.086	8	PVC	0.01	4	6	-0.6	
GM-GIS-CR_ssGM_1879	MH-GIS-CR_ssMH_2980	990.89	MH-GIS-CR_ssMH_2979	986.08	75.7	0.064	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-CR_ssGM_1880	MH-GIS-CR_ssMH_2990	959.4	MH-GIS-CR_ssMH_2337	958.27	55.5	0.02	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-CR_ssGM_1881	MH-GIS-CR_ssMH_2981	978.58	MH-GIS-CR_ssMH_2990	959.4	249.3	0.077	8	PVC	0.01	7	8.5	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CR_ssGM_1882	MH-GIS-CR_ssMH_2984	988.74	MH-GIS-CR_ssMH_2982	983.25	226.8	0.024	8	PVC	0.01	4	6	-0.6	
GM-GIS-CR_ssGM_1883	MH-GIS-CR_ssMH_2982	983.25	MH-GIS-CR_ssMH_2981	978.58	126.4	0.037	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CR_ssGM_1884	MH-GIS-CR_ssMH_2983	991.74	MH-GIS-CR_ssMH_2984	988.74	86.3	0.035	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-CT_ssGM_8	MH-GIS-CT_ssMH_1278	749.62	MH-GIS-MH-36	749.5	23.3	0.005	8	PVC	0.01	83	29.5	-0.5	
GM-GIS-CT_ssGM_9	MH-GIS-MH-93	762.41	MH-GIS-CT_ssMH_1293	750.54	60.1	0.198	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_10	MH-GIS-CT_ssMH_1293	750.54	MH-GIS-CT_ssMH_1277	750.19	56	0.006	8	PVC	0.01	80	29	-0.5	
GM-GIS-CT_ssGM_11	MH-GIS-CT_ssMH_1277	750.19	MH-GIS-CT_ssMH_1278	749.62	46.1	0.012	8	PVC	0.01	81	29.3	-0.5	
GM-GIS-CT_ssGM_12	MH-GIS-CT_ssMH_1291	754.92	MH-GIS-CT_ssMH_1276	754.24	87.6	0.008	8	PVC	0.01	67	26.4	-0.5	
GM-GIS-CT_ssGM_13	MH-GIS-CT_ssMH_1276	754.24	MH-GIS-CT_ssMH_1294	752.33	82.1	0.023	8	PVC	0.01	68	26.7	-0.5	
GM-GIS-CT_ssGM_14	MH-GIS-CT_ssMH_1286	762.24	MH-GIS-CT_ssMH_1287	761.05	151.9	0.008	8	PVC	0.01	59	24.8	-0.5	
GM-GIS-CT_ssGM_15	MH-GIS-MH-116	765.96	MH-GIS-CT_ssMH_1290	756.86	76.6	0.119	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_16	MH-GIS-CT_ssMH_1280	764	MH-GIS-CT_ssMH_1279	763.04	73.8	0.013	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CT_ssGM_17	MH-GIS-CT_ssMH_1283	769	MH-GIS-CT_ssMH_1282	767.57	230.3	0.006	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_18	MH-GIS-BA_ssMH_1284	764.62	MH-GIS-CT_ssMH_1285	762.94	157.8	0.011	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-CT_ssGM_19	MH-GIS-CT_ssMH_1290	756.86	MH-GIS-CT_ssMH_1291	754.92	253.1	0.008	8	PVC	0.01	65	26.2	-0.5	
GM-GIS-CT_ssGM_20	MH-GIS-CT_ssMH_1292	751.73	MH-GIS-CT_ssMH_1293	750.54	197.8	0.006	8	PVC	0.01	77	28.5	-0.5	
GM-GIS-CT_ssGM_21	MH-GIS-CT_ssMH_1294	752.33	MH-GIS-CT_ssMH_1292	751.73	108.9	0.006	8	PVC	0.01	76	28.3	-0.5	
GM-GIS-CT_ssGM_22	MH-GIS-CT_ssMH_1289	758.1	MH-GIS-CT_ssMH_1290	756.86	167.8	0.007	8	PVC	0.01	63	25.7	-0.5	
GM-GIS-CT_ssGM_23	MH-GIS-CT_ssMH_1288	760.29	MH-GIS-CT_ssMH_1289	758.1	295.1	0.007	8	PVC	0.01	61	25.4	-0.5	
GM-GIS-CT_ssGM_24	MH-GIS-CT_ssMH_1287	761.05	MH-GIS-CT_ssMH_1288	760.29	80	0.01	8	PVC	0.01	60	25.1	-0.5	
GM-GIS-CT_ssGM_25	MH-GIS-CT_ssMH_1285	762.94	MH-GIS-CT_ssMH_1286	762.24	72.1	0.01	8	PVC	0.01	57	24.5	-0.5	
GM-GIS-CT_ssGM_26	MH-GIS-CT_ssMH_1282	767.57	MH-GIS-CT_ssMH_1281	766.46	218.9	0.005	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-CT_ssGM_27	MH-GIS-CT_ssMH_1279	763.04	MH-GIS-CT_ssMH_1294	752.33	59.9	0.179	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-CT_ssGM_28	MH-GIS-CT_ssMH_1281	766.46	MH-GIS-CT_ssMH_1280	764	307.2	0.008	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-CT_ssGM_246	MH-GIS-CT_ssMH_1692	756.63	MH-GIS-MH-77	756.31	49.4	0.006	8	PVC	0.01	55	24	-0.5	
GM-GIS-CT_ssGM_247	MH-GIS-CT_ssMH_1693	768.42	MH-GIS-CT_ssMH_1692	756.63	202.7	0.058	8	PVC	0.01	54	23.7	-0.5	
GM-GIS-CT_ssGM_248	MH-GIS-GC_ssMH_1622	773.42	MH-GIS-CT_ssMH_1693	768.42	112.9	0.044	8	Ductile Iron	0.013	53	23.4	-0.5	
GM-GIS-CV_ssGM_201	MH-GIS-CV_ssMH_1587	788.2	MH-GIS-CV_ssMH_1586	779.6	113.2	0.076	8	PVC	0.01	25	16	-0.6	
GM-GIS-CV_ssGM_202	MH-GIS-CV_ssMH_1586	779.6	MH-GIS-CV_ssMH_1585	771.51	125.8	0.064	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-CV_ssGM_203	MH-GIS-CV_ssMH_1585	771.51	MH-GIS-CV_ssMH_1584	767.13	180.4	0.024	8	PVC	0.01	28	100	1	
GM-GIS-CV_ssGM_204	MH-GIS-CV_ssMH_1584	767.13	MH-GIS-GC_ssMH_1590	769.6	299	-0.008	8	PVC	0.01	29	100	5.8	
GM-GIS-CV_ssGM_211	MH-GIS-GC_ssMH_1588	794	MH-GIS-CV_ssMH_1587	788.2	176.7	0.033	8	PVC	0.01	24	15.6	-0.6	
GM-GIS-CV_ssGM_212	MH-GIS-CV_ssMH_1598	859.22	MH-GIS-CV_ssMH_1597	850.39	107.1	0.082	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_242	MH-GIS-CV_ssMH_1625	716.37	PSFWW	704	24.3	0.509	8	PVC	0.01	47	22.2	-0.5	
GM-GIS-CV_ssGM_495	MH-GIS-MH-100	732.8	MH-GIS-CV_ssMH_1698	728.76	63.2	0.064	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_496	MH-GIS-CV_ssMH_1699	725.63	MH-GIS-CV_ssMH_1698	728.76	107.6	-0.029	8	PVC	0.01	42	100	2.7	
GM-GIS-CV_ssGM_497	MH-GIS-CV_ssMH_1700	727.16	MH-GIS-CV_ssMH_1699	725.63	103.1	0.015	8	PVC	0.01	41	100	1.2	
GM-GIS-CV_ssGM_498	MH-GIS-CV_ssMH_1701	730.39	MH-GIS-CV_ssMH_1700	727.16	103.7	0.031	8	PVC	0.01	39	20.2	-0.5	
GM-GIS-CV_ssGM_499	MH-GIS-CV_ssMH_1703	742.7	MH-GIS-CV_ssMH_1701	730.39	195.6	0.063	8	PVC	0.01	38	19.9	-0.5	
GM-GIS-CV_ssGM_500	MH-GIS-CV_ssMH_1702	749	MH-GIS-CV_ssMH_1703	742.7	156.5	0.04	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-CV_ssGM_501	MH-GIS-MH-121	752.94	MH-GIS-CV_ssMH_1702	749	81.1	0.049	6	PVC	0.01	1	5.2	-0.5	
GM-GIS-CV_ssGM_502	MH-GIS-CV_ssMH_1705	756.4	MH-GIS-CV_ssMH_1703	742.7	194.6	0.07	8	PVC	0.01	34	18.8	-0.5	
GM-GIS-CV_ssGM_503	MH-GIS-CV_ssMH_1706	767.27	MH-GIS-CV_ssMH_1705	756.4	173.7	0.063	8	Ductile Iron	0.013	33	18.4	-0.5	
GM-GIS-CV_ssGM_504	MH-GIS-CV_ssMH_1707	771.95	MH-GIS-CV_ssMH_1706	767.27	87.8	0.053	8	Ductile Iron	0.013	32	18	-0.5	
GM-GIS-CV_ssGM_505	MH-GIS-CV_ssMH_1704	775.43	MH-GIS-CV_ssMH_1707	771.95	104.4	0.033	8	Ductile Iron	0.013	22	15.1	-0.6	
GM-GIS-CV_ssGM_506	MH-GIS-CV_ssMH_1708	782.07	MH-GIS-CV_ssMH_1704	775.43	102.6	0.065	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-CV_ssGM_507	MH-GIS-CV_ssMH_1711	787.91	MH-GIS-CV_ssMH_1708	782.07	102.2	0.057	8	PVC	0.01	20	14.2	-0.6	
GM-GIS-CV_ssGM_508	MH-GIS-CV_ssMH_1712	795.98	MH-GIS-CV_ssMH_1711	787.91	120.3	0.067	8	Ductile Iron	0.013	18	13.7	-0.6	
GM-GIS-CV_ssGM_509	MH-GIS-CV_ssMH_1715	794	MH-GIS-CV_ssMH_1712	795.98	101.7	-0.019	8	PVC	0.01	4	100	1.4	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CV_ssGM_510	MH-GIS-CV_ssMH_1717	794	MH-GIS-CV_ssMH_1715	794	54.3	0	8	PVC	0.01	3	100	1.4	
GM-GIS-CV_ssGM_511	MH-GIS-CV_ssMH_1718	803.09	MH-GIS-CV_ssMH_1717	794	134.8	0.067	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_512	MH-GIS-CV_ssMH_1721	804.66	MH-GIS-CV_ssMH_1720	794.25	68.3	0.152	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-CV_ssGM_513	MH-GIS-CV_ssMH_1709	772.62	MH-GIS-CV_ssMH_1707	771.95	70.4	0.01	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_514	MH-GIS-CV_ssMH_1720	794.25	MH-GIS-CV_ssMH_1719	779	182.9	0.083	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-CV_ssGM_515	MH-GIS-CV_ssMH_1719	779	MH-GIS-CV_ssMH_1710	774	207.8	0.024	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CV_ssGM_516	MH-GIS-CV_ssMH_1710	774	MH-GIS-CV_ssMH_1709	772.62	179.2	0.008	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-CV_ssGM_517	MH-GIS-CV_ssMH_1731	826.6	MH-GIS-CV_ssMH_1729	831.01	260.2	-0.017	8	Ductile Iron	0.013	4	100	3.9	
GM-GIS-CV_ssGM_518	MH-GIS-MH-128	831.4	MH-GIS-CV_ssMH_1732	827.91	86.2	0.04	8	Ductile Iron	0.013	1	3.6	-0.6	
GM-GIS-CV_ssGM_519	MH-GIS-CV_ssMH_1728	825.39	MH-GIS-GC_ssMH_1591	822.34	141.2	0.022	8	Ductile Iron	0.013	9	9.6	-0.6	
GM-GIS-CV_ssGM_520	MH-GIS-CV_ssMH_1727	827.49	MH-GIS-CV_ssMH_1728	825.39	235.2	0.009	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_521	MH-GIS-CV_ssMH_1726	828.67	MH-GIS-CV_ssMH_1727	827.49	192.3	0.006	8	Ductile Iron	0.013	7	8.7	-0.6	
GM-GIS-CV_ssGM_522	MH-GIS-CV_ssMH_1725	824	MH-GIS-CV_ssMH_1726	828.67	189.6	-0.025	8	Ductile Iron	0.013	5	100	4.1	
GM-GIS-CV_ssGM_523	MH-GIS-CV_ssMH_1724	830.43	MH-GIS-CV_ssMH_1725	824	159.8	0.04	8	Ductile Iron	0.013	4	6.3	-0.6	
GM-GIS-CV_ssGM_524	MH-GIS-CV_ssMH_1723	837.84	MH-GIS-CV_ssMH_1724	830.43	357.5	0.021	8	Ductile Iron	0.013	3	5.2	-0.6	
GM-GIS-CV_ssGM_525	MH-GIS-CV_ssMH_1730	842.76	MH-GIS-CV_ssMH_1723	837.84	248.5	0.02	8	Ductile Iron	0.013	1	3.6	-0.6	
GM-GIS-CV_ssGM_526	MH-GIS-CV_ssMH_1732	827.91	MH-GIS-CV_ssMH_1731	826.6	95.1	0.014	8	Ductile Iron	0.013	3	100	2.5	
GM-GIS-CV_ssGM_527	MH-GIS-MH-139	808.6	MH-GIS-CV_ssMH_1721	804.66	100.2	0.039	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_528	MH-GIS-CV_ssMH_1597	850.39	MH-GIS-CV_ssMH_1729	831.01	193.6	0.1	8	Ductile Iron	0.013	3	5.2	-0.6	
GM-GIS-CV_ssGM_529	MH-GIS-CV_ssMH_1697	722.01	MH-GIS-CV_ssMH_1625	716.37	75.2	0.075	8	PVC	0.01	46	21.9	-0.5	
GM-GIS-CV_ssGM_530	MH-GIS-CV_ssMH_1698	728.76	MH-GIS-CV_ssMH_1697	722.01	216.6	0.031	8	PVC	0.01	45	21.5	-0.5	
GM-GIS-CV_ssGM_1043	MH-GIS-CV_ssMH_1722	826.36	MH-GIS-CV_ssMH_1716	812.89	206.2	0.065	8	Ductile Iron	0.013	9	9.6	-0.6	
GM-GIS-CV_ssGM_1044	MH-GIS-CV_ssMH_1729	831.01	MH-GIS-CV_ssMH_1722	826.36	250.8	0.019	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_1045	MH-GIS-CV_ssMH_1714	807.44	MH-GIS-CV_ssMH_1713	802.34	86.6	0.059	8	PVC	0.01	12	11	-0.6	
GM-GIS-CV_ssGM_1046	MH-GIS-CV_ssMH_1713	802.34	MH-GIS-CV_ssMH_1712	795.98	110.1	0.058	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-CV_ssGM_1047	MH-GIS-CV_ssMH_1716	812.89	MH-GIS-CV_ssMH_1714	807.44	87.8	0.062	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-CV_ssGM_1053	MH-GIS-GC_ssMH_1590	769.6	MH-GIS-GC_ssMH_1622	773.42	80	-0.048	8	PVC	0.01	30	100	3.3	
GM-GIS-DH_ssGM_199	MH-GIS-DH_ssMH_1602	809.49	MH-GIS-DH_ssMH_1627	802	228.7	0.033	8	PVC	0.01	19	14	-0.6	
GM-GIS-DH_ssGM_200	MH-GIS-MU_ssMH_1805	809.96	MH-GIS-DH_ssMH_1602	809.49	80.7	0.006	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-DH_ssGM_213	MH-GIS-MH-30	818.72	MH-GIS-DH_ssMH_1621	814.69	19.2	0.21	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_214	MH-GIS-DH_ssMH_1601	841.46	MH-GIS-DH_ssMH_1772	828	136.4	0.099	8	PVC	0.01	28	17	-0.6	
GM-GIS-DH_ssGM_221	MH-GIS-DH_ssMH_1855	841	MH-GIS-DH_ssMH_1601	841.46	130.8	-0.004	8	PVC	0.01	18	92	-0.1	
GM-GIS-DH_ssGM_243	MH-GIS-DH_ssMH_1627	801.7	PSK3-WW	801.5	54.7	0.004	10	PVC	0.01	68	20.1	-0.7	
GM-GIS-DH_ssGM_244	MH-GIS-DH_ssMH_1772	828	MH-GIS-DH_ssMH_1621	814.69	112.1	0.119	8	PVC	0.01	32	18.1	-0.5	
GM-GIS-DH_ssGM_245	MH-GIS-DH_ssMH_1621	814.69	PSK3-WW	793	133.3	0.163	8	PVC	0.01	33	18.5	-0.5	
GM-GIS-DH_ssGM_264	MH-GIS-DH_ssMH_1643	907.41	MH-GIS-DH_ssMH_1642	904	206	0.017	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-DH_ssGM_265	MH-GIS-DH_ssMH_1631	907.59	MH-GIS-DH_ssMH_1633	902.33	166.9	0.032	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-DH_ssGM_266	MH-GIS-DH_ssMH_1630	907.74	MH-GIS-DH_ssMH_1631	907.59	187.5	8E-04	8	PVC	0.01	2	7.8	-0.6	
GM-GIS-DH_ssGM_267	MH-GIS-DH_ssMH_1629	909	MH-GIS-DH_ssMH_1630	907.74	107.7	0.012	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_268	MH-GIS-MH-149	912.36	MH-GIS-DH_ssMH_1640	911.41	115.9	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_269	MH-GIS-DH_ssMH_1640	911.41	MH-GIS-DH_ssMH_1641	907.27	320.9	0.013	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_270	MH-GIS-DH_ssMH_1650	912.29	MH-GIS-DH_ssMH_1644	908.13	203.6	0.02	8	PVC	0.01	7	8.7	-0.6	
GM-GIS-DH_ssGM_271	MH-GIS-DH_ssMH_1633	902.33	MH-GIS-DH_ssMH_1634	900.81	32.8	0.046	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-DH_ssGM_272	MH-GIS-MH-193	912.64	MH-GIS-DH_ssMH_1632	903.43	164.7	0.056	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_273	MH-GIS-DH_ssMH_1645	916.73	MH-GIS-DH_ssMH_1646	917.3	159.3	-0.004	8	PVC	0.01	1	100	0.5	
GM-GIS-DH_ssGM_274	MH-GIS-DH_ssMH_1646	917.3	MH-GIS-DH_ssMH_1647	917.68	140.8	-0.003	8	PVC	0.01	2	87.1	-0.1	
GM-GIS-DH_ssGM_275	MH-GIS-DH_ssMH_1647	917.68	MH-GIS-DH_ssMH_1648	917.81	84.7	-0.002	8	PVC	0.01	2	30.1	-0.5	
GM-GIS-DH_ssGM_276	MH-GIS-DH_ssMH_1648	917.81	MH-GIS-DH_ssMH_1649	914	274.8	0.014	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-DH_ssGM_277	MH-GIS-DH_ssMH_1651	917.06	MH-GIS-DH_ssMH_1650	912.29	201.9	0.024	8	PVC	0.01	2	5	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DH_ssGM_278	MH-GIS-DH_ssMH_1652	919	MH-GIS-DH_ssMH_1651	917.06	205.7	0.009	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_279	MH-GIS-DH_ssMH_1653	919	MH-GIS-DH_ssMH_1652	919	268.8	0	8	PVC	0.01	1	9.7	-0.6	
GM-GIS-DH_ssGM_280	MH-GIS-DH_ssMH_1635	884.99	MH-GIS-DH_ssMH_1636	887.23	38.1	-0.059	8	PVC	0.01	7	100	7	
GM-GIS-DH_ssGM_281	MH-GIS-DH_ssMH_1634	900.81	MH-GIS-DH_ssMH_1635	884.99	141.7	0.112	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-DH_ssGM_282	MH-GIS-DH_ssMH_1636	887.23	MH-GIS-DH_ssMH_1637	888.71	122.6	-0.012	8	PVC	0.01	8	100	4.8	
GM-GIS-DH_ssGM_283	MH-GIS-DH_ssMH_1637	888.71	MH-GIS-DH_ssMH_1638	888.98	222	-0.001	8	PVC	0.01	9	100	3.3	
GM-GIS-DH_ssGM_284	MH-GIS-DH_ssMH_1638	888.98	MH-GIS-DH_ssMH_1639	892.53	204.7	-0.017	8	PVC	0.01	10	100	3	
GM-GIS-DH_ssGM_285	MH-GIS-DH_ssMH_1639	892.53	MH-GIS-DH_ssMH_1310	888.97	106.7	0.033	8	PVC	0.01	11	10.5	-0.6	
GM-GIS-DH_ssGM_286	MH-GIS-DH_ssMH_1633	902.33	MH-GIS-DH_ssMH_1632	903.43	21.1	0.052	8	PVC	0.01	2	4.1	0.5	
GM-GIS-DH_ssGM_287	MH-GIS-MH-148	911.26	MH-GIS-DH_ssMH_1629	909	114.6	0.02	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_288	MH-GIS-DH_ssMH_1641	907.27	MH-GIS-DH_ssMH_1643	907.41	221.6	-6E-04	8	PVC	0.01	2	33.1	-0.4	
GM-GIS-DH_ssGM_289	MH-GIS-DH_ssMH_1649	914	MH-GIS-DH_ssMH_1650	912.29	85.4	0.02	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-DH_ssGM_290	MH-GIS-DH_ssMH_1644	908.13	MH-GIS-DH_ssMH_1643	907.41	104.9	0.007	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-DH_ssGM_381	MH-GIS-DH_ssMH_1773	832.79	MH-GIS-DH_ssMH_1772	828	28.2	0.17	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-DH_ssGM_383	MH-GIS-DH_ssMH_1796	867.52	MH-GIS-DH_ssMH_1775	858.76	181.9	0.048	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_384	MH-GIS-DH_ssMH_1775	858.76	MH-GIS-DH_ssMH_1795	855.63	126.9	0.025	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_385	MH-GIS-DH_ssMH_1795	855.63	MH-GIS-DH_ssMH_1777	854	91.2	0.018	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_386	MH-GIS-DH_ssMH_1777	854	MH-GIS-DH_ssMH_1776	854	98.8	0	8	PVC	0.01	3	23.5	-0.5	
GM-GIS-DH_ssGM_387	MH-GIS-DH_ssMH_1776	854	MH-GIS-DH_ssMH_1774	854	94.5	0	8	PVC	0.01	4	23.3	-0.5	
GM-GIS-DH_ssGM_388	MH-GIS-DH_ssMH_1774	854	MH-GIS-DH_ssMH_1794	854.06	44.9	-0.001	8	PVC	0.01	4	23	-0.5	
GM-GIS-DH_ssGM_389	MH-GIS-DH_ssMH_1778	857.96	MH-GIS-DH_ssMH_1794	854.06	158.5	0.025	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_390	MH-GIS-DH_ssMH_1782	858.36	MH-GIS-DH_ssMH_1778	857.96	122.3	0.003	8	PVC	0.01	1	4.4	-0.6	
GM-GIS-DH_ssGM_391	MH-GIS-DH_ssMH_1780	878.22	MH-GIS-DH_ssMH_1779	874.82	183.8	0.018	8	PVC	0.01	8	9	-0.6	
GM-GIS-DH_ssGM_392	MH-GIS-DH_ssMH_1784	879	MH-GIS-DH_ssMH_1780	878.22	103.4	0.008	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-DH_ssGM_393	MH-GIS-DH_ssMH_1781	875.18	MH-GIS-DH_ssMH_1780	878.22	126	-0.024	8	PVC	0.01	2	100	2.4	
GM-GIS-DH_ssGM_394	MH-GIS-DH_ssMH_1788	874	MH-GIS-DH_ssMH_1781	875.18	101.8	-0.012	8	PVC	0.01	1	100	3.6	
GM-GIS-DH_ssGM_395	MH-GIS-DH_ssMH_1779	874.82	MH-GIS-DH_ssMH_1783	862.01	106.7	0.12	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-DH_ssGM_396	MH-GIS-DH_ssMH_1783	862.01	MH-GIS-DH_ssMH_1794	854.06	159.3	0.05	8	PVC	0.01	10	9.8	-0.6	
GM-GIS-DH_ssGM_397	MH-GIS-DH_ssMH_1786	902.52	MH-GIS-DH_ssMH_1785	896.55	131	0.046	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_398	MH-GIS-DH_ssMH_1785	896.55	MH-GIS-DH_ssMH_1784	879	213.2	0.082	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_399	MH-GIS-DH_ssMH_1787	912.62	MH-GIS-DH_ssMH_1786	902.52	116.9	0.086	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_400	MH-GIS-DH_ssMH_1790	872.4	MH-GIS-DH_ssMH_1788	874	77.4	-0.021	8	PVC	0.01	1	100	5.2	
GM-GIS-DH_ssGM_401	MH-GIS-DH_ssMH_1789	879	MH-GIS-DH_ssMH_1780	878.22	160.3	0.005	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-DH_ssGM_402	MH-GIS-DH_ssMH_1791	880.21	MH-GIS-DH_ssMH_1789	879	193.5	0.006	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_403	MH-GIS-DH_ssMH_1792	888.54	MH-GIS-DH_ssMH_1791	880.21	144.5	0.058	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_404	MH-GIS-DH_ssMH_1793	860.37	MH-GIS-DH_ssMH_1782	858.36	108.8	0.018	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_405	MH-GIS-DH_ssMH_1794	854.06	MH-GIS-DH_ssMH_1854	847.07	184	0.038	8	PVC	0.01	17	13.1	-0.6	
GM-GIS-DH_ssGM_478	MH-GIS-DH_ssMH_1840	904.51	MH-GIS-DH_ssMH_1841	902.08	121.4	0.02	8	PVC	0.01	17	13	-0.6	
GM-GIS-DH_ssGM_479	MH-GIS-DH_ssMH_1642	904	MH-GIS-DH_ssMH_1840	904.51	90.7	-0.006	8	PVC	0.01	12	95	0	
GM-GIS-DH_ssGM_482	MH-GIS-DH_ssMH_1845	914	MH-GIS-DH_ssMH_1844	908.63	274.7	0.02	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_483	MH-GIS-DH_ssMH_1844	908.63	MH-GIS-DH_ssMH_1843	905.71	251.5	0.012	8	PVC	0.01	2	5	-0.6	
GM-GIS-DH_ssGM_484	MH-GIS-DH_ssMH_1843	905.71	MH-GIS-DH_ssMH_1840	904.51	277.1	0.004	8	PVC	0.01	3	6.1	-0.6	
GM-GIS-DH_ssGM_485	MH-GIS-DH_ssMH_1846	915.61	MH-GIS-DH_ssMH_1845	914	277.6	0.006	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_494	MH-GIS-DH_ssMH_1854	847.07	MH-GIS-DH_ssMH_1855	841	218.6	0.028	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1141	MH-GIS-DP_ssMH_2226	886.37	MH-GIS-DP_ssMH_2225	875.46	339.3	0.032	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1142	MH-GIS-DP_ssMH_2232	854.82	MH-GIS-DP_ssMH_2231	852.15	45.5	0.059	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-DP_ssGM_1143	MH-GIS-DP_ssMH_2235	900.74	MH-GIS-DP_ssMH_2234	891.07	142.3	0.068	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1144	MH-GIS-DP_ssMH_2234	891.07	MH-GIS-MH-81	886.96	62.1	0.066	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1145	MH-GIS-DP_ssMH_2236	854	MH-GIS-DP_ssMH_2227	854	78.9	0	8	PVC	0.01	9	100	5.3	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1146	MH-GIS-DP_ssMH_2237	884.29	MH-GIS-DP_ssMH_2271	886.47	90.5	-0.024	8	PVC	0.01	2	100	1.6	
GM-GIS-DP_ssGM_1147	MH-GIS-DP_ssMH_2271	886.47	MH-GIS-DP_ssMH_2226	886.37	51.9	0.002	8	PVC	0.01	4	7.5	-0.6	
GM-GIS-DP_ssGM_1148	MH-GIS-DP_ssMH_2267	857.19	MH-GIS-DP_ssMH_2262	860.27	79.6	-0.039	8	PVC	0.01	14	100	8.4	
GM-GIS-DP_ssGM_1149	MH-GIS-DP_ssMH_2238	873.56	MH-GIS-DP_ssMH_2263	872.16	41.6	0.034	8	PVC	0.01	4	39.5	-0.4	
GM-GIS-DP_ssGM_1150	MH-GIS-DP_ssMH_2231	852.15	MH-GIS-MH-32	848.68	70.2	0.049	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-DP_ssGM_1151	MH-GIS-DP_ssMH_2265	857.32	MH-GIS-DP_ssMH_2230	832.03	264.5	0.096	8	PVC	0.01	334	61.1	-0.3	
GM-GIS-DP_ssGM_1152	MH-GIS-DP_ssMH_2270	872.05	MH-GIS-DP_ssMH_2228	859.78	247.7	0.05	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1153(1)	MH-GIS-DP_ssMH_2239	840	MH-GIS-DP_ssMH_2572	839	113.7	0.009	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-DP_ssGM_1153(2)	MH-GIS-DP_ssMH_2572	839	MH-GIS-DP_ssMH_2351	839	25.5	0	8	PVC	0.01	21	86.6	-0.1	
GM-GIS-DP_ssGM_1154	MH-GIS-DP_ssMH_2230	832.03	MH-GIS-DP_ssMH_2573	826.42	113.2	0.05	8	PVC	0.01	336	61.3	-0.3	
GM-GIS-DP_ssGM_1154(1)	MH-GIS-DP_ssMH_2573	826.42	MH-GIS-BP_ssMH_2354	825.07	25	0.054	8	PVC	0.01	337	61.5	-0.3	
GM-GIS-DP_ssGM_1155	MH-GIS-DP_ssMH_2240	826.56	MH-GIS-DP_ssMH_2574	824.46	144.6	0.015	8	PVC	0.01	26	16.5	-0.6	
GM-GIS-DP_ssGM_1156	MH-GIS-DP_ssMH_2243	857.36	MH-GIS-DP_ssMH_2239	840	212.3	0.082	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1157	MH-GIS-DP_ssMH_2241	896.36	MH-GIS-DP_ssMH_2242	889.46	115.1	0.06	8	PVC	0.01	325	60.3	-0.3	
GM-GIS-DP_ssGM_1158	MH-GIS-MH-48	881.7	MH-GIS-DP_ssMH_2244	879.62	32.6	0.064	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-DP_ssGM_1159	MH-GIS-DP_ssMH_2244	879.62	MH-GIS-DP_ssMH_2246	862.14	195.4	0.089	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1160	MH-GIS-DP_ssMH_2251	866.38	MH-GIS-DP_ssMH_2250	853.91	149.5	0.083	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-DP_ssGM_1161	MH-GIS-DP_ssMH_2250	853.91	MH-GIS-DP_ssMH_2249	853.17	59.9	0.012	8	PVC	0.01	26	100	4.6	
GM-GIS-DP_ssGM_1162	MH-GIS-MH-26	894.4	MH-GIS-DP_ssMH_2253	893.86	15	0.036	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-DP_ssGM_1163	MH-GIS-DP_ssMH_2253	893.86	MH-GIS-DP_ssMH_2252	878.79	161.1	0.094	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-DP_ssGM_1164	MH-GIS-DP_ssMH_2252	878.79	MH-GIS-DP_ssMH_2251	866.38	138.5	0.09	8	PVC	0.01	23	15.3	-0.6	
GM-GIS-DP_ssGM_1165	MH-GIS-DP_ssMH_2248	853.14	MH-GIS-DP_ssMH_2247	853.34	85	-0.002	8	PVC	0.01	30	100	5.5	
GM-GIS-DP_ssGM_1166	MH-GIS-DP_ssMH_2249	853.17	MH-GIS-DP_ssMH_2248	853.14	63.8	5E-04	8	PVC	0.01	28	100	5.3	
GM-GIS-DP_ssGM_1167	MH-GIS-DP_ssMH_2233	901.08	MH-GIS-MH-132	897.42	98	0.037	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-DP_ssGM_1168	MH-GIS-DP_ssMH_2257	903.51	MH-GIS-DP_ssMH_2233	901.08	84.4	0.029	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-DP_ssGM_1169	MH-GIS-DP_ssMH_2256	906.73	MH-GIS-DP_ssMH_2257	903.51	96	0.034	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1170	MH-GIS-DP_ssMH_2255	908.98	MH-GIS-DP_ssMH_2256	906.73	136.8	0.016	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1171	MH-GIS-DP_ssMH_2254	912.48	MH-GIS-DP_ssMH_2255	908.98	48.2	0.073	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1172	MH-GIS-DP_ssMH_2258	869	MH-GIS-DP_ssMH_2243	857.36	200.7	0.058	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-DP_ssGM_1173	MH-GIS-DP_ssMH_2259	874.02	MH-GIS-DP_ssMH_2258	869	123.1	0.041	8	PVC	0.01	14	12	-0.6	
GM-GIS-DP_ssGM_1174	MH-GIS-DP_ssMH_2261	899.74	MH-GIS-DP_ssMH_2260	879.52	245.2	0.082	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-DP_ssGM_1175	MH-GIS-DP_ssMH_2260	879.52	MH-GIS-DP_ssMH_2259	874.02	56.4	0.098	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1176	MH-GIS-MH-27	900.33	MH-GIS-DP_ssMH_2261	899.74	17.1	0.035	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-DP_ssGM_1177	MH-GIS-DP_ssMH_2266	855.35	MH-GIS-DP_ssMH_2267	857.19	83.1	-0.022	8	PVC	0.01	12	100	7.2	
GM-GIS-DP_ssGM_1179	MH-GIS-DP_ssMH_2227	854	MH-GIS-DP_ssMH_2266	855.35	130	-0.01	8	PVC	0.01	11	100	6.7	
GM-GIS-DP_ssGM_1180	MH-GIS-DP_ssMH_2268	875.98	MH-GIS-DP_ssMH_2269	875.13	92.9	0.009	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1181	MH-GIS-DP_ssMH_2269	875.13	MH-GIS-DP_ssMH_2270	872.05	54.9	0.056	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1182	MH-GIS-DP_ssMH_2273	871.91	MH-GIS-DP_ssMH_2272	870.72	84.4	0.014	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-DP_ssGM_1183	MH-GIS-DP_ssMH_2274	877.11	MH-GIS-DP_ssMH_2273	871.91	233.8	0.022	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1184	MH-GIS-DP_ssMH_2298	866.27	MH-GIS-DP_ssMH_2232	854.82	205	0.056	8	PVC	0.01	40	20.5	-0.5	
GM-GIS-DP_ssGM_1185	MH-GIS-DP_ssMH_2272	870.72	MH-GIS-DP_ssMH_2298	866.27	77.7	0.057	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1186	MH-GIS-DP_ssMH_2225	875.46	MH-GIS-DP_ssMH_2273	871.91	126.2	0.028	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1187	MH-GIS-DP_ssMH_2275	877.45	MH-GIS-DP_ssMH_2238	873.56	59.9	0.065	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1188	MH-GIS-DP_ssMH_2228	859.78	MH-GIS-DP_ssMH_2236	854	256.6	0.023	8	PVC	0.01	7	33	-0.4	
GM-GIS-DP_ssGM_1189	MH-GIS-DP_ssMH_2277	852.62	MH-GIS-DP_ssMH_2276	849.27	106.1	0.032	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-DP_ssGM_1190	MH-GIS-DP_ssMH_2290	828.38	MH-GIS-DP_ssMH_2240	826.56	70.6	0.026	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-DP_ssGM_1191	MH-GIS-MH-106	902.27	MH-GIS-DP_ssMH_2233	901.08	71.4	0.017	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1192	MH-GIS-MH-135	906.59	MH-GIS-MH-106	902.27	117.5	0.037	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1193	MH-GIS-DP_ssMH_2280	909.09	MH-GIS-MH-135	906.59	99.1	0.025	8	PVC	0.01	2	4.2	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1195	MH-GIS-DP_ssMH_2284	857.2	MH-GIS-DP_ssMH_2282	857.41	123.6	-0.002	8	PVC	0.01	51	69.6	-0.2	
GM-GIS-DP_ssGM_1196	MH-GIS-DP_ssMH_2283	843.58	MH-GIS-MH-38	840.28	35.7	0.093	8	PVC	0.01	54	23.8	-0.5	
GM-GIS-DP_ssGM_1197	MH-GIS-DP_ssMH_2247	853.34	MH-GIS-DP_ssMH_2245	856.11	77.7	-0.036	8	PVC	0.01	32	100	8.1	
GM-GIS-DP_ssGM_1197(1)	MH-GIS-DP_ssMH_2245	856.11	MH-GIS-DP_ssMH_2246	862.14	69.1	-0.087	8	PVC	0.01	33	100	5.6	
GM-GIS-DP_ssGM_1198	MH-GIS-DP_ssMH_2246	862.14	MH-GIS-DP_ssMH_2285	857.88	117.2	0.036	8	PVC	0.01	47	22.2	-0.5	
GM-GIS-DP_ssGM_1199	MH-GIS-DP_ssMH_2285	857.88	MH-GIS-DP_ssMH_2284	857.2	42.8	0.016	8	PVC	0.01	49	22.6	-0.5	
GM-GIS-DP_ssGM_1200	MH-GIS-DP_ssMH_2282	857.41	MH-GIS-DP_ssMH_2283	843.58	131.9	0.105	8	PVC	0.01	53	23.4	-0.5	
GM-GIS-DP_ssGM_1201	MH-GIS-DP_ssMH_2278	868.39	MH-GIS-DP_ssMH_2289	854	258.7	0.056	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-DP_ssGM_1202	MH-GIS-DP_ssMH_2289	854	MH-GIS-DP_ssMH_2277	852.62	88.6	0.016	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1203	MH-GIS-MH-104	874.4	MH-GIS-DP_ssMH_2278	868.39	66.6	0.09	8	PVC	0.01	14	12	-0.6	
GM-GIS-DP_ssGM_1204	MH-GIS-DP_ssMH_2276	849.27	MH-GIS-DP_ssMH_2291	826.74	92.4	0.244	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-DP_ssGM_1205	MH-GIS-DP_ssMH_2291	826.74	MH-GIS-DP_ssMH_2290	828.38	66.6	-0.025	8	PVC	0.01	23	100	1.1	
GM-GIS-DP_ssGM_1206	MH-GIS-DP_ssMH_2294	876.38	MH-GIS-DP_ssMH_2293	847.37	200.4	0.145	8	PVC	0.01	171	43.1	-0.4	
GM-GIS-DP_ssGM_1207	MH-GIS-MH-34	843.8	MH-GIS-DP_ssMH_2292	844.23	23	0.019	8	PVC	0.01	178	44	0.1	
GM-GIS-DP_ssGM_1208	MH-GIS-MH-19	877.92	MH-GIS-DP_ssMH_2294	876.38	10	0.154	8	PVC	0.01	169	42.8	-0.4	
GM-GIS-DP_ssGM_1209	MH-GIS-DP_ssMH_2295	904.7	MH-GIS-MH-52	902.93	37	0.048	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1210	MH-GIS-DP_ssMH_2279	927.21	MH-GIS-DP_ssMH_2254	912.48	208.3	0.071	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1211	MH-GIS-DP_ssMH_2296	867.82	MH-GIS-DP_ssMH_2297	872.58	109.2	-0.044	8	PVC	0.01	23	100	6	
GM-GIS-DP_ssGM_1212	MH-GIS-DP_ssMH_2263	872.16	MH-GIS-DP_ssMH_2296	867.82	94.4	0.046	8	PVC	0.01	5	100	1	
GM-GIS-DP_ssGM_1213	MH-GIS-DP_ssMH_2262	860.27	MH-GIS-DP_ssMH_2296	867.82	155.3	-0.049	8	PVC	0.01	16	100	12.9	
GM-GIS-DP_ssGM_1214	MH-GIS-DP_ssMH_2299	874.3	MH-GIS-DP_ssMH_2298	866.27	247.5	0.032	8	PVC	0.01	26	16.5	-0.6	
GM-GIS-DP_ssGM_1215	MH-GIS-DP_ssMH_2297	872.58	MH-GIS-DP_ssMH_2299	874.3	94.5	-0.018	8	PVC	0.01	25	100	1.2	
GM-GIS-DP_ssGM_1216	MH-GIS-DP_ssMH_2293	847.37	MH-GIS-DP_ssMH_2292	844.23	200	0.016	8	PVC	0.01	176	43.7	-0.4	
GM-GIS-DP_ssGM_1217	MH-GIS-DP_ssMH_2300	849.15	MH-GIS-DP_ssMH_2293	847.37	69.5	0.026	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1218	MH-GIS-DP_ssMH_2300	849.15	MH-GIS-MH-33	853.18	20	0.202	8	PVC	0.01	2	4.2	3.4	
GM-GIS-DP_ssGM_1219	MH-GIS-DP_ssMH_2242	889.46	MH-GIS-DP_ssMH_2301	875.07	181.8	0.079	8	PVC	0.01	327	60.4	-0.3	
GM-GIS-DP_ssGM_1220	MH-GIS-DP_ssMH_2264	864	MH-GIS-DP_ssMH_2265	857.32	144.6	0.046	8	PVC	0.01	332	61	-0.3	
GM-GIS-DP_ssGM_1221	MH-GIS-DP_ssMH_2301	875.07	MH-GIS-DP_ssMH_2229	867.69	99.1	0.074	8	PVC	0.01	329	60.6	-0.3	
GM-GIS-DP_ssGM_1222	MH-GIS-DP_ssMH_2229	867.69	MH-GIS-DP_ssMH_2264	864	111.8	0.033	8	PVC	0.01	330	60.8	-0.3	
GM-GIS-DP_ssGM_1223	MH-GIS-MH-81	886.96	MH-GIS-DP_ssMH_2303	886.09	50	0.017	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1225	MH-GIS-DP_ssMH_2304	893.01	MH-GIS-DP_ssMH_2303	886.09	200.5	0.035	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1226	MH-GIS-DP_ssMH_2308	901.14	MH-GIS-DP_ssMH_2309	902.8	137	-0.012	8	PVC	0.01	5	100	1.1	
GM-GIS-DP_ssGM_1227	MH-GIS-MH-52	902.93	MH-GIS-DP_ssMH_2308	901.14	50	0.036	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1228	MH-GIS-DP_ssMH_2306	886.34	MH-GIS-DP_ssMH_2307	876.14	271.1	0.038	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1229	MH-GIS-DP_ssMH_2303	886.09	MH-GIS-MH-48	881.7	78	0.056	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-DP_ssGM_1230	MH-GIS-MH-132	897.42	MH-GIS-MH-26	894.4	110	0.027	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1231	MH-GIS-DP_ssMH_2309	902.8	MH-GIS-MH-27	900.33	70	0.035	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1232	MH-GIS-DP_ssMH_2302	898.53	MH-GIS-DP_ssMH_2241	896.36	79.8	0.027	8	PVC	0.01	323	60.1	-0.3	
GM-GIS-DP_ssGM_1233	MH-GIS-DP_ssMH_2310	880.97	MH-GIS-MH-50	882.1	35	0.032	8	PVC	0.01	2	4.2	0.5	
GM-GIS-DP_ssGM_1234	MH-GIS-DP_ssMH_2313	874	MH-GIS-DP_ssMH_2312	876.61	124.7	-0.021	8	PVC	0.01	11	100	2.1	
GM-GIS-DP_ssGM_1235	MH-GIS-DP_ssMH_2307	876.14	MH-GIS-DP_ssMH_2313	874	151.3	0.014	8	PVC	0.01	9	90	-0.1	
GM-GIS-DP_ssGM_1236	MH-GIS-DP_ssMH_2312	876.61	MH-GIS-MH-104	874.4	75	0.029	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1237	MH-GIS-DP_ssMH_2310	880.97	MH-GIS-MH-19	877.92	46.6	0.065	8	PVC	0.01	167	42.6	-0.4	
GM-GIS-DP_ssGM_1238	MH-GIS-DP_ssMH_2305	891.12	MH-GIS-DP_ssMH_2314	887.98	54.9	0.057	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1239	MH-GIS-DP_ssMH_2314	887.98	MH-GIS-DP_ssMH_2306	886.34	59.5	0.028	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1240	MH-GIS-DP_ssMH_2311	896.03	MH-GIS-DP_ssMH_2305	891.12	123.7	0.04	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1241	MH-GIS-DP_ssMH_2315	882.04	MH-GIS-DP_ssMH_2310	880.97	126.6	0.008	8	PVC	0.01	164	42.1	-0.4	
GM-GIS-DP_ssGM_1242	MH-GIS-DP_ssMH_2316	889	MH-GIS-DP_ssMH_2315	882.04	400	0.017	8	PVC	0.01	162	41.9	-0.4	
GM-GIS-DP_ssGM_1243	MH-GIS-NJ_ssMH_2565	895.08	MH-GIS-DP_ssMH_2316	889	211	0.029	8	PVC	0.01	160	41.7	-0.4	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1274	MH-GIS-DP_ssMH_2360	836.89	MH-GIS-DP_ssMH_2347	827.82	148.1	0.061	8	PVC	0.01	49	22.6	-0.5	
GM-GIS-DP_ssGM_1275	MH-GIS-MH-173	852.82	MH-GIS-DP_ssMH_2341	849.09	64.9	0.057	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1276	MH-GIS-DP_ssMH_2341	849.09	MH-GIS-DP_ssMH_2348	849	251	4E-04	8	Glass	0.013	7	17.7	-0.5	
GM-GIS-DP_ssGM_1277	MH-GIS-DP_ssMH_2355	840.68	MH-GIS-DP_ssMH_2343	837.64	115	0.026	8	PVC	0.01	192	45.8	-0.4	
GM-GIS-DP_ssGM_1278	MH-GIS-DP_ssMH_2351	839	MH-GIS-DP_ssMH_2344	838.9	112.8	9E-04	8	PVC	0.01	280	86.6	-0.1	
GM-GIS-DP_ssGM_1279	MH-GIS-DP_ssMH_2348	849	MH-GIS-DP_ssMH_2342	844	400	0.013	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-DP_ssGM_1280	MH-GIS-DP_ssMH_2358	834	MH-GIS-DP_ssMH_2349	839	260	-0.019	8	PVC	0.01	255	100	5.6	
GM-GIS-DP_ssGM_1281	MH-GIS-DP_ssMH_2349	839	MH-GIS-DP_ssMH_2351	839	291.8	0	8	PVC	0.01	257	100	0.3	
GM-GIS-DP_ssGM_1282	MH-GIS-DP_ssMH_2344	838.9	MH-GIS-BP_ssMH_2352	835.22	94.5	0.039	8	PVC	0.01	281	55.9	-0.3	
GM-GIS-DP_ssGM_1285	MH-GIS-DP_ssMH_2350	824	MH-GIS-BP_ssMH_2353	824.9	116.1	-0.008	8	PVC	0.01	84	100	0.8	
GM-GIS-DP_ssGM_1286	MH-GIS-DP_ssMH_2345	824	MH-GIS-DP_ssMH_2350	824	119.4	0	8	PVC	0.01	54	100	0.8	
GM-GIS-DP_ssGM_1287	MH-GIS-DP_ssMH_2346	824	MH-GIS-DP_ssMH_2345	824	79.5	0	8	PVC	0.01	53	100	0.8	
GM-GIS-DP_ssGM_1288	MH-GIS-DP_ssMH_2347	827.82	MH-GIS-DP_ssMH_2346	824	139.4	0.027	8	PVC	0.01	51	23.1	-0.5	
GM-GIS-DP_ssGM_1289	MH-GIS-MH-34	843.8	MH-GIS-DP_ssMH_2355	840.68	25	0.125	8	PVC	0.01	180	44.2	-0.4	
GM-GIS-DP_ssGM_1290	MH-GIS-DP_ssMH_2342	844	MH-GIS-DP_ssMH_2355	840.68	71.3	0.047	8	Glass	0.013	11	10.4	-0.6	
GM-GIS-DP_ssGM_1291	MH-GIS-DP_ssMH_2574	824.46	MH-GIS-DP_ssMH_2350	824	25	0.018	8	PVC	0.01	28	100	0.4	
GM-GIS-DP_ssGM_1292	MH-GIS-MH-38	840.28	MH-GIS-DP_ssMH_2343	837.64	25	0.106	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-DP_ssGM_1293	MH-GIS-DP_ssMH_2357	834	MH-GIS-DP_ssMH_2358	834	111.1	0	8	PVC	0.01	253	100	5.5	
GM-GIS-DP_ssGM_1294	MH-GIS-DP_ssMH_2356	834	MH-GIS-DP_ssMH_2357	834	140.9	0	8	PVC	0.01	252	100	5.5	
GM-GIS-DP_ssGM_1295	MH-GIS-DP_ssMH_2343	837.64	MH-GIS-DP_ssMH_2356	834	99.5	0.037	8	PVC	0.01	250	100	1.8	
GM-GIS-DP_ssGM_1296	MH-GIS-MH-32	848.68	MH-GIS-DP_ssMH_2359	847.39	20	0.065	8	PVC	0.01	46	21.8	-0.5	
GM-GIS-DP_ssGM_1297	MH-GIS-DP_ssMH_2359	847.39	MH-GIS-DP_ssMH_2360	836.89	187.4	0.056	8	PVC	0.01	47	22.2	-0.5	
GM-GIS-DT_ssGM_760	MH-GIS-MH-196	418.86	MH-GIS-RW_ssMH_1506	417.71	175	0.007	8	Concrete	0.013	9	9.9	-0.6	SM4
GM-GIS-DT_ssGM_761	MH-GIS-MH-186	419.33	MH-GIS-RW_ssMH_1506	417.71	404.2	0.004	8	Concrete	0.013	18	15.5	-0.6	
GM-GIS-DT_ssGM_762	MH-GIS-MH-185	419.96	MH-GIS-MH-186	419.33	158	0.004	8	Concrete	0.013	9	11.1	-0.6	
GM-GIS-DT_ssGM_763	MH-IS-277	413.81	MH-IS-96	412.74	166.6	0.006	10	Concrete	0.013	36	68.6	-0.3	
GM-GIS-DT_ssGM_770	MH-GIS-DT_ssMH_2022	415.16	MH-GIS-DT_ssMH_2021	414	290.8	0.004	8	Concrete	0.013	9	11.1	-0.6	
GM-GIS-DT_ssGM_771	MH-GIS-DT_ssMH_2021	414	MH-IS-271	410.4	323.6	0.011	8	Concrete	0.013	18	13.5	-0.6	
GM-GIS-DT_ssGM_782	MH-GIS-DT_ssMH_1492	416.47	MH-GIS-DT_ssMH_2026	415.29	296.2	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-DT_ssGM_783	MH-GIS-DT_ssMH_2026	415.29	MH-IS-136	409.7	368.5	0.015	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-DT_ssGM_788	MH-GIS-DT_ssMH_1483	415.09	MH-IS-138	409.59	399.9	0.014	8	Concrete	0.013	3	5.8	-0.6	SM4
GM-GIS-DT_ssGM_791	MH-GIS-RW_ssMH_1485	415.75	MH-IS-139	410.69	189.6	0.027	8	Concrete	0.013	64	25.8	-0.5	
GM-GIS-DT_ssGM_802	MH-GIS-RW_ssMH_1498	414	MH-IS-277	413.81	297	7E-04	8	Glass	0.013	18	57.1	-0.3	
GM-GIS-DT_ssGM_804	MH-GIS-MH-198	414.78	MH-GIS-MH-15	414.08	182.5	0.004	8	Concrete	0.013	3	100	1.9	
GM-GIS-DT_ssGM_805	MH-GIS-DT_ssMH_2029	415.39	MH-IS-139	410.69	316.4	0.015	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-DT_ssGM_806	MH-GIS-MH-168	416.02	MH-GIS-DT_ssMH_2029	415.39	144	0.004	8	Glass	0.013	3	6.9	-0.6	
GM-GIS-DT_ssGM_807	MH-GIS-MH-179	416.76	MH-GIS-DT_ssMH_1472	416.37	150.1	0.003	8	Concrete	0.013	3	45.7	-0.4	
GM-GIS-DT_ssGM_808	MH-GIS-DT_ssMH_2031	412.24	MH-IS-139	410.69	171.5	0.009	8	Concrete	0.013	43	21.2	-0.5	
GM-GIS-DT_ssGM_809	MH-GIS-DT_ssMH_1472	416.37	MH-GIS-DT_ssMH_2030	416.92	184.3	-0.003	8	Concrete	0.013	10	100	0	
GM-GIS-DT_ssGM_810	MH-GIS-DT_ssMH_2030	416.92	MH-GIS-DT_ssMH_2031	412.24	297	0.016	8	Concrete	0.013	13	11.7	-0.6	
GM-GIS-DT_ssGM_813	MH-GIS-RW_ssMH_2034	414	MH-GIS-DT_ssMH_2031	412.24	228.8	0.008	8	Concrete	0.013	27	16.6	-0.6	
GM-GIS-DT_ssGM_920	MH-GIS-DT_ssMH_2107	418.03	MH-GIS-DT_ssMH_1472	416.37	433.8	0.004	8	Concrete	0.013	3	7.1	-0.6	
GM-GIS-DT_ssGM_972	MH-GIS-GS_ssMH_2154	416.74	MH-IS-137	411.83	318.3	0.015	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-DT_ssGM_1011	MH-GIS-RW_ssMH_2095	415.61	MH-IS-140	409.52	115.2	0.053	8	Concrete	0.013	27	16.6	-0.6	
GM-GIS-DT_ssGM_1013	MH-GIS-MH-160	418.62	MH-GIS-RW_ssMH_2094	417.87	130.7	0.006	8	Concrete	0.013	9	10.2	-0.6	
GM-GIS-DT_ssGM_1456	MH-GIS-MH-53	414	MH-IS-192	405.19	64	0.138	15	Concrete	0.013	18	6.1	-1.2	
GM-GIS-DT_ssGM_1457	MH-GIS-MH-54	414	MH-GIS-MH-53	414	37.2	0	15	Concrete	0.013	9	8.6	-1.1	
GM-GIS-DY_ssGM_1459	MH-GIS-DY_ssMH_2562	754	MH-GIS-DY_ssMH_2548	754.07	240.5	-3E-04	8	Glass	0.013	1	20.6	-0.5	
GM-GIS-DY_ssGM_1460	MH-GIS-DY_ssMH_2551	737.26	MH-GIS-DY_ssMH_2549	743.29	74.9	0.081	8	Glass	0.013	10	9.9	5.4	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DY_ssGM_1461	MH-GIS-DY_ssMH_2548	754.07	MH-GIS-DY_ssMH_2550	745.64	122.1	0.069	8	Glass	0.013	2	4.9	-0.6	
GM-GIS-DY_ssGM_1462	MH-GIS-DY_ssMH_2550	745.64	MH-GIS-DY_ssMH_2549	743.29	37.9	0.062	8	Glass	0.013	4	6	-0.6	
GM-GIS-DY_ssGM_1463	MH-GIS-DY_ssMH_2561	721.57	MH-GIS-DY_ssMH_2551	737.26	171.8	0.091	8	Glass	0.013	11	10.5	15.1	
GM-GIS-DY_ssGM_1464	MH-GIS-DY_ssMH_2555	717.93	MH-GIS-DY_ssMH_2556	716.86	51.1	-0.021	8	Glass	0.013	4	100	3.1	
GM-GIS-DY_ssGM_1465	MH-GIS-DY_ssMH_2555	717.93	MH-GIS-DY_ssMH_2552	718.95	69.9	-0.015	8	Glass	0.013	5	100	3.1	
GM-GIS-DY_ssGM_1466	MH-GIS-DY_ssMH_2561	721.57	MH-GIS-DY_ssMH_2552	718.95	43.5	-0.06	8	Glass	0.013	6	100	-0.6	
GM-GIS-DY_ssGM_1467	MH-GIS-DY_ssMH_2557	739	MH-GIS-DY_ssMH_2558	739	68.4	0	8	Glass	0.013	4	100	3.7	
GM-GIS-DY_ssGM_1468	MH-GIS-DY_ssMH_2560	734	MH-GIS-DY_ssMH_2559	734	83.1	0	8	Glass	0.013	1	100	5.3	
GM-GIS-DY_ssGM_1469	MH-GIS-DY_ssMH_2549	743.29	MH-GIS-DY_ssMH_2557	739	79.3	-0.054	8	Glass	0.013	5	100	-0.6	
GM-GIS-DY_ssGM_1470	MH-GIS-DY_ssMH_2559	734	MH-GIS-DY_ssMH_2558	739	296.5	-0.017	8	Glass	0.013	2	100	8.7	
GM-GIS-DY_ssGM_1471	MH-GIS-DY_ssMH_2553	711.51	MH-GIS-DY_ssMH_2554	713.53	58.5	-0.035	8	Glass	0.013	1	100	7.4	
GM-GIS-DY_ssGM_1472	MH-GIS-DY_ssMH_2556	716.86	MH-GIS-DY_ssMH_2554	713.53	106.5	-0.031	8	Glass	0.013	2	100	4.1	
GM-GIS-EL_ssGM_1	MH-GIS-GC_ssMH_2036	775.66	MH-GIS-GC_ssMH_1622	773.42	52.2	0.043	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-EL_ssGM_825	MH-GIS-EL_ssMH_2037	786.68	MH-GIS-GC_ssMH_2036	775.66	133	0.083	8	PVC	0.01	20	14.2	-0.6	
GM-GIS-EL_ssGM_826	MH-GIS-EL_ssMH_2045	822.1	MH-GIS-EL_ssMH_2039	813.97	63.2	0.129	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-EL_ssGM_827	MH-GIS-EL_ssMH_2052	807.93	MH-GIS-EL_ssMH_2040	802.37	48.4	0.115	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-EL_ssGM_828	MH-GIS-EL_ssMH_2053	820.51	MH-GIS-EL_ssMH_2052	807.93	272.9	0.046	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-EL_ssGM_829	MH-GIS-EL_ssMH_2040	802.37	MH-GIS-EL_ssMH_2051	797.05	55.5	0.096	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-EL_ssGM_830	MH-GIS-EL_ssMH_2050	793.43	MH-GIS-EL_ssMH_2051	797.05	53.2	-0.068	8	PVC	0.01	8	100	3.1	
GM-GIS-EL_ssGM_831	MH-GIS-EL_ssMH_2044	793.41	MH-GIS-EL_ssMH_2050	793.43	66.5	-3E-04	8	PVC	0.01	7	100	3.1	
GM-GIS-EL_ssGM_832	MH-GIS-EL_ssMH_2043	804.53	MH-GIS-EL_ssMH_2057	797.97	68	0.096	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-EL_ssGM_833	MH-GIS-EL_ssMH_2057	797.97	MH-GIS-EL_ssMH_2044	793.41	211.4	0.022	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-EL_ssGM_834	MH-GIS-EL_ssMH_2039	813.97	MH-GIS-EL_ssMH_2043	804.53	69.3	0.136	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-EL_ssGM_835	MH-GIS-EL_ssMH_2051	797.05	MH-GIS-EL_ssMH_2049	793.26	67.6	0.056	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-EL_ssGM_836	MH-GIS-EL_ssMH_2049	793.26	MH-GIS-EL_ssMH_2058	788.67	54.5	0.084	8	PVC	0.01	17	13.2	-0.6	
GM-GIS-EL_ssGM_837	MH-GIS-EL_ssMH_2055	834.28	MH-GIS-EL_ssMH_2054	829.37	73.6	0.067	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-EL_ssGM_838	MH-GIS-EL_ssMH_2058	788.67	MH-GIS-EL_ssMH_2037	786.68	129.2	0.015	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-EL_ssGM_839	MH-GIS-EL_ssMH_2054	829.37	MH-GIS-EL_ssMH_2053	820.51	150.8	0.059	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-EN_ssGM_329	MH-GIS-EN_ssMH_1694	700	MH-GIS-IR_ssMH_1695	661.78	331	0.115	8	PVC	0.01	27	16.5	-0.6	
GM-GIS-EN_ssGM_330	MH-GIS-EN_ssMH_1366	703.34	MH-GIS-EN_ssMH_1694	700	29.9	0.112	8	PVC	0.01	26	16.3	-0.6	
GM-GIS-EN_ssGM_588	MH-GIS-EN_ssMH_1350	786.65	MH-GIS-EN_ssMH_1351	786.96	97.8	-0.003	8	Glass	0.013	2	100	0.4	
GM-GIS-EN_ssGM_589	MH-GIS-EN_ssMH_1351	786.96	MH-GIS-EN_ssMH_1352	787.67	99.2	-0.007	8	Glass	0.013	3	100	0.1	
GM-GIS-EN_ssGM_590	MH-GIS-EN_ssMH_1354	762.16	MH-GIS-EN_ssMH_1353	762.07	120.2	8E-04	8	Glass	0.013	2	9	-0.6	
GM-GIS-EN_ssGM_591	MH-GIS-EN_ssMH_1355	763	MH-GIS-EN_ssMH_1354	762.16	101.1	0.008	8	Glass	0.013	2	4.2	-0.6	
GM-GIS-EN_ssGM_592	MH-GIS-EN_ssMH_1353	762.07	MH-GIS-EN_ssMH_1365	751.94	130.6	0.078	8	Glass	0.013	21	14.6	-0.6	
GM-GIS-EN_ssGM_593	MH-GIS-EN_ssMH_1365	751.94	MH-GIS-EN_ssMH_1356	739.92	120.6	0.1	8	Glass	0.013	22	14.8	-0.6	
GM-GIS-EN_ssGM_594	MH-GIS-EN_ssMH_1356	739.92	MH-GIS-EN_ssMH_1357	727.9	120.8	0.1	8	Glass	0.013	22	15.2	-0.6	
GM-GIS-EN_ssGM_595	MH-GIS-EN_ssMH_1357	727.9	MH-GIS-EN_ssMH_1358	723.94	90	0.044	8	Glass	0.013	23	15.5	-0.6	
GM-GIS-EN_ssGM_596	MH-GIS-EN_ssMH_1358	723.94	MH-GIS-EN_ssMH_1359	703.73	187.4	0.108	8	Glass	0.013	24	15.7	-0.6	
GM-GIS-EN_ssGM_597	MH-GIS-EN_ssMH_1352	787.67	MH-GIS-EN_ssMH_1370	777.86	233.3	0.042	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-EN_ssGM_598	MH-GIS-EN_ssMH_1370	777.86	MH-GIS-EN_ssMH_1369	774.89	78.7	0.038	8	Glass	0.013	5	7.2	-0.6	
GM-GIS-EN_ssGM_599	MH-GIS-EN_ssMH_1369	774.89	MH-GIS-EN_ssMH_1360	769.1	95.6	0.061	8	Glass	0.013	6	7.6	-0.6	
GM-GIS-EN_ssGM_600	MH-GIS-EN_ssMH_1360	769.1	MH-GIS-EN_ssMH_1361	762.16	107.5	0.065	8	Glass	0.013	17	13	-0.6	
GM-GIS-EN_ssGM_601	MH-GIS-EN_ssMH_1361	762.16	MH-GIS-EN_ssMH_1353	762.07	98.2	9E-04	8	Glass	0.013	17	22	-0.5	
GM-GIS-EN_ssGM_602	MH-GIS-EN_ssMH_1362	770.19	MH-GIS-EN_ssMH_1360	769.1	41.2	0.026	8	Glass	0.013	10	10	-0.6	
GM-GIS-EN_ssGM_603	MH-GIS-EN_ssMH_1364	779.77	MH-GIS-EN_ssMH_1362	770.19	104	0.092	8	Glass	0.013	9	9.6	-0.6	
GM-GIS-EN_ssGM_604	MH-GIS-EN_ssMH_1363	787.35	MH-GIS-EN_ssMH_1364	779.77	74.3	0.102	8	Glass	0.013	8	9.2	-0.6	
GM-GIS-EN_ssGM_605	MH-GIS-MH-97	794	MH-GIS-EN_ssMH_1363	787.35	61	0.109	8	Glass	0.013	7	8.7	-0.6	
GM-GIS-EN_ssGM_606	MH-GIS-EN_ssMH_1359	703.73	MH-GIS-EN_ssMH_1366	703.34	41.7	0.009	8	Glass	0.013	25	16	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-EN_ssGM_607	MH-GIS-MH-101	784	MH-GIS-EN_ssMH_1367	784	63.2	0	8	Glass	0.013	1	100	3.1	
GM-GIS-EN_ssGM_608	MH-GIS-EN_ssMH_1367	784	MH-GIS-EN_ssMH_1350	786.65	124.1	-0.021	8	Glass	0.013	2	100	3.1	
GM-GIS-EN_ssGM_609	MH-GIS-EN_ssMH_1368	763.36	MH-GIS-EN_ssMH_1355	763	42.8	0.008	8	Glass	0.013	1	3.1	-0.6	
GM-GIS-EP_ssGM_1253	MH-GIS-EP_ssMH_2571	1,044.00	MH-GIS-EP_ssMH_2317	1,044.00	20	0	8	PVC	0.01	111	100	0.6	
GM-GIS-EP_ssGM_1477	MH-GIS-EP_ssMH_2579	1,063.97	MH-GIS-EP_ssMH_2590	1,059.65	112.1	0.039	8	Glass	0.013	18	13.4	-0.6	
GM-GIS-EP_ssGM_1478	MH-GIS-EP_ssMH_2585	1,067.19	MH-GIS-EP_ssMH_2584	1,074.61	115.1	0.064	8	Glass	0.013	16	12.7	6.8	
GM-GIS-EP_ssGM_1479	MH-GIS-EP_ssMH_2587	1,053.88	MH-GIS-EP_ssMH_2585	1,067.19	204.1	0.065	8	Glass	0.013	18	13.4	12.7	
GM-GIS-EP_ssGM_1480	MH-GIS-EP_ssMH_2600	1,085.09	MH-GIS-EP_ssMH_2583	1,079.32	59.4	0.097	8	Glass	0.013	14	12	-0.6	
GM-GIS-EP_ssGM_1481	MH-GIS-EP_ssMH_2590	1,059.65	MH-GIS-EP_ssMH_2594	1,058.00	129.4	0.013	8	Glass	0.013	60	100	3	
GM-GIS-EP_ssGM_1482	MH-GIS-EP_ssMH_2578	1,064.51	MH-GIS-EP_ssMH_2601	1,069.76	160.9	0.033	8	Glass	0.013	2	4.2	4.6	
GM-GIS-EP_ssGM_1483	MH-GIS-EP_ssMH_2592	1,062.35	MH-GIS-EP_ssMH_2594	1,058.00	186	0.023	8	Glass	0.013	4	100	0.2	
GM-GIS-EP_ssGM_1484	MH-GIS-EP_ssMH_2581	1,107.73	MH-GIS-EP_ssMH_2604	1,097.53	171.2	0.06	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-EP_ssGM_1485	MH-GIS-EP_ssMH_2607	1,058.36	MH-GIS-EP_ssMH_2606	1,061.67	281.4	-0.012	8	Glass	0.013	71	100	5	
GM-GIS-EP_ssGM_1486	MH-GIS-EP_ssMH_2591	1,057.24	MH-GIS-EP_ssMH_2608	1,057.37	48	-0.003	8	Glass	0.013	67	100	5.5	
GM-GIS-EP_ssGM_1487	MH-GIS-EP_ssMH_2603	1,063.73	MH-GIS-EP_ssMH_2589	1,057.65	176.2	0.035	8	Glass	0.013	25	15.9	-0.6	
GM-GIS-EP_ssGM_1488	MH-GIS-EP_ssMH_2602	1,070.56	MH-GIS-EP_ssMH_2603	1,063.73	63.7	0.107	8	Glass	0.013	23	15.3	-0.6	
GM-GIS-EP_ssGM_1489	MH-GIS-EP_ssMH_2595	1,086.22	MH-GIS-EP_ssMH_2596	1,082.11	177.6	0.023	8	Glass	0.013	19	14.1	-0.6	
GM-GIS-EP_ssGM_1490	MH-GIS-MH-197	1,071.22	MH-GIS-EP_ssMH_2578	1,064.51	216.3	0.031	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-EP_ssGM_1491	MH-GIS-EP_ssMH_2608	1,057.37	MH-GIS-EP_ssMH_2607	1,058.36	169.8	-0.006	8	Glass	0.013	69	100	6	
GM-GIS-EP_ssGM_1492	MH-GIS-EP_ssMH_2582	1,062.05	MH-GIS-EP_ssMH_2606	1,061.67	40.7	-0.009	8	Glass	0.013	72	100	1.2	
GM-GIS-EP_ssGM_1493	MH-GIS-EP_ssMH_2605	1,063.65	MH-GIS-EP_ssMH_2587	1,053.88	263.1	0.037	8	Glass	0.013	88	30.6	-0.5	
GM-GIS-EP_ssGM_1494	MH-GIS-EP_ssMH_2605	1,063.65	MH-GIS-EP_ssMH_2582	1,062.05	56	-0.029	8	Glass	0.013	86	100	-0.4	
GM-GIS-EP_ssGM_1495	MH-GIS-EP_ssMH_2586	1,087.41	MH-GIS-EP_ssMH_2597	1,087.13	50.8	0.005	8	Glass	0.013	14	12.8	-0.6	
GM-GIS-EP_ssGM_1496	MH-GIS-EP_ssMH_2604	1,097.53	MH-GIS-EP_ssMH_2588	1,087.69	169.8	0.058	8	Glass	0.013	11	10.4	-0.6	
GM-GIS-EP_ssGM_1497	MH-GIS-EP_ssMH_2596	1,082.11	MH-GIS-EP_ssMH_2602	1,070.56	268	0.043	8	Glass	0.013	21	14.7	-0.6	
GM-GIS-EP_ssGM_1498	MH-GIS-EP_ssMH_2580	1,092.25	MH-GIS-EP_ssMH_2600	1,085.09	109.6	0.065	8	Glass	0.013	12	11.2	-0.6	
GM-GIS-EP_ssGM_1499	MH-GIS-EP_ssMH_2599	1,091.67	MH-GIS-EP_ssMH_2595	1,086.22	202.2	0.027	8	Glass	0.013	2	4.2	-0.6	
GM-GIS-EP_ssGM_1500	MH-GIS-MH-99	1,100.90	MH-GIS-EP_ssMH_2598	1,099.00	153.2	0.012	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-EP_ssGM_1501	MH-GIS-EP_ssMH_2597	1,087.13	MH-GIS-EP_ssMH_2595	1,086.22	167.4	0.005	8	Glass	0.013	16	13.6	-0.6	
GM-GIS-EP_ssGM_1502	MH-GIS-EP_ssMH_2588	1,087.69	MH-GIS-EP_ssMH_2586	1,087.41	51.6	0.005	8	Glass	0.013	12	12	-0.6	
GM-GIS-EP_ssGM_1503	MH-GIS-EP_ssMH_2581	1,107.73	MH-GIS-MH-75	1,110.99	48.3	0.067	8	Glass	0.013	7	8.5	2.6	
GM-GIS-EP_ssGM_1504	MH-GIS-EP_ssMH_2594	1,058.00	MH-GIS-EP_ssMH_2591	1,057.24	96.7	0.008	8	Glass	0.013	65	100	4.6	
GM-GIS-EP_ssGM_1505	MH-GIS-EP_ssMH_2593	1,066.04	MH-GIS-EP_ssMH_2592	1,062.35	170.6	0.022	8	Glass	0.013	2	4.2	-0.6	
GM-GIS-EP_ssGM_1506	MH-GIS-EP_ssMH_2589	1,057.65	MH-GIS-EP_ssMH_2590	1,059.65	134	-0.015	8	Glass	0.013	41	100	5	
GM-GIS-EP_ssGM_1507	MH-GIS-EP_ssMH_2598	1,099.00	MH-GIS-EP_ssMH_2580	1,092.25	300	0.023	8	Glass	0.013	11	10.4	-0.6	
GM-GIS-EP_ssGM_1508	MH-GIS-EP_ssMH_2578	1,064.51	MH-GIS-EP_ssMH_2582	1,062.05	102.8	0.024	8	Glass	0.013	12	11.2	-0.6	
GM-GIS-EP_ssGM_1509	MH-GIS-EP_ssMH_2583	1,079.32	MH-GIS-EP_ssMH_2579	1,063.97	155	0.099	8	Glass	0.013	16	12.7	-0.6	
GM-GIS-EP_ssGM_1510	MH-GIS-EP_ssMH_2609	1,046.79	MH-GIS-EP_ssMH_2587	1,053.88	157	0.045	8	Glass	0.013	108	33.8	6.6	
GM-GIS-EP_ssGM_1511	MH-GIS-EP_ssMH_2571	1,044.00	MH-GIS-EP_ssMH_2609	1,046.79	131.3	0.021	8	Glass	0.013	109	34.1	2.4	
GM-GIS-FW_ssGM_189	MH-GIS-FW_ssMH_1607	894	MH-GIS-FW_ssMH_1606	891.15	175.4	0.016	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_208	MH-GIS-FW_ssMH_1603	862.78	MH-GIS-NE_ssMH_1604	868.35	299.1	0.019	8	PVC	0.01	10	10	5	
GM-GIS-FW_ssGM_209	MH-IS-39	847.91	MH-GIS-FW_ssMH_1603	862.78	345.5	0.043	8	PVC	0.01	11	10.5	14.3	
GM-GIS-FW_ssGM_215	MH-GIS-FW_ssMH_1595	881.15	MH-GIS-FW_ssMH_1596	871.76	240.9	0.039	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-FW_ssGM_216	MH-GIS-FW_ssMH_1593	890.23	MH-GIS-FW_ssMH_1594	885.7	170.8	0.027	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-FW_ssGM_217	MH-GIS-FW_ssMH_1594	885.7	MH-GIS-FW_ssMH_1595	881.15	150.1	0.03	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-FW_ssGM_223	MH-GIS-FW_ssMH_1606	891.15	MH-GIS-FW_ssMH_1608	884.67	299.5	0.022	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_228	MH-GIS-FW_ssMH_1592	894	MH-GIS-FW_ssMH_1593	890.23	150.8	0.025	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-FW_ssGM_291	MH-GIS-FW_ssMH_1664	844	MH-GIS-FW_ssMH_1661	843.39	111.7	0.005	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-FW_ssGM_292	MH-GIS-FW_ssMH_1661	843.39	MH-GIS-FW_ssMH_1660	841.89	222.3	0.007	8	PVC	0.01	5	7.2	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-FW_ssGM_293	MH-GIS-FW_ssMH_1663	844.21	MH-GIS-FW_ssMH_1664	844	48.7	0.004	8	PVC	0.01	2	5.3	-0.6	
GM-GIS-FW_ssGM_294	MH-GIS-FW_ssMH_1662	848.3	MH-GIS-FW_ssMH_1664	844	201.1	0.021	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_295	MH-GIS-FW_ssMH_1908	837.79	MH-GIS-FW_ssMH_1659	831.2	153	0.043	8	PVC	0.01	7	8.7	-0.6	
GM-GIS-FW_ssGM_296	MH-GIS-FW_ssMH_1658	813.49	MH-GIS-GC_ssMH_1612	813.35	165.1	9E-04	8	PVC	0.01	13	17.2	-0.6	
GM-GIS-FW_ssGM_297	MH-GIS-FW_ssMH_1659	831.2	MH-GIS-FW_ssMH_1658	813.49	343.4	0.052	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-FW_ssGM_298	MH-GIS-FW_ssMH_1660	841.89	MH-GIS-FW_ssMH_1908	837.79	155.5	0.026	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-FW_ssGM_299	MH-GIS-FW_ssMH_1666	864.43	MH-GIS-FW_ssMH_1665	860.56	113.6	0.034	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_300	MH-GIS-FW_ssMH_1656	827.21	MH-GIS-FW_ssMH_1657	815.87	190.5	0.06	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-FW_ssGM_301	MH-GIS-MH-145	834.18	MH-GIS-FW_ssMH_1656	827.21	106.8	0.065	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_302	MH-GIS-FW_ssMH_1655	846.35	MH-GIS-FW_ssMH_1656	827.21	365	0.052	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_303	MH-GIS-FW_ssMH_1654	855.98	MH-GIS-FW_ssMH_1655	846.35	162.5	0.059	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_304	MH-GIS-FW_ssMH_1657	815.87	MH-GIS-FW_ssMH_1658	813.49	143.4	0.017	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-FW_ssGM_305	MH-GIS-FW_ssMH_1665	860.56	MH-GIS-FW_ssMH_1663	844.21	222	0.074	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_306	MH-GIS-MH-147	842.69	MH-GIS-FW_ssMH_1908	837.79	114.4	0.043	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_307	MH-GIS-FW_ssMH_1676	876.82	MH-GIS-FW_ssMH_1675	875	235.7	0.008	8	PVC	0.01	541	78	-0.1	
GM-GIS-FW_ssGM_308	MH-GIS-FW_ssMH_1675	875	MH-IS-MH-4	873	401.1	0.005	8	PVC	0.01	542	100	0.2	
GM-GIS-FW_ssGM_309	MH-GIS-FW_ssMH_1667	887.28	MH-GIS-FW_ssMH_1668	884	391	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_313	MH-GIS-FW_ssMH_1669	875.37	MH-GIS-FW_ssMH_1670	872.88	75.7	0.033	8	PVC	0.01	2	5	-0.6	
GM-GIS-FW_ssGM_314	MH-GIS-FW_ssMH_1670	872.88	MH-IS-43	861.48	302.9	0.038	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-FW_ssGM_315	MH-GIS-MH-187	877.48	MH-GIS-FW_ssMH_1670	872.88	158.3	0.029	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_316	MH-GIS-FW_ssMH_1668	884	MH-GIS-FW_ssMH_1669	875.37	351.6	0.025	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-GC_ssGM_192	MH-GIS-MH-29	797.76	MH-GIS-GC_ssMH_1578	798	18.4	-0.013	8	Glass	0.013	1	100	5.4	
GM-GIS-GC_ssGM_193	MH-GIS-MH-65	798.64	MH-GIS-GC_ssMH_1578	798	43.3	0.015	8	Glass	0.013	1	100	4.5	
GM-GIS-GC_ssGM_194	MH-GIS-GC_ssMH_1578	798	MH-GIS-GC_ssMH_1579	799.91	132.6	-0.014	8	PVC	0.01	4	100	5.2	
GM-GIS-GC_ssGM_195	MH-GIS-GC_ssMH_1579	799.91	MH-GIS-GC_ssMH_1580	803.06	194.9	-0.016	8	PVC	0.01	5	100	3.3	
GM-GIS-GC_ssGM_196	MH-GIS-GC_ssMH_1580	803.06	MH-GIS-GC_ssMH_1581	803.72	261.4	-0.003	8	PVC	0.01	7	100	0.1	
GM-GIS-GC_ssGM_197	MH-GIS-GC_ssMH_1581	803.72	MH-GIS-GC_ssMH_1582	792.63	287.3	0.039	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-GC_ssGM_198	MH-GIS-GC_ssMH_1582	792.63	MH-GIS-GC_ssMH_1583	794	172.4	-0.008	8	PVC	0.01	9	100	0.8	
GM-GIS-GC_ssGM_205	MH-GIS-GC_ssMH_1583	794	MH-GIS-GC_ssMH_1588	794	57.2	0	8	PVC	0.01	11	20	-0.5	
GM-GIS-GC_ssGM_206	MH-GIS-GC_ssMH_1591	822.34	MH-GIS-GC_ssMH_1589	804.13	208.7	0.087	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-GC_ssGM_210	MH-GIS-GC_ssMH_1589	804.13	MH-GIS-GC_ssMH_1588	794	233.8	0.043	8	PVC	0.01	12	11	-0.6	
GM-GIS-GC_ssGM_232	MH-GIS-GC_ssMH_1612	813.35	MH-IS-40	811.95	77.2	0.018	8	PVC	0.01	14	12	-0.6	
GM-GIS-GC_ssGM_1080	MH-GIS-GC_ssMH_2208	780.56	MH-IS-38	767.46	246.4	0.053	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-GS_ssGM_779	MH-GIS-GS_ssMH_1470	411.77	MH-IS-193	407.54	62.7	0.067	8	Concrete	0.013	10	10.1	-0.6	
GM-GIS-GS_ssGM_780	MH-GIS-GS_ssMH_1493	414	MH-IS-134	408.52	284.5	0.019	8	Concrete	0.013	3	5.8	-0.6	
GM-GIS-GS_ssGM_883	MH-GIS-GS_ssMH_2090	414.88	MH-GIS-GS_ssMH_2091	415.82	47.9	-0.02	8	Concrete	0.013	23	100	3	SM4
GM-GIS-GS_ssGM_884	MH-GIS-GS_ssMH_1528	416.02	MH-GIS-GS_ssMH_2090	414.88	196.2	0.006	8	PVC	0.01	3	100	1.9	
GM-GIS-GS_ssGM_885	MH-GIS-MH-206	419	MH-GIS-GS_ssMH_2091	415.82	258.5	0.012	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-GS_ssGM_886	MH-GIS-GS_ssMH_2091	415.82	MH-GIS-GS_ssMH_1476	418.34	176.4	-0.014	8	Concrete	0.013	30	100	2.1	SM4
GM-GIS-GS_ssGM_887	MH-GIS-GS_ssMH_1476	418.34	MH-IS-257	414.64	242.3	0.015	8	Concrete	0.013	33	18.6	-0.5	SM4
GM-GIS-GS_ssGM_888	MH-GIS-GS_ssMH_2092	417.72	MH-IS-266	415.38	344.4	0.007	8	Concrete	0.013	3	6.2	-0.6	
GM-GIS-GS_ssGM_909	MH-GIS-MB_ssMH_1461	416	MH-GIS-GS_ssMH_1468	415.12	249.2	0.004	8	Concrete	0.013	136	45.3	-0.4	
GM-GIS-GS_ssGM_910	MH-GIS-GS_ssMH_1468	415.12	MH-GIS-GS_ssMH_1467	414.38	299.4	0.002	8	Concrete	0.013	139	50.9	-0.3	
GM-GIS-GS_ssGM_911	MH-GIS-GS_ssMH_1477	412.88	MH-GIS-GS_ssMH_1478	412.68	30.6	0.007	8	Concrete	0.013	149	40.1	-0.4	
GM-GIS-GS_ssGM_913	MH-GIS-GS_ssMH_1478	412.68	MH-GIS-GS_ssMH_2101	411.66	353.3	0.003	8	Concrete	0.013	153	51.4	-0.3	
GM-GIS-GS_ssGM_914	MH-GIS-GS_ssMH_2101	411.66	MH-IS-GS_ssMH_1480	408.77	302.7	0.01	8	Concrete	0.013	156	41.1	-0.4	
GM-GIS-GS_ssGM_918	MH-GIS-GS_ssMH_2106	414.79	MH-GIS-GS_ssMH_2105	414.08	177.7	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-GS_ssGM_919	MH-GIS-GS_ssMH_2105	414.08	MH-IS-GS_ssMH_1480	408.77	152.8	0.035	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-GS_ssGM_973	MH-GIS-GS_ssMH_2104	418.06	MH-GIS-GS_ssMH_2154	416.74	329.4	0.004	8	Concrete	0.013	3	7	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-GS_ssGM_979	MH-GIS-GS_ssMH_2089	415.97	MH-GIS-GS_ssMH_2090	414.88	302.3	0.004	8	PVC	0.01	10	100	1.9	
GM-GIS-GS_ssGM_980	MH-GIS-MC_ssMH_2159	417.2	MH-GIS-GS_ssMH_2089	415.97	267	0.005	8	Ductile Iron	0.013	7	100	0.7	
GM-GIS-GS_ssGM_981	MH-GIS-MH-21	417.4	MH-GIS-MC_ssMH_2159	417.2	11.7	0.017	8	Ductile Iron	0.013	3	100	0.5	
GM-GIS-GS_ssGM_982	MH-GIS-GS_ssMH_2153	414.94	MH-IS-135	409.66	297.3	0.018	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-GS_ssGM_983	MH-GIS-GS_ssMH_2103	416.1	MH-GIS-GS_ssMH_2153	414.94	291	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-GS_ssGM_1000	MH-GIS-GS_ssMH_1467	414.38	MH-GIS-GS_ssMH_2172	413.45	139.3	0.007	8	Concrete	0.013	143	39.2	-0.4	
GM-GIS-GS_ssGM_1001	MH-GIS-GS_ssMH_2172	413.45	MH-GIS-GS_ssMH_1477	412.88	163.6	0.003	8	Concrete	0.013	146	47.4	-0.4	
GM-GIS-GS_ssGM_1004	MH-GIS-GS_ssMH_2102	414	MH-GIS-GS_ssMH_1470	411.77	363.2	0.006	8	Concrete	0.013	7	8.7	-0.6	
GM-GIS-GS_ssGM_1005	MH-GIS-MH-176	414.6	MH-GIS-GS_ssMH_2102	414	148.8	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-GS_ssGM_1021	MH-GIS-MH-79	415.21	MH-GIS-GS_ssMH_2090	414.88	83.3	0.004	8	Concrete	0.013	7	100	2.7	
GM-GIS-GS_ssGM_1022	MH-GIS-MH-78	416.02	MH-GIS-MH-79	415.21	49.5	0.016	8	PVC	0.01	3	100	1.9	
GM-GIS-IR_ssGM_249	MH-GIS-MH-14	605.02	MH-GIS-MH-41	593.77	28.2	0.399	6	Glass	0.013	12	15.7	-0.4	
GM-GIS-IR_ssGM_250	MH-GIS-MH-13	605.89	MH-GIS-MH-14	605.02	4	0.219	6	Glass	0.013	11	15.1	-0.4	
GM-GIS-IR_ssGM_251	MH-GIS-MH-51	606.69	MH-GIS-MH-13	605.89	97.2	0.008	6	Glass	0.013	10	14.5	-0.4	
GM-GIS-IR_ssGM_252	MH-GIS-IR_ssMH_1623	608.04	MH-GIS-MH-51	606.69	36.1	0.037	6	Glass	0.013	9	13.9	-0.4	
GM-GIS-IR_ssGM_253	MH-GIS-MH-133	618.69	MH-GIS-IR_ssMH_1623	608.04	98	0.109	6	Glass	0.013	8	13.2	-0.4	
GM-GIS-IR_ssGM_254	MH-GIS-MH-137	631.94	MH-GIS-MH-133	618.69	101.2	0.131	6	Glass	0.013	7	12.5	-0.4	
GM-GIS-IR_ssGM_255	MH-GIS-MH-136	641.15	MH-GIS-MH-137	631.94	100	0.092	6	Glass	0.013	7	11.8	-0.4	
GM-GIS-IR_ssGM_256	MH-GIS-MH-138	649.38	MH-GIS-MH-136	641.15	100	0.082	6	Glass	0.013	6	11	-0.4	
GM-GIS-IR_ssGM_257	MH-GIS-MH-61	657.01	MH-GIS-MH-138	649.38	100	0.076	6	Glass	0.013	5	10.2	-0.4	
GM-GIS-IR_ssGM_258	MH-GIS-IR_ssMH_1624	662.95	MH-GIS-MH-61	657.01	41	0.145	6	Glass	0.013	4	9.3	-0.5	
GM-GIS-IR_ssGM_259	MH-GIS-MH-111	676.44	MH-GIS-IR_ssMH_1624	662.95	83.4	0.162	6	Glass	0.013	3	8.3	-0.5	
GM-GIS-IR_ssGM_260	MH-GIS-MH-110	685.5	MH-GIS-MH-111	676.44	73.4	0.123	6	Glass	0.013	2	7.2	-0.5	
GM-GIS-IR_ssGM_261	MH-GIS-MH-23	684.07	MH-GIS-MH-110	685.5	82.7	-0.017	6	Glass	0.013	2	100	1	
GM-GIS-IR_ssGM_262	MH-GIS-MH-22	685.57	MH-GIS-MH-23	684.07	12.3	0.122	6	Glass	0.013	1	4.1	-0.5	
GM-GIS-IR_ssGM_674	MH-GIS-IR_ssMH_1695	661.78	MH-GIS-IR_ssMH_1946	658.6	73.5	0.043	8	Glass	0.013	27	16.8	-0.6	
GM-GIS-IR_ssGM_675	MH-GIS-IR_ssMH_1954	720.01	MH-GIS-IR_ssMH_1948	718.96	30.1	0.035	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_676	MH-GIS-IR_ssMH_1973	674.31	MH-GIS-IR_ssMH_1977	664.88	122.9	0.077	8	Glass	0.013	7	8.2	-0.6	
GM-GIS-IR_ssGM_677	MH-GIS-IR_ssMH_1946	658.6	MH-GIS-IR_ssMH_1979	644.64	157.8	0.088	8	Glass	0.013	28	17.1	-0.6	
GM-GIS-IR_ssGM_678	MH-GIS-IR_ssMH_1949	685.69	MH-GIS-IR_ssMH_1976	677.81	118.5	0.066	8	Glass	0.013	17	13	-0.6	
GM-GIS-IR_ssGM_679	MH-GIS-IR_ssMH_1952	723.4	MH-GIS-IR_ssMH_1954	720.01	183.1	0.019	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_680	MH-GIS-IR_ssMH_1953	717.36	MH-GIS-IR_ssMH_1954	720.01	224.3	-0.012	8	Glass	0.013	1	100	2	
GM-GIS-IR_ssGM_681	MH-GIS-IR_ssMH_1980	639	MH-GIS-IR_ssMH_1981	641.5	151.6	-0.016	8	Glass	0.013	38	100	2.1	
GM-GIS-IR_ssGM_682	MH-GIS-IR_ssMH_1979	644.64	MH-GIS-IR_ssMH_1980	639	160	0.035	8	Glass	0.013	37	19.7	-0.5	
GM-GIS-IR_ssGM_683	MH-GIS-IR_ssMH_1978	655.71	MH-GIS-IR_ssMH_1979	644.64	169.4	0.065	8	Glass	0.013	8	9.2	-0.6	
GM-GIS-IR_ssGM_684	MH-GIS-IR_ssMH_1977	664.88	MH-GIS-IR_ssMH_1978	655.71	171	0.054	8	Glass	0.013	7	8.7	-0.6	
GM-GIS-IR_ssGM_685	MH-GIS-IR_ssMH_1955	707.87	MH-GIS-IR_ssMH_1956	701.78	99	0.062	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-IR_ssGM_686	MH-GIS-IR_ssMH_1948	718.96	MH-GIS-IR_ssMH_1955	707.87	140.9	0.079	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_687	MH-GIS-IR_ssMH_1958	705.64	MH-GIS-IR_ssMH_1959	693	126.7	0.1	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-IR_ssGM_688	MH-GIS-IR_ssMH_1957	730.49	MH-GIS-IR_ssMH_1958	705.64	262.3	0.095	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_689	MH-GIS-IR_ssMH_1959	693	MH-GIS-IR_ssMH_1968	689.98	121.5	0.025	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_690	MH-GIS-IR_ssMH_1962	747.5	MH-GIS-IR_ssMH_1963	734.42	162.3	0.081	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_691	MH-GIS-IR_ssMH_1961	767.17	MH-GIS-IR_ssMH_1962	747.5	255.4	0.077	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_692	MH-GIS-IR_ssMH_1960	766.86	MH-GIS-IR_ssMH_1961	767.17	73.7	-0.004	8	Glass	0.013	2	56.6	-0.3	
GM-GIS-IR_ssGM_693	MH-GIS-MH-114	770.66	MH-GIS-IR_ssMH_1960	766.86	75.3	0.05	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_694	MH-GIS-IR_ssMH_1947	757.4	MH-GIS-IR_ssMH_1969	741.39	147.1	0.109	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_695	MH-GIS-IR_ssMH_1963	734.42	MH-GIS-IR_ssMH_1964	717.96	217.8	0.076	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-IR_ssGM_696	MH-GIS-IR_ssMH_1964	717.96	MH-GIS-IR_ssMH_1965	709.36	93.4	0.092	8	Glass	0.013	5	7.2	-0.6	
GM-GIS-IR_ssGM_697	MH-GIS-IR_ssMH_1965	709.36	MH-GIS-IR_ssMH_1966	701.3	85.6	0.094	8	Glass	0.013	6	7.6	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-IR_ssGM_698	MH-GIS-IR_ssMH_1966	701.3	MH-GIS-IR_ssMH_1967	695.27	91.3	0.066	8	Glass	0.013	12	10.9	-0.6	
GM-GIS-IR_ssGM_699	MH-GIS-IR_ssMH_1956	701.78	MH-GIS-IR_ssMH_1966	701.3	64.4	0.007	8	Glass	0.013	5	7.3	-0.6	
GM-GIS-IR_ssGM_700	MH-GIS-IR_ssMH_1967	695.27	MH-GIS-IR_ssMH_1968	689.98	197.5	0.027	8	Glass	0.013	12	11.2	-0.6	
GM-GIS-IR_ssGM_701	MH-GIS-IR_ssMH_1968	689.98	MH-GIS-IR_ssMH_1949	685.69	158.1	0.027	8	Glass	0.013	16	12.7	-0.6	
GM-GIS-IR_ssGM_702	MH-GIS-IR_ssMH_1969	741.39	MH-GIS-IR_ssMH_1970	713.33	255.2	0.11	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-IR_ssGM_703	MH-GIS-IR_ssMH_1970	713.33	MH-GIS-IR_ssMH_1971	692.5	189.8	0.11	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_704	MH-GIS-IR_ssMH_1971	692.5	MH-GIS-IR_ssMH_1972	677.86	142.1	0.103	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_705	MH-GIS-IR_ssMH_1972	677.86	MH-GIS-IR_ssMH_1973	674.31	55.7	0.064	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-IR_ssGM_706	MH-GIS-IR_ssMH_1974	674	MH-GIS-IR_ssMH_1973	674.31	76.9	-0.004	8	Glass	0.013	2	55.5	-0.3	
GM-GIS-IR_ssGM_707	MH-GIS-IR_ssMH_1975	677.11	MH-GIS-IR_ssMH_1974	674	145.1	0.021	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_708	MH-GIS-IR_ssMH_1981	641.5	MH-GIS-IR_ssMH_1982	609.69	301.6	0.105	8	Glass	0.013	39	20.1	-0.5	
GM-GIS-IR_ssGM_709	MH-GIS-IR_ssMH_1976	677.81	MH-GIS-IR_ssMH_1951	667.09	127.6	0.084	8	Glass	0.013	17	13.4	-0.6	
GM-GIS-IR_ssGM_710	MH-GIS-IR_ssMH_1951	667.09	MH-IS-129	645.79	117.2	0.182	8	Glass	0.013	18	13.7	-0.6	
GM-GIS-IR_ssGM_735	MH-GIS-IR_ssMH_1982	609.69	MH-IS-48	588.13	104.8	0.206	8	Glass	0.013	40	20.3	-0.5	
GM-GIS-JH_ssGM_1102	MH-GIS-MH-74	466.99	MH-IS-16	465.97	48.5	0.021	8	Ductile Iron	0.013	220	49.1	-0.3	
GM-GIS-KC_ssGM_747	MH-GIS-MH-188	418.46	MH-GIS-MH-189	417.83	158.6	0.004	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-KC_ssGM_748	MH-GIS-MH-189	417.83	MH-GIS-KC_ssMH_2009	417.17	163.9	0.004	8	PVC	0.01	5	7.8	-0.6	
GM-GIS-KC_ssGM_749	MH-GIS-KC_ssMH_2009	417.17	MH-GIS-MH-155	416.67	125.3	0.004	8	PVC	0.01	8	9.4	-0.6	
GM-GIS-KC_ssGM_750	MH-GIS-MH-155	416.67	Pump Station No. 6 Wetwell	415	213.3	0.008	8	PVC	0.01	11	49.6	-0.3	
GM-GIS-KC_ssGM_857	MH-GIS-MH-209	418.15	MH-IS-30	415.36	355.8	0.008	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-KC_ssGM_860	MH-GIS-MH-76	418.62	MH-GIS-KC_ssMH_1509	417.94	49.3	0.014	8	PVC	0.01	9	16.6	-0.6	
GM-GIS-KC_ssGM_861	MH-GIS-KC_ssMH_1509	417.94	MH-IS-24	416.67	281.1	0.005	8	PVC	0.01	18	100	0.1	
GM-GIS-KC_ssGM_870	MH-GIS-KC_ssMH_2084	482.14	MH-GIS-KC_ssMH_2083	463.1	295.4	0.064	8	PVC	0.01	334	61.1	-0.3	
GM-GIS-KC_ssGM_871	MH-GIS-KC_ssMH_2083	463.1	MH-GIS-KC_ssMH_2082	440.53	345.7	0.065	8	PVC	0.01	343	62	-0.3	
GM-GIS-KC_ssGM_872	MH-GIS-KC_ssMH_2082	440.53	MH-IS-57	425.87	240.2	0.061	8	PVC	0.01	351	62.8	-0.2	
GM-GIS-KC_ssGM_891	MH-GIS-MH-195	522.26	MH-GIS-KC_ssMH_2084	482.14	281.4	0.143	8	PVC	0.01	45	21.5	-0.5	
GM-GIS-KC_ssGM_892	MH-GIS-MH-199	557.17	MH-GIS-MH-195	522.26	183	0.191	8	PVC	0.01	27	16.6	-0.6	
GM-GIS-KC_ssGM_893	MH-GIS-MH-165	569.29	MH-GIS-MH-199	557.17	203.7	0.06	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-KC_ssGM_894	MH-GIS-MH-164	577.65	MH-GIS-MH-165	569.29	138.8	0.06	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-KC_ssGM_895	MH-GIS-MH-194	561.05	MH-GIS-MH-195	522.26	173.8	0.223	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-KC_ssGM_922	MH-GIS-KC_ssMH_2108	1,027.84	MH-GIS-KC_ssMH_2109	1,006.90	270.9	0.077	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_923	MH-GIS-KC_ssMH_2109	1,006.90	MH-GIS-KC_ssMH_2111	970.9	297.5	0.121	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-KC_ssGM_924	MH-GIS-KC_ssMH_2111	970.9	MH-GIS-KC_ssMH_2110	961.14	117.7	0.083	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-KC_ssGM_925	MH-GIS-KC_ssMH_2110	961.14	MH-GIS-KC_ssMH_2112	946.39	98.7	0.149	8	PVC	0.01	35	18.9	-0.5	
GM-GIS-KC_ssGM_926	MH-GIS-KC_ssMH_2112	946.39	MH-GIS-KC_ssMH_2113	926.05	298.9	0.068	8	PVC	0.01	44	21.3	-0.5	
GM-GIS-KC_ssGM_927	MH-GIS-KC_ssMH_2113	926.05	MH-GIS-MH-123	906.59	236.2	0.082	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-KC_ssGM_928	MH-GIS-MH-123	906.59	MH-GIS-KC_ssMH_2115	900.25	83.5	0.076	8	PVC	0.01	61	25.3	-0.5	
GM-GIS-KC_ssGM_929	MH-GIS-KC_ssMH_2115	900.25	MH-GIS-KC_ssMH_2116	887.69	229.2	0.055	8	PVC	0.01	70	27	-0.5	
GM-GIS-KC_ssGM_930	MH-GIS-KC_ssMH_2116	887.69	MH-GIS-KC_ssMH_2117	874.03	141.2	0.097	8	PVC	0.01	78	28.8	-0.5	
GM-GIS-KC_ssGM_931	MH-GIS-KC_ssMH_2117	874.03	MH-GIS-KC_ssMH_2118	847.41	300.1	0.089	8	PVC	0.01	87	30.4	-0.5	
GM-GIS-KC_ssGM_932	MH-GIS-KC_ssMH_2118	847.41	MH-GIS-KC_ssMH_2119	790.79	349.9	0.162	8	PVC	0.01	96	31.9	-0.5	
GM-GIS-KC_ssGM_933	MH-GIS-KC_ssMH_2119	790.79	MH-GIS-KC_ssMH_2122	729.26	389.2	0.158	8	PVC	0.01	105	33.4	-0.4	
GM-GIS-KC_ssGM_934	MH-GIS-KC_ssMH_2122	729.26	MH-GIS-KC_ssMH_2196	707.3	203.5	0.108	8	PVC	0.01	113	34.8	-0.4	
GM-GIS-KC_ssGM_935	MH-GIS-KC_ssMH_2196	707.3	MH-GIS-KC_ssMH_2197	701.32	62.5	0.096	8	PVC	0.01	122	36.2	-0.4	
GM-GIS-KC_ssGM_936	MH-GIS-KC_ssMH_2197	701.32	MH-GIS-KC_ssMH_2123	691.09	106.9	0.096	8	PVC	0.01	131	37.5	-0.4	
GM-GIS-KC_ssGM_937	MH-GIS-KC_ssMH_2123	691.09	MH-GIS-KC_ssMH_2124	686.29	81	0.059	8	PVC	0.01	139	38.7	-0.4	
GM-GIS-KC_ssGM_938	MH-GIS-KC_ssMH_2124	686.29	MH-GIS-KC_ssMH_2125	653.86	85.6	0.379	8	Ductile Iron	0.013	148	40	-0.4	
GM-GIS-KC_ssGM_939	MH-GIS-KC_ssMH_2125	653.86	MH-GIS-KC_ssMH_2126	651.73	144	0.015	8	PVC	0.01	157	41.2	-0.4	
GM-GIS-KC_ssGM_940	MH-GIS-KC_ssMH_2126	651.73	MH-GIS-KC_ssMH_2168	644.03	103.7	0.074	8	PVC	0.01	166	42.4	-0.4	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-KC_ssGM_941	MH-GIS-KC_ssMH_2168	644.03	MH-GIS-KC_ssMH_2127	641.46	315.3	0.008	8	PVC	0.01	174	43.5	-0.4	
GM-GIS-KC_ssGM_942	MH-GIS-KC_ssMH_2127	641.46	MH-GIS-KC_ssMH_2128	634.26	66.3	0.109	8	PVC	0.01	183	44.6	-0.4	
GM-GIS-KC_ssGM_943	MH-GIS-KC_ssMH_2128	634.26	MH-GIS-KC_ssMH_2129	611.91	210.3	0.106	8	PVC	0.01	192	45.8	-0.4	
GM-GIS-KC_ssGM_944	MH-GIS-KC_ssMH_2129	611.91	MH-GIS-KC_ssMH_2130	603.73	76.9	0.106	8	PVC	0.01	201	46.8	-0.4	
GM-GIS-KC_ssGM_945	MH-GIS-KC_ssMH_2130	603.73	MH-GIS-KC_ssMH_2131	592.15	108.9	0.106	8	PVC	0.01	209	47.9	-0.3	
GM-GIS-KC_ssGM_946	MH-GIS-KC_ssMH_2131	592.15	MH-GIS-KC_ssMH_2132	561.7	286.5	0.106	8	PVC	0.01	218	48.9	-0.3	
GM-GIS-KC_ssGM_947	MH-GIS-KC_ssMH_2132	561.7	MH-GIS-KC_ssMH_2133	549	131.6	0.096	8	PVC	0.01	227	49.9	-0.3	
GM-GIS-KC_ssGM_948	MH-GIS-KC_ssMH_2133	549	MH-GIS-KC_ssMH_2134	535.47	176.1	0.077	8	PVC	0.01	235	50.9	-0.3	
GM-GIS-KC_ssGM_949	MH-GIS-KC_ssMH_2134	535.47	MH-GIS-KC_ssMH_2135	534.13	43.6	0.031	8	PVC	0.01	244	51.9	-0.3	
GM-GIS-KC_ssGM_950	MH-GIS-KC_ssMH_2135	534.13	MH-GIS-KC_ssMH_2120	521.21	135.8	0.095	8	PVC	0.01	253	52.9	-0.3	
GM-GIS-KC_ssGM_984	MH-GIS-KC_ssMH_2084	482.14	MH-GIS-KC_ssMH_2160	482.58	9.6	0.046	8	PVC	0.01	280	55.8	0.1	
GM-GIS-KC_ssGM_987	MH-GIS-KC_ssMH_2121	507.3	MH-GIS-KC_ssMH_2160	482.58	373.8	0.066	8	PVC	0.01	271	54.8	-0.3	
GM-GIS-KC_ssGM_988	MH-GIS-KC_ssMH_2120	521.21	MH-GIS-KC_ssMH_2121	507.3	184.9	0.075	8	PVC	0.01	262	53.9	-0.3	
GM-GIS-KR_ssGM_29	MH-GIS-KR_ssMH_1445	579.09	MH-GIS-KR_ssMH_1442	570.02	120.4	0.075	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-KR_ssGM_34	MH-GIS-KR_ssMH_1442	570.02	MH-GIS-KR_ssMH_1441	558.99	117.6	0.094	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-KR_ssGM_35	MH-GIS-KR_ssMH_1441	558.99	MH-GIS-KR_ssMH_1439	565.63	153.6	-0.043	8	PVC	0.01	17	100	6.1	
GM-GIS-KR_ssGM_36	MH-GIS-KR_ssMH_1439	565.63	MH-GIS-KR_ssMH_1431	552.59	70.1	0.186	8	PVC	0.01	19	14	-0.6	
GM-GIS-KR_ssGM_554	MH-GIS-MH-88	587.38	MH-IS-89	577.39	54.9	0.182	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_557	MH-GIS-MH-41	593.77	MH-IS-89	577.39	124.3	0.132	6	PVC	0.01	12	16.2	-0.4	
GM-GIS-KR_ssGM_610	MH-GIS-MH-43	553.07	MH-GIS-KR_ssMH_1900	546.6	29.5	0.219	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-KR_ssGM_611	MH-GIS-KR_ssMH_1899	550.74	MH-GIS-KR_ssMH_1898	549.33	161.7	0.009	8	PVC	0.01	54	23.8	-0.5	
GM-GIS-KR_ssGM_612	MH-GIS-KR_ssMH_1431	552.59	MH-GIS-KR_ssMH_1899	550.74	181.5	0.01	8	PVC	0.01	53	23.6	-0.5	
GM-GIS-KR_ssGM_613	MH-GIS-KR_ssMH_1898	549.33	MH-GIS-KR_ssMH_1901	548.1	163.4	0.008	8	PVC	0.01	55	24	-0.5	
GM-GIS-KR_ssGM_614	MH-GIS-KR_ssMH_1901	548.1	MH-GIS-KR_ssMH_1900	546.6	141.6	0.011	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-KR_ssGM_615	MH-GIS-KR_ssMH_1900	546.6	MH-GIS-KR_ssMH_1897	535.33	181.1	0.062	8	PVC	0.01	58	24.5	-0.5	
GM-GIS-KR_ssGM_616	MH-GIS-KR_ssMH_1897	535.33	MH-GIS-KR_ssMH_1896	518.29	184.2	0.093	8	PVC	0.01	58	24.7	-0.5	
GM-GIS-KR_ssGM_617	MH-GIS-KR_ssMH_1896	518.29	MH-GIS-KR_ssMH_1902	515.25	160.9	0.019	8	PVC	0.01	232	50.6	-0.3	
GM-GIS-KR_ssGM_618	MH-GIS-KR_ssMH_1902	515.25	MH-GIS-KR_ssMH_1903	513.28	230.4	0.009	8	PVC	0.01	233	50.6	-0.3	
GM-GIS-KR_ssGM_619	MH-GIS-KR_ssMH_1903	513.28	MH-GIS-KR_ssMH_1904	511.5	192.5	0.009	8	PVC	0.01	234	50.8	-0.3	
GM-GIS-KR_ssGM_620	MH-GIS-KR_ssMH_1904	511.5	MH-IS-128	510.28	158.6	0.008	8	PVC	0.01	235	50.8	-0.3	
GM-GIS-KR_ssGM_621	MH-GIS-MH-31	528.89	MH-GIS-KR_ssMH_1896	518.29	19.3	0.55	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_642	MH-GIS-MH-20	570.83	MH-GIS-KR_ssMH_1442	570.02	10.2	0.08	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-KR_ssGM_643	MH-GIS-MH-151	579.54	MH-GIS-MH-20	570.83	118.6	0.073	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_644	MH-GIS-KR_ssMH_1916	559.83	MH-GIS-KR_ssMH_1439	565.63	104.6	-0.055	8	PVC	0.01	1	100	5.2	
GM-GIS-KR_ssGM_645	MH-GIS-KR_ssMH_1917	585.29	MH-GIS-KR_ssMH_1439	565.63	256.8	0.077	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_536	MH-IS-MH-2	408.8	MH-GIS-KV_ssMH_1913	417.96	20.6	0.444	8	PVC	0.01	2	4.9	8.5	
GM-GIS-KV_ssGM_539	MH-GIS-KV_ssMH_2205	458.37	MH-IS-82	448.73	44.8	0.215	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_558	MH-GIS-MH-108	504.12	MH-IS-121	498.94	71.9	0.072	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_752	MH-GIS-AR_ssMH_2017	517.96	MH-IS-154	499.58	185.3	0.099	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-KV_ssGM_970	MH-GIS-KV_ssMH_2150	418.31	MH-GIS-KV_ssMH_1913	417.96	87.6	0.004	8	PVC	0.01	2	4.4	-0.6	
GM-GIS-KV_ssGM_971	MH-GIS-KV_ssMH_2151	419.18	MH-GIS-KV_ssMH_2150	418.31	217.1	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-KV_ssGM_1063	MH-GIS-KV_ssMH_2190	449.99	MH-IS-81	438.64	73.2	0.155	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-KV_ssGM_1064	MH-GIS-KV_ssMH_2191	450.77	MH-GIS-KV_ssMH_2190	449.99	196.2	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-KV_ssGM_1088	MH-GIS-KV_ssMH_2186	457	MH-IS-82	448.73	154.5	0.054	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-MB_ssGM_842	MH-GIS-MB_ssMH_2062	417.89	MH-GIS-MB_ssMH_1459	415.85	296.9	0.007	8	Glass	0.013	12	11.4	-0.6	
GM-GIS-MB_ssGM_843	MH-GIS-MB_ssMH_1459	415.85	MH-GIS-MB_ssMH_1460	414.21	235.7	0.007	8	Concrete	0.013	37	19.6	-0.5	
GM-GIS-MB_ssGM_844	MH-GIS-MB_ssMH_1458	415.48	MH-GIS-MB_ssMH_1459	415.85	258.2	-0.001	8	Glass	0.013	12	79.6	-0.1	
GM-GIS-MB_ssGM_845	MH-GIS-MB_ssMH_1457	416.2	MH-GIS-MB_ssMH_1458	415.48	257.9	0.003	8	Glass	0.013	8	11.7	-0.6	
GM-GIS-MB_ssGM_846	MH-GIS-MB_ssMH_1460	414.21	MH-GIS-MB_ssMH_2063	415.06	147.3	-0.006	8	Glass	0.013	46	100	0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-MB_ssGM_847	MH-GIS-MB_ssMH_2063	415.06	MH-GIS-MB_ssMH_2064	415.09	272.7	-1E-04	8	Concrete	0.013	54	60.3	-0.3	
GM-GIS-MB_ssGM_848	MH-GIS-MB_ssMH_2064	415.09	MH-GIS-MB_ssMH_2066	412.31	270.3	0.01	8	Concrete	0.013	58	24.6	-0.5	
GM-GIS-MB_ssGM_849	MH-GIS-MB_ssMH_2066	412.31	MH-GIS-MB_ssMH_2065	405.51	52.5	0.129	8	Concrete	0.013	62	25.5	-0.5	SM2
GM-GIS-MB_ssGM_850	MH-GIS-MB_ssMH_2065	405.51	MH-GIS-MB_ssMH_2067	408.72	220.6	-0.015	8	Concrete	0.013	66	100	5.6	SM2
GM-GIS-MB_ssGM_851	MH-GIS-MB_ssMH_2068	416.46	MH-GIS-MB_ssMH_2063	415.06	293	0.005	8	Concrete	0.013	4	7.4	-0.6	
GM-GIS-MB_ssGM_852	MH-GIS-MB_ssMH_2070	414	MH-GIS-MB_ssMH_2069	416.57	297.5	-0.009	8	Concrete	0.013	21	100	2.9	
GM-GIS-MB_ssGM_853	MH-GIS-MB_ssMH_2071	414.51	MH-GIS-MB_ssMH_2070	414	236.3	0.002	8	Concrete	0.013	4	100	2.4	
GM-GIS-MB_ssGM_854	MH-GIS-MB_ssMH_2072	417.27	MH-GIS-MB_ssMH_2073	409.91	101.6	0.072	8	Concrete	0.013	54	23.7	-0.5	
GM-GIS-MB_ssGM_896	MH-GIS-MB_ssMH_2073	409.91	MH-GIS-MB_ssMH_2096	411.42	87.3	-0.017	8	PVC	0.01	58	100	1.1	
GM-GIS-MB_ssGM_897	MH-GIS-MB_ssMH_2097	415.13	MH-GIS-MB_ssMH_1460	414.21	432.2	0.002	8	Concrete	0.013	4	51.9	-0.3	
GM-GIS-MB_ssGM_898	MH-GIS-MH-150	418.93	MH-GIS-MB_ssMH_2098	418.47	117	0.004	8	Glass	0.013	4	7.7	-0.6	
GM-GIS-MB_ssGM_899	MH-GIS-MB_ssMH_2098	418.47	MH-GIS-MB_ssMH_2062	417.89	143.9	0.004	8	Vitrified Clay	0.013	8	10.7	-0.6	
GM-GIS-MB_ssGM_902	MH-GIS-MB_ssMH_1456	414	MH-GIS-MB_ssMH_1455	414	185.5	0	8	Concrete	0.013	4	100	2.9	
GM-GIS-MB_ssGM_903	MH-GIS-MB_ssMH_1455	414	MH-GIS-MB_ssMH_2070	414	256.9	0	8	Concrete	0.013	12	100	2.9	
GM-GIS-MB_ssGM_904	MH-GIS-MB_ssMH_2069	416.57	MH-GIS-MB_ssMH_1463	415.51	204.1	0.005	8	Concrete	0.013	33	100	0.4	
GM-GIS-MB_ssGM_905	MH-GIS-MB_ssMH_1463	415.51	MH-GIS-MB_ssMH_1462	414	146.3	0.01	8	Concrete	0.013	37	100	1.4	
GM-GIS-MB_ssGM_906	MH-GIS-MB_ssMH_1462	414	MH-GIS-MB_ssMH_2099	414	152.2	0	8	Concrete	0.013	41	100	2.9	
GM-GIS-MB_ssGM_907	MH-GIS-MB_ssMH_2099	414	MH-GIS-MB_ssMH_2100	412.94	189.2	0.006	8	Concrete	0.013	46	100	2.9	
GM-GIS-MB_ssGM_908	MH-GIS-MB_ssMH_2100	412.94	MH-GIS-MB_ssMH_2072	417.27	140.4	-0.031	8	Concrete	0.013	50	100	3.9	
GM-GIS-MB_ssGM_912	MH-GIS-MH-180	414	MH-GIS-MB_ssMH_1455	414	154	0	8	Concrete	0.013	4	100	2.9	
GM-GIS-MB_ssGM_921	MH-GIS-MB_ssMH_2152	416.16	MH-GIS-MB_ssMH_2069	416.57	399	-0.001	8	Concrete	0.013	8	100	0.8	
GM-GIS-MB_ssGM_997	MH-GIS-MB_ssMH_2170	417.01	MH-GIS-MB_ssMH_1459	415.85	163.5	0.007	8	Concrete	0.013	8	9.4	-0.6	
GM-GIS-MB_ssGM_998	MH-GIS-MB_ssMH_2171	417.99	MH-GIS-MB_ssMH_2170	417.01	263	0.004	8	Concrete	0.013	4	7.8	-0.6	
GM-GIS-MB_ssGM_999	MH-GIS-MH-141	416.19	MH-GIS-MB_ssMH_1457	416.2	101	-1E-04	8	Concrete	0.013	4	17.6	-0.5	
GM-GIS-MB_ssGM_1014	MH-GIS-MB_ssMH_2096	411.42	PS4WW	399.83	3.1	3.713	8	Cast iron	0.013	133	37.7	-0.4	
GM-GIS-MB_ssGM_1017	MH-GIS-MB_ssMH_2067	408.72	MH-GIS-MB_ssMH_2096	411.42	21.2	-0.127	8	Concrete	0.013	70	100	2.3	SM2
GM-GIS-MB_ssGM_1089	MH-GIS-MH-143	417.14	MH-GIS-MB_ssMH_2152	416.16	103.1	0.01	8	Concrete	0.013	4	67.7	-0.2	
GM-GIS-MU_ssGM_332	MH-GIS-MH-130	824.65	MH-GIS-MH-28	822.32	100	0.023	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_333	MH-GIS-MH-129	830.87	MH-GIS-MH-130	824.65	90	0.069	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_334	MH-GIS-MH-201	814.99	MH-GIS-MH-80	819.26	202.5	-0.021	8	PVC	0.01	1	100	6	
GM-GIS-MU_ssGM_335	MH-GIS-MH-204	820.15	MH-GIS-MH-201	814.99	221.1	0.023	8	PVC	0.01	1	100	0.2	
GM-GIS-MU_ssGM_336	MH-GIS-MH-80	819.26	MH-GIS-MU_ssMH_1810	821.61	50	-0.047	8	PVC	0.01	2	100	1.8	
GM-GIS-MU_ssGM_406	MH-GIS-MU_ssMH_1797	844.97	MH-GIS-MU_ssMH_1798	840.84	109.8	0.038	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_407	MH-GIS-MU_ssMH_1798	840.84	MH-GIS-MU_ssMH_1799	841.52	151.2	-0.005	8	PVC	0.01	2	100	0.1	
GM-GIS-MU_ssGM_408	MH-GIS-MU_ssMH_1799	841.52	MH-GIS-MU_ssMH_1809	832.29	149	0.062	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-MU_ssGM_409	MH-GIS-MU_ssMH_1801	839	MH-GIS-MU_ssMH_1800	831.63	206.8	0.036	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_410	MH-GIS-MU_ssMH_1800	831.63	MH-GIS-MU_ssMH_1802	829	42.5	0.062	8	PVC	0.01	1	100	0.1	
GM-GIS-MU_ssGM_411	MH-GIS-MU_ssMH_1803	828.62	MH-GIS-MU_ssMH_1809	832.29	198.9	-0.018	8	PVC	0.01	4	100	3.1	
GM-GIS-MU_ssGM_412	MH-GIS-MU_ssMH_1802	829	MH-GIS-MU_ssMH_1804	827.72	137.6	0.009	8	PVC	0.01	2	100	2.7	
GM-GIS-MU_ssGM_413	MH-GIS-MU_ssMH_1804	827.72	MH-GIS-MU_ssMH_1803	828.62	93.8	-0.01	8	PVC	0.01	3	100	4	
GM-GIS-MU_ssGM_414	MH-GIS-MU_ssMH_1806	845.55	MH-GIS-MU_ssMH_1807	837.51	116.7	0.069	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_415	MH-GIS-MU_ssMH_1807	837.51	MH-GIS-MU_ssMH_1808	836.34	107.4	0.011	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_416	MH-GIS-MU_ssMH_1808	836.34	MH-GIS-MU_ssMH_1809	832.29	160.6	0.025	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-MU_ssGM_417	MH-GIS-MU_ssMH_1811	818.4	MH-GIS-MU_ssMH_1805	809.96	80.2	0.105	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-MU_ssGM_418	MH-GIS-MU_ssMH_1811	818.4	MH-GIS-MH-28	822.32	17.9	0.219	8	PVC	0.01	2	4.7	3.3	
GM-GIS-MU_ssGM_419	MH-GIS-MU_ssMH_1812	841.15	MH-GIS-MU_ssMH_1799	841.52	68.1	-0.005	8	PVC	0.01	1	63	-0.2	
GM-GIS-MU_ssGM_420	MH-GIS-MH-146	844.16	MH-GIS-MU_ssMH_1812	841.15	109.6	0.027	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_421	MH-GIS-MH-131	847.51	MH-GIS-MU_ssMH_1797	844.97	94.4	0.027	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_422	MH-GIS-MU_ssMH_1810	821.61	MH-GIS-MU_ssMH_1811	818.4	327.2	0.01	8	PVC	0.01	15	12.2	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-MU_ssGM_423	MH-GIS-MU_ssMH_1813	831.08	MH-GIS-MU_ssMH_1810	821.61	160.2	0.059	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-MU_ssGM_424	MH-GIS-MU_ssMH_1809	832.29	MH-GIS-MU_ssMH_1813	831.08	32.4	0.037	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-NC_ssGM_713	MH-GIS-MH-159	411.85	MH-GIS-NC_ssMH_1983	411.33	129.6	0.004	8	Glass	0.013	2	6	-0.6	
GM-GIS-NC_ssGM_714	MH-GIS-NC_ssMH_1983	411.33	MH-IS-188	407.79	180.3	0.02	8	Glass	0.013	5	6.9	-0.6	
GM-GIS-NC_ssGM_715	MH-GIS-NC_ssMH_1984	411.05	MH-IS-148	404.7	271.6	0.023	8	Concrete	0.013	40	20.5	-0.5	
GM-GIS-NC_ssGM_716	MH-GIS-NC_ssMH_1985	413.81	MH-GIS-NC_ssMH_1984	411.05	237.1	0.012	8	Concrete	0.013	38	19.8	-0.5	
GM-GIS-NC_ssGM_717	MH-GIS-NC_ssMH_1987	414	MH-GIS-NC_ssMH_1990	414	75	0	8	Concrete	0.013	31	35.2	-0.4	
GM-GIS-NC_ssGM_718	MH-GIS-NC_ssMH_1990	414	MH-GIS-NC_ssMH_1991	413.35	127.3	0.005	8	Concrete	0.013	33	19.8	-0.5	
GM-GIS-NC_ssGM_719	MH-GIS-NC_ssMH_1991	413.35	MH-GIS-NC_ssMH_1985	413.81	73	-0.006	8	Concrete	0.013	36	99.8	0	SM4
GM-GIS-NC_ssGM_720	MH-GIS-NC_ssMH_1986	413.35	MH-GIS-NC_ssMH_1987	414	143.2	-0.005	8	Concrete	0.013	5	100	0.2	
GM-GIS-NC_ssGM_721	MH-GIS-MH-156	410.7	MH-GIS-NC_ssMH_1986	413.35	127.2	-0.021	8	Concrete	0.013	2	100	2.9	
GM-GIS-NC_ssGM_722	MH-GIS-NC_ssMH_1988	414	MH-GIS-NC_ssMH_1987	414	14.9	0	8	Concrete	0.013	24	35.8	-0.4	
GM-GIS-NC_ssGM_723	MH-GIS-NC_ssMH_1989	414	MH-GIS-NC_ssMH_1988	414	49.7	0	8	Concrete	0.013	21	37.2	-0.4	
GM-GIS-NC_ssGM_724	MH-GIS-NC_ssMH_1993	414	MH-GIS-NC_ssMH_1992	414	15.9	0	8	Concrete	0.013	17	40.6	-0.4	
GM-GIS-NC_ssGM_725	MH-GIS-NC_ssMH_1992	414	MH-GIS-NC_ssMH_1989	414	172	0	8	Concrete	0.013	19	40.4	-0.4	
GM-GIS-NC_ssGM_726	MH-GIS-NC_ssMH_1995	412.09	MH-GIS-NC_ssMH_1996	413.4	161.4	-0.008	8	Concrete	0.013	7	100	1.5	
GM-GIS-NC_ssGM_727	MH-GIS-MH-109	412.69	MH-GIS-NC_ssMH_1996	413.4	72.4	-0.01	8	Concrete	0.013	2	100	0.9	
GM-GIS-NC_ssGM_728	MH-GIS-NC_ssMH_1996	413.4	MH-GIS-NC_ssMH_1994	413.99	123.2	-0.005	8	Concrete	0.013	12	100	0.2	
GM-GIS-NC_ssGM_729	MH-GIS-NC_ssMH_1994	413.99	MH-GIS-NC_ssMH_1993	414	192.4	-5E-05	8	Concrete	0.013	14	43.6	-0.4	
GM-GIS-NC_ssGM_730	MH-GIS-NC_ssMH_1998	411.16	MH-IS-248	408.21	455.2	0.006	8	Concrete	0.013	9	9.9	-0.6	
GM-GIS-NC_ssGM_732	MH-GIS-NC_ssMH_2001	414	MH-GIS-NC_ssMH_2000	410.94	267.5	0.011	8	Concrete	0.013	2	4.8	-0.6	
GM-GIS-NC_ssGM_733	MH-GIS-NC_ssMH_2000	410.94	MH-IS-214	408.1	148	0.019	8	Concrete	0.013	5	6.9	-0.6	SM4
GM-GIS-NC_ssGM_739	MH-GIS-NC_ssMH_2004	409.85	MH-GIS-NC_ssMH_1522	409.08	192.1	0.004	8	PVC	0.01	2	5.3	-0.6	
GM-GIS-NC_ssGM_740	MH-GIS-NC_ssMH_1522	409.08	MH-GIS-NC_ssMH_1521	409	164.1	5E-04	8	PVC	0.01	5	12	-0.6	
GM-GIS-NC_ssGM_741	MH-GIS-NC_ssMH_1521	409	MH-IS-144	403.08	174	0.034	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-NC_ssGM_840	MH-GIS-NC_ssMH_2061	411.3	MH-GIS-NC_ssMH_1995	412.09	441.2	-0.002	8	PVC	0.01	2	100	2.3	
GM-GIS-NC_ssGM_841	MH-GIS-MH-56	411.79	MH-GIS-NC_ssMH_1995	412.09	38.2	-0.008	8	PVC	0.01	2	100	1.8	
GM-GIS-NE_ssGM_48	MH-GIS-NE_ssMH_1315	856.39	MH-GIS-NE_ssMH_1297	857.74	45.9	0.029	8	PVC	0.01	4	6.5	0.7	
GM-GIS-NE_ssGM_49	MH-GIS-NE_ssMH_1298	854.31	MH-IS-205	845.9	55	0.153	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-NE_ssGM_50	MH-GIS-NE_ssMH_1295	854.07	MH-IS-205	845.9	36.8	0.222	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_51	MH-GIS-NE_ssMH_1304	862.69	MH-GIS-NE_ssMH_1297	857.74	190.1	0.026	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_52	MH-GIS-NE_ssMH_1303	862.09	MH-GIS-NE_ssMH_1304	862.69	116.7	-0.005	8	PVC	0.01	2	100	0	
GM-GIS-NE_ssGM_53	MH-GIS-NE_ssMH_1296	860.61	MH-GIS-NE_ssMH_1303	862.09	47	-0.031	8	PVC	0.01	2	100	1.5	
GM-GIS-NE_ssGM_54	MH-GIS-NE_ssMH_1300	858.22	MH-GIS-NE_ssMH_1299	857.7	102.5	0.005	8	PVC	0.01	2	5.1	-0.6	
GM-GIS-NE_ssGM_55	MH-GIS-NE_ssMH_1301	858.5	MH-GIS-NE_ssMH_1300	858.22	148.1	0.002	8	PVC	0.01	2	5.3	-0.6	
GM-GIS-NE_ssGM_56	MH-GIS-NE_ssMH_1299	857.7	MH-GIS-NE_ssMH_1298	854.31	131	0.026	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_57	MH-GIS-MH-57	859.16	MH-GIS-NE_ssMH_1301	858.5	38.4	0.017	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_58	MH-GIS-NE_ssMH_1302	857.22	MH-GIS-NE_ssMH_1295	854.07	114.7	0.027	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_59	MH-GIS-MH-124	859	MH-GIS-NE_ssMH_1302	857.22	84.3	0.021	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_60	MH-GIS-NE_ssMH_1296	860.61	MH-GIS-MH-60	857.92	40.2	-0.067	8	PVC	0.01	1	100	1.5	
GM-GIS-NE_ssGM_61	MH-GIS-NE_ssMH_1677	863	MH-GIS-NE_ssMH_1335	861.87	36.8	0.031	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_62	MH-GIS-NE_ssMH_1315	856.39	MH-GIS-NE_ssMH_1339	851.06	154.4	0.035	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_63	MH-GIS-MH-105	852.15	MH-GIS-NE_ssMH_1317	854.61	68.4	-0.036	8	PVC	0.01	1	100	1.8	
GM-GIS-NE_ssGM_64	MH-GIS-NE_ssMH_1339	851.06	MH-GIS-NE_ssMH_1316	851.91	177.9	-0.005	8	PVC	0.01	7	100	0.3	
GM-GIS-NE_ssGM_66	MH-GIS-MH-125	891.48	MH-GIS-NE_ssMH_1308	889	85.6	0.029	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_67	MH-GIS-NE_ssMH_1343	869	MH-GIS-NE_ssMH_1324	871.3	226.4	-0.01	8	PVC	0.01	5	100	1.7	
GM-GIS-NE_ssGM_68	MH-GIS-NE_ssMH_1312	876.87	MH-GIS-NE_ssMH_1328	865.28	261.4	0.044	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_69	MH-GIS-MH-126	877.34	MH-GIS-NE_ssMH_1312	876.87	85.7	0.005	8	PVC	0.01	1	3	-0.6	
GM-GIS-NE_ssGM_70	MH-GIS-NE_ssMH_1309	882.54	MH-GIS-NE_ssMH_1348	879.07	155.5	0.022	8	PVC	0.01	12	11.2	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-NE_ssGM_71	MH-GIS-DH_ssMH_1310	888.97	MH-GIS-NE_ssMH_1309	882.54	356.7	0.018	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-NE_ssGM_72	MH-GIS-NE_ssMH_1319	869	MH-GIS-NE_ssMH_1343	869	78.2	0	8	PVC	0.01	3	100	1.7	
GM-GIS-NE_ssGM_73	MH-GIS-NE_ssMH_1307	878.68	MH-GIS-NE_ssMH_1324	871.3	225.9	0.033	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_74	MH-GIS-NE_ssMH_1308	889	MH-GIS-NE_ssMH_1307	878.68	292.2	0.035	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_79	MH-GIS-NE_ssMH_1348	879.07	MH-GIS-NE_ssMH_1334	862.57	346.2	0.048	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-NE_ssGM_86	MH-GIS-NE_ssMH_1317	854.61	MH-GIS-NE_ssMH_1339	851.06	191.8	0.019	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_87	MH-GIS-NE_ssMH_1316	851.91	MH-GIS-NE_ssMH_1318	851.7	190.7	0.001	8	PVC	0.01	8	12.9	-0.6	
GM-GIS-NE_ssGM_88	MH-GIS-NE_ssMH_1336	867.41	MH-GIS-NE_ssMH_1335	861.87	386.3	0.014	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_89	MH-GIS-NE_ssMH_1335	861.87	MH-GIS-NE_ssMH_1334	862.57	149.3	-0.005	8	PVC	0.01	7	100	0.1	
GM-GIS-NE_ssGM_90	MH-GIS-NE_ssMH_1334	862.57	MH-GIS-NE_ssMH_1333	860.25	235.6	0.01	8	PVC	0.01	22	14.8	-0.6	
GM-GIS-NE_ssGM_91	MH-GIS-NE_ssMH_1333	860.25	MH-IS-276	849.3	252.6	0.043	8	PVC	0.01	22	15.2	-0.6	
GM-GIS-NE_ssGM_94	MH-GIS-NE_ssMH_1318	851.7	MH-IS-203	843.68	198.7	0.04	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-NE_ssGM_95	MH-GIS-NE_ssMH_1328	865.28	MH-GIS-NE_ssMH_1329	863.49	157	0.011	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-NE_ssGM_97	MH-GIS-NE_ssMH_1330	859	MH-IS-201	841.44	191.5	0.092	8	PVC	0.01	21	14.6	-0.6	
GM-GIS-NE_ssGM_98	MH-GIS-NE_ssMH_1329	863.49	MH-GIS-NE_ssMH_1330	859	175.2	0.026	8	PVC	0.01	19	14	-0.6	
GM-GIS-NE_ssGM_99	MH-GIS-NE_ssMH_1346	864	MH-GIS-NE_ssMH_1328	865.28	168.9	-0.008	8	PVC	0.01	15	100	0.8	
GM-GIS-NE_ssGM_100	MH-GIS-NE_ssMH_1324	871.3	MH-GIS-NE_ssMH_1325	868.22	155.7	0.02	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-NE_ssGM_101	MH-GIS-NE_ssMH_1327	864	MH-GIS-NE_ssMH_1346	864	158.8	0	8	PVC	0.01	14	100	0.8	
GM-GIS-NE_ssGM_102	MH-GIS-NE_ssMH_1326	865.7	MH-GIS-NE_ssMH_1327	864	117.8	0.014	8	PVC	0.01	10	10	-0.6	
GM-GIS-NE_ssGM_103	MH-GIS-NE_ssMH_1325	868.22	MH-GIS-NE_ssMH_1326	865.7	150.3	0.017	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-NE_ssGM_171	MH-GIS-NE_ssMH_1313	868.11	MH-GIS-NE_ssMH_1343	869	96.8	-0.009	8	PVC	0.01	1	100	2.6	
GM-GIS-NE_ssGM_173	MH-GIS-NE_ssMH_1562	831.9	MH-GIS-NE_ssMH_1563	826	111.8	0.053	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_174	MH-GIS-NE_ssMH_1563	826	MH-GIS-NE_ssMH_1564	823	53	0.057	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_175	MH-GIS-NE_ssMH_1565	822.14	MH-GIS-NE_ssMH_1567	819.88	83.3	0.027	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_176	MH-GIS-NE_ssMH_1566	828.75	MH-GIS-NE_ssMH_1565	822.14	180.5	0.037	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_177	MH-GIS-NE_ssMH_1569	831.92	MH-GIS-NE_ssMH_1566	828.75	57.8	0.055	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_178	MH-GIS-NE_ssMH_1567	819.88	MH-IS-3	797.17	107.5	0.211	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_179	MH-GIS-NE_ssMH_1564	823	MH-GIS-NE_ssMH_1565	822.14	167.6	0.005	8	PVC	0.01	2	5.1	-0.6	
GM-GIS-NE_ssGM_222	MH-GIS-FW_ssMH_1608	884.67	MH-GIS-NE_ssMH_1605	875.6	205.1	0.044	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-NE_ssGM_224	MH-GIS-MH-115	840.44	MH-IS-249	830.76	75.7	0.128	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_227	MH-GIS-NE_ssMH_1610	840.34	MH-IS-249	830.76	207.6	0.046	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-NE_ssGM_229	MH-GIS-NE_ssMH_1611	835.16	MH-GIS-NE_ssMH_1610	840.34	206.8	-0.025	8	PVC	0.01	7	100	4.7	
GM-GIS-NE_ssGM_230	MH-GIS-NE_ssMH_2184	836.06	MH-GIS-NE_ssMH_1611	835.16	43.8	0.021	8	PVC	0.01	7	100	3.8	
GM-GIS-NE_ssGM_231	MH-GIS-NE_ssMH_1605	875.6	MH-GIS-NE_ssMH_1604	868.35	211.3	0.034	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-NE_ssGM_318	MH-GIS-NE_ssMH_1679	872.8	MH-GIS-NE_ssMH_1678	871.46	225.6	0.006	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_319	MH-GIS-NE_ssMH_1680	882.57	MH-GIS-NE_ssMH_1679	872.8	205.6	0.048	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_320	MH-GIS-NE_ssMH_1683	879	MH-GIS-NE_ssMH_1682	877.35	185.7	0.009	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_321	MH-GIS-NE_ssMH_1682	877.35	MH-GIS-NE_ssMH_1681	866.6	200.5	0.054	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_322	MH-GIS-NE_ssMH_1678	871.46	MH-GIS-NE_ssMH_1681	866.6	245.7	0.02	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_323	MH-GIS-NE_ssMH_1681	866.6	MH-GIS-NE_ssMH_1677	863	87.3	0.041	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_324	MH-GIS-NE_ssMH_1689	863.6	MH-GIS-NE_ssMH_1690	859	78	0.059	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NE_ssGM_325	MH-GIS-NE_ssMH_1684	865.93	MH-GIS-NE_ssMH_1327	864	131.7	0.015	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_326	MH-GIS-NE_ssMH_1687	868.98	MH-GIS-NE_ssMH_1684	865.93	100.2	0.03	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_327	MH-GIS-NE_ssMH_1686	869.89	MH-GIS-NE_ssMH_1687	868.98	125.7	0.007	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_328	MH-GIS-NE_ssMH_1685	875.58	MH-GIS-NE_ssMH_1686	869.89	120.2	0.047	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_450	MH-GIS-NE_ssMH_1816	878.47	MH-GIS-NE_ssMH_1319	869	175.5	0.054	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_451	MH-GIS-NE_ssMH_1814	882.73	MH-GIS-NE_ssMH_1816	878.47	76.5	0.056	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_452	MH-GIS-NE_ssMH_1815	880.36	MH-GIS-NE_ssMH_1814	882.73	104.7	-0.023	8	PVC	0.01	1	100	1.7	
GM-GIS-NE_ssGM_476	MH-GIS-ST_ssMH_1541	863.36	MH-IS-70	866.12	62.4	-0.044	8	Ductile Iron	0.013	34	100	2.3	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-NE_ssGM_480	MH-GIS-NE_ssMH_1690	859	MH-IS-71	858.15	143.8	0.006	8	Ductile Iron	0.013	3	5.7	-0.6	
GM-GIS-NE_ssGM_481	MH-GIS-MH-98	858	MH-IS-71	858.15	62.3	-0.002	8	Ductile Iron	0.013	1	43.5	-0.4	
GM-GIS-NE_ssGM_486	MH-GIS-NE_ssMH_1847	871.21	MH-IS-70	866.12	168.5	0.03	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-NE_ssGM_487	MH-GIS-NE_ssMH_1849	881.09	MH-GIS-NE_ssMH_1848	875.96	197.5	0.026	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_488	MH-GIS-NE_ssMH_1851	886.82	MH-GIS-NE_ssMH_1849	881.09	122.4	0.047	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-NE_ssGM_489	MH-GIS-NE_ssMH_1852	891.98	MH-GIS-NE_ssMH_1851	886.82	137.9	0.037	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-NE_ssGM_490	MH-GIS-NE_ssMH_1850	896.68	MH-GIS-NE_ssMH_1852	891.98	192.4	0.024	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NE_ssGM_491	MH-GIS-NE_ssMH_1848	875.96	MH-GIS-NE_ssMH_1847	871.21	211.2	0.022	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-NE_ssGM_492	MH-GIS-NE_ssMH_1853	894	MH-IS-69	876.77	174.8	0.099	8	Ductile Iron	0.013	1	2.9	-0.6	
GM-GIS-NE_ssGM_587	MH-GIS-NE_ssMH_1688	874	MH-GIS-NE_ssMH_1312	876.87	130.5	-0.022	8	PVC	0.01	1	100	2.2	
GM-GIS-NE_ssGM_1035	MH-GIS-NE_ssMH_2177	838.01	MH-GIS-NE_ssMH_2184	836.06	62.9	0.031	8	PVC	0.01	6	100	1.8	
GM-GIS-NE_ssGM_1036	MH-GIS-NE_ssMH_2179	840.41	MH-GIS-NE_ssMH_2177	838.01	169.7	0.014	8	PVC	0.01	5	11.5	-0.6	
GM-GIS-NE_ssGM_1037	MH-GIS-NE_ssMH_2181	842.94	MH-GIS-NE_ssMH_2178	842.59	125.8	0.003	8	PVC	0.01	2	5.9	-0.6	
GM-GIS-NE_ssGM_1038	MH-GIS-NE_ssMH_2178	842.59	MH-GIS-NE_ssMH_2179	840.41	30.9	0.071	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-NE_ssGM_1039	MH-GIS-NE_ssMH_2183	844	MH-GIS-NE_ssMH_2181	842.94	122.6	0.009	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_1040	MH-GIS-NE_ssMH_2180	843.16	MH-GIS-NE_ssMH_2178	842.59	145.7	0.004	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-NE_ssGM_1041	MH-GIS-NE_ssMH_2182	846.38	MH-GIS-NE_ssMH_2183	844	123	0.019	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_1048	MH-GIS-DH_ssMH_1841	902.08	MH-GIS-NE_ssMH_1839	898.53	148.7	0.024	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-NE_ssGM_1049	MH-GIS-NE_ssMH_1839	898.53	MH-IS-69	876.77	141	0.154	8	Ductile Iron	0.013	18	13.7	-0.6	
GM-GIS-NE_ssGM_1068	MH-GIS-NE_ssMH_2195	863.72	MH-GIS-NE_ssMH_1330	859	60.5	0.078	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_1071	MH-GIS-NE_ssMH_2198	844	MH-IS-233	831.11	105.7	0.122	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_1072	MH-GIS-NE_ssMH_2199	846.87	MH-GIS-NE_ssMH_2198	844	114	0.025	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_1073	MH-GIS-NE_ssMH_2200	849	MH-GIS-NE_ssMH_2199	846.87	43	0.05	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-NE_ssGM_1074	MH-GIS-NE_ssMH_2201	853.71	MH-GIS-NE_ssMH_2200	849	114.1	0.041	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_1075	MH-GIS-NE_ssMH_2203	854	MH-GIS-NE_ssMH_2201	853.71	44.2	0.007	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_1076	MH-GIS-NE_ssMH_2202	854	MH-GIS-NE_ssMH_2203	854	45.5	0	8	PVC	0.01	2	9.1	-0.6	
GM-GIS-NE_ssGM_1077	MH-GIS-NE_ssMH_2204	854	MH-GIS-NE_ssMH_2202	854	83.8	0	8	PVC	0.01	1	9.6	-0.6	
GM-GIS-NE_ssGM_1081	MH-GIS-NE_ssMH_2176	877.99	MH-GIS-NE_ssMH_1311	872.35	59.6	0.095	6	PVC	0.01	1	4.1	-0.5	
GM-GIS-NE_ssGM_1082	MH-GIS-NE_ssMH_1311	872.35	MH-IS-234	862.31	64.7	0.155	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NJ_ssGM_581	MH-GIS-MH-174	854.94	MH-GIS-MH-173	852.82	148.4	0.014	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-NJ_ssGM_582	MH-GIS-MH-172	854.95	MH-GIS-MH-173	852.82	147.7	0.014	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-PA_ssGM_817	MH-GIS-PA_ssMH_2041	819.14	MH-GIS-PA_ssMH_2042	811.79	123.1	0.06	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-PA_ssGM_818	MH-GIS-PA_ssMH_2042	811.79	MH-GIS-PA_ssMH_2038	801.05	124.5	0.086	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-PA_ssGM_819	MH-GIS-PA_ssMH_2048	797.66	MH-GIS-PA_ssMH_2047	802.09	122.8	-0.036	8	Glass	0.013	3	100	3.8	
GM-GIS-PA_ssGM_820	MH-GIS-PA_ssMH_2046	800.91	MH-GIS-PA_ssMH_2060	794.84	112.5	0.054	8	Glass	0.013	5	7.2	-0.6	
GM-GIS-PA_ssGM_821	MH-GIS-PA_ssMH_2060	794.84	MH-GIS-GC_ssMH_2059	794	187.5	0.004	8	Glass	0.013	6	8.8	-0.6	
GM-GIS-PA_ssGM_822	MH-GIS-PA_ssMH_2038	801.05	MH-GIS-PA_ssMH_2048	797.66	117.6	0.029	8	Glass	0.013	2	100	0.5	
GM-GIS-PA_ssGM_823	MH-GIS-PA_ssMH_2047	802.09	MH-GIS-PA_ssMH_2046	800.91	400.3	0.003	8	Glass	0.013	4	8.3	-0.6	
GM-GIS-PA_ssGM_824	MH-GIS-GC_ssMH_2059	794	MH-GIS-MH-97	794	36.9	0	8	Glass	0.013	7	16.9	-0.6	
GM-GIS-RI_ssGM_1244	MH-GIS-EP_ssMH_2317	1,044.00	MH-GIS-RI_ssMH_2318	1,044.79	392.6	-0.002	8	PVC	0.01	113	100	0.6	
GM-GIS-RI_ssGM_1245	MH-GIS-RI_ssMH_2318	1,044.79	MH-GIS-RI_ssMH_2326	1,044.00	75.5	0.01	8	PVC	0.01	115	35	-0.4	
GM-GIS-RI_ssGM_1246	MH-GIS-RI_ssMH_2319	1,043.14	MH-GIS-RI_ssMH_2329	1,034.10	162.8	0.056	8	PVC	0.01	118	35.5	-0.4	
GM-GIS-RI_ssGM_1247	MH-GIS-RI_ssMH_2327	1,009.32	MH-GIS-RI_ssMH_2322	995.97	127.4	0.105	8	PVC	0.01	148	39.9	-0.4	
GM-GIS-RI_ssGM_1248	MH-GIS-RI_ssMH_2322	995.97	MH-GIS-RI_ssMH_2320	987.3	88.6	0.098	8	PVC	0.01	150	40.2	-0.4	
GM-GIS-RI_ssGM_1249	MH-GIS-RI_ssMH_2326	1,044.00	MH-GIS-RI_ssMH_2319	1,043.14	102.7	0.008	8	PVC	0.01	116	35.3	-0.4	
GM-GIS-RI_ssGM_1257	MH-GIS-RI_ssMH_2320	987.3	MH-GIS-CR_ssMH_2331	979.07	98.4	0.084	8	PVC	0.01	155	40.9	-0.4	
GM-GIS-RI_ssGM_1264	MH-GIS-RI_ssMH_2329	1,034.10	MH-GIS-RI_ssMH_2327	1,009.32	233.9	0.106	8	PVC	0.01	146	39.7	-0.4	
GM-GIS-RI_ssGM_1265	MH-GIS-RI_ssMH_2567	1,034.71	MH-GIS-RI_ssMH_2329	1,034.10	75	0.008	8	PVC	0.01	26	16.5	-0.6	
GM-GIS-RI_ssGM_1302	MH-GIS-RI_ssMH_2376	1,051.81	MH-GIS-RI_ssMH_2389	1,049.11	213.9	0.013	8	PVC	0.01	2	4.2	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-RI_ssGM_1303	MH-GIS-RI_ssMH_2389	1,049.11	MH-GIS-RI_ssMH_2366	1,048.11	52.9	0.019	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1304	MH-GIS-RI_ssMH_2375	1,029.15	MH-GIS-RI_ssMH_2371	1,019.04	178.5	0.057	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1305	MH-GIS-RI_ssMH_2371	1,019.04	MH-GIS-RI_ssMH_2384	1,014.00	142.3	0.035	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-RI_ssGM_1306	MH-GIS-RI_ssMH_2384	1,014.00	MH-GIS-RI_ssMH_2381	1,010.84	138.8	0.023	8	PVC	0.01	14	12	-0.6	
GM-GIS-RI_ssGM_1307	MH-GIS-RI_ssMH_2377	1,003.28	MH-GIS-RI_ssMH_2378	992.3	95.6	0.115	8	PVC	0.01	40	20.5	-0.5	
GM-GIS-RI_ssGM_1308	MH-GIS-RI_ssMH_2373	1,023.44	MH-GIS-RI_ssMH_2371	1,019.04	85	0.052	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1309	MH-GIS-RI_ssMH_2368	1,044.30	MH-GIS-RI_ssMH_2369	1,017.04	363.5	0.075	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-RI_ssGM_1310	MH-GIS-RI_ssMH_2372	1,028.88	MH-GIS-RI_ssMH_2373	1,023.44	43.3	0.126	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1311	MH-GIS-RI_ssMH_2374	1,040.14	MH-GIS-RI_ssMH_2372	1,028.88	144.1	0.078	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1312	MH-GIS-RI_ssMH_2378	992.3	MH-GIS-RI_ssMH_2380	976.93	128.1	0.12	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-RI_ssGM_1313	MH-GIS-RI_ssMH_2380	976.93	MH-GIS-CR_ssMH_2379	970.91	51.8	0.116	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-RI_ssGM_1314	MH-GIS-RI_ssMH_2381	1,010.84	MH-GIS-RI_ssMH_2390	1,009.47	70.7	0.019	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-RI_ssGM_1315	MH-GIS-RI_ssMH_2390	1,009.47	MH-GIS-RI_ssMH_2377	1,003.28	62.9	0.098	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-RI_ssGM_1316	MH-GIS-RI_ssMH_2382	1,011.10	MH-GIS-RI_ssMH_2370	1,008.28	173.5	0.016	8	PVC	0.01	14	12	-0.6	
GM-GIS-RI_ssGM_1317	MH-GIS-RI_ssMH_2369	1,017.04	MH-GIS-RI_ssMH_2386	1,013.87	37.7	0.084	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-RI_ssGM_1318	MH-GIS-RI_ssMH_2370	1,008.28	MH-GIS-RI_ssMH_2383	1,007.11	182	0.006	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-RI_ssGM_1319	MH-GIS-RI_ssMH_2367	1,046.50	MH-GIS-RI_ssMH_2368	1,044.30	81.4	0.027	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-RI_ssGM_1320	MH-GIS-RI_ssMH_2366	1,048.11	MH-GIS-RI_ssMH_2367	1,046.50	162.4	0.01	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1321	MH-GIS-RI_ssMH_2385	1,019.49	MH-GIS-RI_ssMH_2384	1,014.00	81.2	0.068	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1322	MH-GIS-RI_ssMH_2386	1,013.87	MH-GIS-RI_ssMH_2382	1,011.10	71.9	0.039	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-RI_ssGM_1323	MH-GIS-RI_ssMH_2388	1,027.47	MH-GIS-RI_ssMH_2385	1,019.49	58.3	0.137	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1324	MH-GIS-RI_ssMH_2391	1,000.58	MH-GIS-RI_ssMH_2377	1,003.28	88.8	-0.03	8	PVC	0.01	21	100	2.2	
GM-GIS-RI_ssGM_1325	MH-GIS-RI_ssMH_2383	1,007.11	MH-GIS-RI_ssMH_2387	1,000.16	291.1	0.024	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-RI_ssGM_1326	MH-GIS-RI_ssMH_2387	1,000.16	MH-GIS-RI_ssMH_2391	1,000.58	44.8	-0.009	8	PVC	0.01	19	100	2.6	
GM-GIS-RI_ssGM_1327	MH-GIS-RI_ssMH_2392	1,037.74	MH-GIS-RI_ssMH_2396	1,030.17	175.3	0.043	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1328	MH-GIS-RI_ssMH_2394	1,033.48	MH-GIS-RI_ssMH_2393	1,025.56	221	0.036	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1329	MH-GIS-RI_ssMH_2566	1,032.26	MH-GIS-RI_ssMH_2395	1,034.00	142	-0.012	8	PVC	0.01	2	100	1.1	
GM-GIS-RI_ssGM_1330	MH-GIS-RI_ssMH_2395	1,034.00	MH-GIS-RI_ssMH_2394	1,033.48	43.7	0.012	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1331	MH-GIS-RI_ssMH_2400	1,039.67	MH-GIS-RI_ssMH_2392	1,037.74	63	0.031	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1332	MH-GIS-RI_ssMH_2399	1,037.54	MH-GIS-RI_ssMH_2392	1,037.74	77.9	-0.003	8	PVC	0.01	2	38.3	-0.4	
GM-GIS-RI_ssGM_1333	MH-GIS-RI_ssMH_2393	1,025.56	MH-GIS-RI_ssMH_2401	1,025.26	79.7	0.004	8	PVC	0.01	7	100	5	
GM-GIS-RI_ssGM_1334	MH-GIS-RI_ssMH_2401	1,025.26	MH-GIS-RI_ssMH_2404	1,026.47	33.5	-0.036	8	PVC	0.01	9	100	6.5	
GM-GIS-RI_ssGM_1335	MH-GIS-RI_ssMH_2397	1,027.19	MH-GIS-RI_ssMH_2567	1,034.71	256.3	-0.029	8	PVC	0.01	25	100	7.1	
GM-GIS-RI_ssGM_1336	MH-GIS-RI_ssMH_2398	1,033.56	MH-GIS-RI_ssMH_2396	1,030.17	81.7	0.042	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1337	MH-GIS-RI_ssMH_2396	1,030.17	MH-GIS-RI_ssMH_2402	1,028.72	62.6	0.023	8	PVC	0.01	9	100	2.4	
GM-GIS-RI_ssGM_1338	MH-GIS-RI_ssMH_2402	1,028.72	MH-GIS-RI_ssMH_2403	1,028.11	119.1	0.005	8	PVC	0.01	21	100	3.8	
GM-GIS-RI_ssGM_1339	MH-GIS-RI_ssMH_2404	1,026.47	MH-GIS-RI_ssMH_2402	1,028.72	84.5	-0.027	8	PVC	0.01	11	100	6.1	
GM-GIS-RI_ssGM_1340	MH-GIS-RI_ssMH_2403	1,028.11	MH-GIS-RI_ssMH_2397	1,027.19	39.3	0.023	8	PVC	0.01	23	100	4.4	
GM-GIS-RW_ssGM_731	MH-GIS-RW_ssMH_1999	416.83	MH-GIS-RW_ssMH_1527	415.93	225.3	0.004	8	Concrete	0.013	9	11.1	-0.6	
GM-GIS-RW_ssGM_757	MH-GIS-RW_ssMH_1506	417.71	MH-IS-97	412.47	183	0.029	8	Concrete	0.013	36	19.2	-0.5	SM4
GM-GIS-RW_ssGM_758	MH-GIS-RW_ssMH_2019	417	MH-GIS-RW_ssMH_2018	416.02	278.1	0.004	8	Glass	0.013	2	6.1	-0.6	
GM-GIS-RW_ssGM_759	MH-GIS-RW_ssMH_2018	416.02	MH-IS-245	410.33	46.7	0.122	8	Concrete	0.013	5	6.9	-0.6	
GM-GIS-RW_ssGM_772	MH-GIS-RW_ssMH_1527	415.93	MH-GIS-RW_ssMH_1526	414.56	342.1	0.004	8	Concrete	0.013	18	15.5	-0.6	
GM-GIS-RW_ssGM_773	MH-GIS-RW_ssMH_1526	414.56	MH-IS-267	409.97	102.7	0.045	8	Concrete	0.013	27	16.6	-0.6	
GM-GIS-RW_ssGM_790	MH-GIS-RW_ssMH_1486	417.09	MH-GIS-RW_ssMH_1485	415.75	164.7	0.008	8	Concrete	0.013	57	24.4	-0.5	
GM-GIS-RW_ssGM_792	MH-GIS-RW_ssMH_1469	414.1	MH-GIS-RW_ssMH_1485	415.75	250.1	-0.007	8	Concrete	0.013	3	100	1.2	SM4
GM-GIS-RW_ssGM_793	MH-GIS-RW_ssMH_1502	416.26	MH-GIS-RW_ssMH_1487	416.66	173.4	-0.002	8	Concrete	0.013	43	100	0.4	
GM-GIS-RW_ssGM_794	MH-GIS-RW_ssMH_1487	416.66	MH-GIS-RW_ssMH_1486	417.09	126.5	-0.003	8	Concrete	0.013	54	100	0	
GM-GIS-RW_ssGM_795	MH-GIS-MH-203	418.22	MH-GIS-RW_ssMH_1487	416.66	220.3	0.007	8	Concrete	0.013	3	6.1	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-RW_ssGM_796	MH-GIS-RW_ssMH_1488	414.61	MH-GIS-RW_ssMH_1487	416.66	419.1	-0.005	8	Concrete	0.013	3	100	2.1	SM4
GM-GIS-RW_ssGM_797	MH-GIS-RW_ssMH_2027	414.03	MH-GIS-RW_ssMH_2028	415.82	340	-0.005	8	Concrete	0.013	13	100	2.7	
GM-GIS-RW_ssGM_798	MH-GIS-RW_ssMH_2028	415.82	MH-GIS-RW_ssMH_1502	416.26	62.1	-0.007	8	Concrete	0.013	30	100	0.9	
GM-GIS-RW_ssGM_799	MH-GIS-RW_ssMH_1500	415.02	MH-GIS-RW_ssMH_1501	415.3	35.3	-0.008	8	PVC	0.01	10	100	1.7	
GM-GIS-RW_ssGM_800	MH-GIS-RW_ssMH_1501	415.3	MH-GIS-RW_ssMH_2028	415.82	127.5	-0.004	8	PVC	0.01	13	100	1.4	
GM-GIS-RW_ssGM_801	MH-GIS-RW_ssMH_1499	414	MH-GIS-RW_ssMH_1500	415.02	153.5	-0.007	8	PVC	0.01	7	100	2.7	
GM-GIS-RW_ssGM_803	MH-GIS-MH-208	415.42	MH-GIS-RW_ssMH_1498	414	352	0.004	8	Glass	0.013	9	11.1	-0.6	
GM-GIS-RW_ssGM_811	MH-GIS-RW_ssMH_2032	419	MH-GIS-RW_ssMH_2033	415.4	230.7	0.016	8	Concrete	0.013	13	11.7	-0.6	
GM-GIS-RW_ssGM_812	MH-GIS-RW_ssMH_2033	415.4	MH-GIS-RW_ssMH_2034	414	87.2	0.016	8	Concrete	0.013	23	15.5	-0.6	
GM-GIS-RW_ssGM_814	MH-GIS-RW_ssMH_2035	417.46	MH-GIS-RW_ssMH_2032	419	228.5	-0.007	8	Concrete	0.013	7	100	1	
GM-GIS-RW_ssGM_815	MH-GIS-MH-153	419	MH-GIS-RW_ssMH_2032	419	123.5	0	8	Concrete	0.013	3	15.9	-0.6	
GM-GIS-RW_ssGM_816	MH-GIS-MH-58	417.61	MH-GIS-RW_ssMH_2035	417.46	39.9	0.004	8	Glass	0.013	3	100	0.8	
GM-GIS-RW_ssGM_873	MH-GIS-RW_ssMH_2085	418.19	MH-GIS-RW_ssMH_2086	416.31	246	0.008	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-RW_ssGM_874	MH-GIS-RW_ssMH_2086	416.31	MH-GIS-RW_ssMH_1502	416.26	83.6	6E-04	8	PVC	0.01	10	100	0.4	
GM-GIS-RW_ssGM_976	MH-GIS-RW_ssMH_2156	415.17	MH-GIS-RW_ssMH_2033	415.4	20.6	-0.011	8	PVC	0.01	7	50.6	-0.3	
GM-GIS-RW_ssGM_977	MH-GIS-RW_ssMH_2157	417.22	MH-GIS-RW_ssMH_2156	415.17	184.2	0.011	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-RW_ssGM_1006	MH-GIS-MH-181	417.73	MH-GIS-RW_ssMH_2085	418.19	154.4	-0.003	8	PVC	0.01	3	80.5	-0.1	
GM-GIS-RW_ssGM_1012	MH-GIS-RW_ssMH_2094	417.87	MH-GIS-RW_ssMH_2095	415.61	328.5	0.007	8	Concrete	0.013	18	13.6	-0.6	
GM-GIS-RW_ssGM_1032	MH-GIS-MH-35	414	MH-IS-1	413.11	23	0.039	8	PVC	0.01	18	99.6	0	
GM-GIS-RW_ssGM_1033	MH-GIS-RW_ssMH_1514	414.67	MH-GIS-MH-35	414	413.4	0.002	8	Concrete	0.013	9	14	-0.6	
GM-GIS-RW_ssGM_1103	MH-GIS-MH-15	414.08	MH-GIS-MH-11	414.05	4.5	0.007	8	PVC	0.01	7	100	2.6	
GM-GIS-RW_ssGM_1104	MH-GIS-RW_ssMH_2027	414.03	MH-GIS-MH-11	414.05	2.8	0.007	8	Concrete	0.013	10	100	2.7	
GM-GIS-RW_ssGM_1105	MH-GIS-MH-82	414	MH-GIS-RW_ssMH_1499	414	51.2	0	8	PVC	0.01	3	100	2.7	
GM-GIS-SC_ssGM_124	MH-GIS-SC_ssMH_1387	832.42	MH-GIS-SC_ssMH_1388	826.75	115.7	0.049	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_125	MH-GIS-SC_ssMH_1393	827.52	MH-GIS-SC_ssMH_1414	821.04	88.4	0.073	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_126	MH-GIS-SC_ssMH_1414	821.04	MH-GIS-SC_ssMH_1415	816.57	117.4	0.038	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_127	MH-GIS-SC_ssMH_1415	816.57	MH-GIS-SC_ssMH_1394	817.44	123.6	-0.007	8	PVC	0.01	7	100	2.5	
GM-GIS-SC_ssGM_128	MH-GIS-MH-64	823.45	MH-GIS-SC_ssMH_1413	818.04	42.7	0.127	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_129	MH-GIS-SC_ssMH_1409	837.73	MH-GIS-SC_ssMH_1410	826.59	124.1	0.09	8	PVC	0.01	40	20.4	-0.5	
GM-GIS-SC_ssGM_130	MH-GIS-SC_ssMH_1408	876.06	MH-GIS-SC_ssMH_1385	868.7	62	0.119	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_131	MH-GIS-SC_ssMH_1407	882.65	MH-GIS-SC_ssMH_1408	876.06	62.9	0.105	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_132	MH-GIS-SC_ssMH_1384	888.26	MH-GIS-SC_ssMH_1407	882.65	62.5	0.09	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-SC_ssGM_133	MH-GIS-SC_ssMH_1406	893.38	MH-GIS-SC_ssMH_1384	888.26	61.8	0.083	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_134	MH-GIS-SC_ssMH_1383	900.79	MH-GIS-SC_ssMH_1406	893.38	105	0.071	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_135	MH-GIS-SC_ssMH_1405	844.7	MH-GIS-SC_ssMH_1382	850.2	58.7	0.094	8	PVC	0.01	20	14.3	4.9	
GM-GIS-SC_ssGM_136	MH-GIS-SC_ssMH_1404	853.62	MH-GIS-SC_ssMH_1382	850.2	57.5	0.059	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_137	MH-GIS-SC_ssMH_1394	817.44	MH-GIS-SC_ssMH_1401	819.51	60.7	-0.034	8	PVC	0.01	33	100	1.6	
GM-GIS-SC_ssGM_138	MH-GIS-SC_ssMH_1412	821.98	MH-GIS-SC_ssMH_1401	819.51	98.4	0.025	8	PVC	0.01	47	22.1	-0.5	
GM-GIS-SC_ssGM_139	MH-GIS-SC_ssMH_1403	801.9	MH-GIS-SC_ssMH_1386	800.02	89.6	0.021	8	PVC	0.01	87	100	3.5	
GM-GIS-SC_ssGM_140	MH-GIS-SC_ssMH_1402	806.3	MH-GIS-SC_ssMH_1403	801.9	85.7	0.051	8	PVC	0.01	85	29.9	-0.5	
GM-GIS-SC_ssGM_141	MH-GIS-SC_ssMH_1401	819.51	MH-GIS-SC_ssMH_1402	806.3	135.3	0.098	8	PVC	0.01	82	29.5	-0.5	
GM-GIS-SC_ssGM_142	MH-GIS-SC_ssMH_1405	844.7	MH-GIS-SC_ssMH_1400	825.38	130.2	0.148	8	PVC	0.01	22	15.1	-0.6	
GM-GIS-SC_ssGM_143	MH-GIS-SC_ssMH_1400	825.38	MH-GIS-SC_ssMH_1394	817.44	96.3	0.082	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-SC_ssGM_144	MH-GIS-SC_ssMH_1379	808.09	MH-GIS-SC_ssMH_1399	805.62	196.3	0.013	8	PVC	0.01	111	34.5	-0.4	
GM-GIS-SC_ssGM_146	MH-GIS-SC_ssMH_1399	805.62	MH-IS-147	790.4	124.5	0.122	8	PVC	0.01	350	62.6	-0.2	
GM-GIS-SC_ssGM_151	MH-GIS-SC_ssMH_1390	815.09	MH-GIS-SC_ssMH_1391	809	119	0.051	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_152	MH-GIS-SC_ssMH_1391	809	MH-IS-235	798.05	86.9	0.126	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_153	MH-GIS-SC_ssMH_1389	821.1	MH-GIS-SC_ssMH_1390	815.09	101.1	0.059	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-SC_ssGM_154	MH-GIS-SC_ssMH_1388	826.75	MH-GIS-SC_ssMH_1389	821.1	106	0.053	8	PVC	0.01	4	6.7	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-SC_ssGM_155	MH-GIS-SC_ssMH_1411	824	MH-GIS-SC_ssMH_1412	821.98	149.8	0.013	8	PVC	0.01	45	21.5	-0.5	
GM-GIS-SC_ssGM_156	MH-GIS-SC_ssMH_1410	826.59	MH-GIS-SC_ssMH_1411	824	130.1	0.02	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-SC_ssGM_158	MH-GIS-SC_ssMH_1386	800.02	MH-GIS-SC_ssMH_1378	800.92	127.1	-0.007	8	PVC	0.01	89	100	6.3	
GM-GIS-SC_ssGM_159	MH-GIS-SC_ssMH_1385	868.7	MH-GIS-SC_ssMH_1382	850.2	167	0.111	8	PVC	0.01	13	11.7	-0.6	
GM-GIS-SC_ssGM_160	MH-GIS-SC_ssMH_1373	860.98	MH-GIS-SC_ssMH_1404	853.62	158.8	0.046	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_162	MH-GIS-SC_ssMH_1378	800.92	MH-GIS-SC_ssMH_1381	806.03	218.6	-0.023	8	PVC	0.01	91	100	6.9	
GM-GIS-SC_ssGM_163	MH-GIS-SC_ssMH_1381	806.03	MH-GIS-SC_ssMH_1380	805.45	127.1	0.005	8	PVC	0.01	94	100	1.8	
GM-GIS-SC_ssGM_164	MH-GIS-SC_ssMH_1380	805.45	MH-GIS-SC_ssMH_1379	808.09	138.7	-0.019	8	PVC	0.01	96	100	2.3	
GM-GIS-SC_ssGM_165	MH-GIS-SC_ssMH_1377	812.62	MH-GIS-SC_ssMH_1379	808.09	137.7	0.033	8	PVC	0.01	13	11.7	-0.6	
GM-GIS-SC_ssGM_166	MH-GIS-SC_ssMH_1376	817.41	MH-GIS-SC_ssMH_1377	812.62	119.1	0.04	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_167	MH-GIS-SC_ssMH_1375	823.01	MH-GIS-SC_ssMH_1376	817.41	255.8	0.022	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_168	MH-GIS-SC_ssMH_1374	818.18	MH-GIS-SC_ssMH_1375	823.01	220.3	-0.022	8	PVC	0.01	7	100	4.3	
GM-GIS-SC_ssGM_169	MH-GIS-SC_ssMH_1413	818.04	MH-GIS-SC_ssMH_1374	818.18	168.6	-8E-04	8	PVC	0.01	4	100	4.4	
GM-GIS-SF_ssGM_186	MH-GIS-SF_ssMH_2138	441.25	MH-GIS-SF_ssMH_1574	441.02	84.7	0.003	8	Concrete	0.013	93	39.7	-0.4	
GM-GIS-SF_ssGM_187	MH-GIS-SF_ssMH_1574	441.02	MH-GIS-SF_ssMH_1575	438.75	461.7	0.005	8	Concrete	0.013	96	34.3	-0.4	
GM-GIS-SF_ssGM_188	MH-GIS-SF_ssMH_1575	438.75	MH-GIS-SF_ssMH_1576	438.31	233.1	0.002	8	Concrete	0.013	99	44.9	-0.4	
GM-GIS-SF_ssGM_879	MH-GIS-SF_ssMH_1450	417.9	MH-GIS-SF_ssMH_1447	416.32	98.7	0.016	10	Glass	0.013	49	17	-0.7	
GM-GIS-SF_ssGM_880	MH-GIS-SF_ssMH_1449	419.28	MH-GIS-SF_ssMH_1450	417.9	179	0.008	10	Glass	0.013	23	11.6	-0.7	
GM-GIS-SF_ssGM_881	MH-GIS-SF_ssMH_1447	410.46	IPPS Wetwell	400.65	77.2	0.127	14	Glass	0.013	611	40.3	-0.7	
GM-GIS-SF_ssGM_882	MH-GIS-SF_ssMH_2088	429.06	MH-IS-27	424.37	121.1	0.039	8	PVC	0.01	549	78.5	-0.1	
GM-GIS-SF_ssGM_951	MH-GIS-MH-24	428.63	MH-GIS-SF_ssMH_1449	424.58	13.2	0.307	10	Ductile Iron	0.013	3	3.9	-0.8	
GM-GIS-SF_ssGM_952	MH-GIS-MH-202	430.39	MH-GIS-MH-190	429.57	206.8	0.004	8	PVC	0.01	3	5.5	-0.6	
GM-GIS-SF_ssGM_953	MH-GIS-MH-190	429.57	MH-GIS-MH-83	428.92	162.1	0.004	8	PVC	0.01	5	7.6	-0.6	
GM-GIS-SF_ssGM_954	MH-GIS-MH-83	428.92	MH-GIS-MH-84	428.71	51.9	0.004	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-SF_ssGM_955	MH-GIS-MH-134	429.8	MH-GIS-SF_ssMH_2137	429.41	98.6	0.004	8	PVC	0.01	3	5.5	-0.6	
GM-GIS-SF_ssGM_956	MH-GIS-SF_ssMH_2137	429.41	MH-GIS-MH-84	428.71	174.2	0.004	8	PVC	0.01	5	7.6	-0.6	
GM-GIS-SF_ssGM_957	MH-GIS-MH-84	428.71	MH-GIS-SF_ssMH_2136	424.95	169	0.022	8	PVC	0.01	15	12.6	-0.6	
GM-GIS-SF_ssGM_958	MH-GIS-SF_ssMH_2136	424.95	MH-GIS-SF_ssMH_1449	424.28	139	0.005	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-SF_ssGM_959	MH-GIS-SF_ssMH_2149	477.68	MH-GIS-SF_ssMH_2148	476.43	12.3	0.101	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-SF_ssGM_960	MH-GIS-SF_ssMH_2148	476.43	MH-GIS-SF_ssMH_2147	471.41	67	0.075	8	PVC	0.01	36	19.4	-0.5	
GM-GIS-SF_ssGM_961	MH-GIS-SF_ssMH_2147	471.41	MH-GIS-SF_ssMH_2146	461.32	244.6	0.041	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-SF_ssGM_962	MH-GIS-SF_ssMH_2146	461.32	MH-GIS-SF_ssMH_2145	459.29	35.8	0.057	8	PVC	0.01	42	20.8	-0.5	
GM-GIS-SF_ssGM_963	MH-GIS-SF_ssMH_2145	459.29	MH-GIS-SF_ssMH_2141	457.36	36.5	0.053	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-SF_ssGM_964	MH-GIS-SF_ssMH_2141	457.36	MH-GIS-SF_ssMH_2140	451.88	23.7	0.231	8	PVC	0.01	86	30.1	-0.5	
GM-GIS-SF_ssGM_965	MH-GIS-SF_ssMH_2140	451.88	MH-GIS-SF_ssMH_2139	443.69	35.4	0.231	8	Concrete	0.013	88	30.6	-0.5	
GM-GIS-SF_ssGM_966	MH-GIS-SF_ssMH_2139	443.69	MH-GIS-SF_ssMH_2138	441.25	341.2	0.007	8	Concrete	0.013	91	31	-0.5	
GM-GIS-SF_ssGM_967	MH-GIS-SF_ssMH_2144	458.32	MH-GIS-SF_ssMH_2143	458.08	61.3	0.004	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-SF_ssGM_968	MH-GIS-SF_ssMH_2143	458.08	MH-GIS-SF_ssMH_2142	457.95	32.3	0.004	8	PVC	0.01	36	19.4	-0.5	
GM-GIS-SF_ssGM_969	MH-GIS-SF_ssMH_2142	457.95	MH-GIS-SF_ssMH_2141	457.36	108.4	0.005	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-SF_ssGM_1057(1)	MH-GIS-SF_ssMH_1451	419.29	MH-GIS-MH-69	419.11	31.1	0.006	10	Glass	0.013	8	7.2	-0.8	
GM-GIS-SF_ssGM_1057(2)(1)	MH-GIS-MH-69	419.11	MH-GIS-MH-63	418.7	73.7	0.006	10	Glass	0.013	13	9.2	-0.8	
GM-GIS-SF_ssGM_1057(2)(2)(1)	MH-GIS-MH-63	418.7	MH-GIS-MH-67	418.13	99.4	0.006	10	Glass	0.013	18	10.8	-0.7	
GM-GIS-SF_ssGM_1057(2)(2)(2)	MH-GIS-MH-67	418.13	MH-GIS-SF_ssMH_1450	417.9	41.1	0.006	10	Glass	0.013	23	12.1	-0.7	
GM-GIS-SF_ssGM_1058	MH-GIS-SF_ssMH_1452	423.36	MH-GIS-SF_ssMH_1451	423.29	17	0.004	8	Glass	0.013	5	8.5	-0.6	
GM-GIS-SF_ssGM_1059	MH-GIS-MH-66	419	MH-GIS-MH-67	418.13	44.6	0.019	8	Glass	0.013	3	5.1	-0.6	
GM-GIS-SF_ssGM_1060	MH-GIS-MH-68	419.29	MH-GIS-MH-69	419.11	45.6	0.004	8	Glass	0.013	3	6.2	-0.6	
GM-GIS-SF_ssGM_1061	MH-GIS-MH-62	419	MH-GIS-MH-63	418.7	43	0.007	8	Glass	0.013	3	5.4	-0.6	
GM-GIS-SF_ssGM_1062	MH-GIS-SF_ssMH_1452	423.36	MH-GIS-SF_ssMH_2224	423.37	3	0.004	8	Glass	0.013	3	7.2	-0.6	
GM-GIS-SF_ssGM_1065	MH-GIS-MH-94	427.82	MH-IS-27	424.37	61.4	0.056	8	PVC	0.01	3	5.1	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-SF_ssGM_1067	MH-GIS-MH-72	431.47	MH-GIS-SF_ssMH_2088	429.06	47.5	0.051	8	Glass	0.013	3	5.1	-0.6	
GM-GIS-SF_ssGM_1079	MH-GIS-SF_ssMH_1576	438.31	MH-GIS-SF_ssMH_2088	429.06	123.5	0.075	8	Concrete	0.013	544	78.2	-0.1	
GM-GIS-ST_ssGM_425	MH-GIS-MH-183	855.01	MH-GIS-ST_ssMH_1545	857.37	157.3	-0.015	8	PVC	0.01	1	100	7.7	
GM-GIS-ST_ssGM_426	MH-GIS-ST_ssMH_1548	860.52	MH-GIS-ST_ssMH_1546	859	76.6	0.02	8	PVC	0.01	18	100	2.2	
GM-GIS-ST_ssGM_427	MH-GIS-ST_ssMH_1547	856.62	MH-GIS-ST_ssMH_1546	859	136.9	-0.017	8	PVC	0.01	3	100	6.1	
GM-GIS-ST_ssGM_428	MH-GIS-MH-118	855.03	MH-GIS-ST_ssMH_1547	856.62	78.3	-0.02	8	PVC	0.01	1	100	6.9	
GM-GIS-ST_ssGM_429	MH-GIS-ST_ssMH_1546	859	MH-GIS-ST_ssMH_1545	857.37	140.4	0.012	8	PVC	0.01	22	100	3.7	
GM-GIS-ST_ssGM_430	MH-GIS-MH-158	859.17	MH-GIS-ST_ssMH_1545	857.37	129.6	0.014	8	PVC	0.01	1	100	3.5	
GM-GIS-ST_ssGM_431	MH-GIS-ST_ssMH_1545	857.37	MH-GIS-ST_ssMH_1544	859	146	-0.011	8	PVC	0.01	26	100	6.7	
GM-GIS-ST_ssGM_432	MH-GIS-MH-71	857.99	MH-GIS-ST_ssMH_1543	858.72	45	-0.016	8	PVC	0.01	1	100	6.1	
GM-GIS-ST_ssGM_433	MH-GIS-MH-161	854.41	MH-GIS-ST_ssMH_1549	857.28	134.8	-0.021	8	PVC	0.01	1	100	8.2	
GM-GIS-ST_ssGM_434	MH-GIS-ST_ssMH_1549	857.28	MH-GIS-ST_ssMH_1551	859.25	122.2	-0.016	8	PVC	0.01	3	100	5.4	
GM-GIS-ST_ssGM_435	MH-GIS-ST_ssMH_1550	857.16	MH-GIS-ST_ssMH_1551	859.25	176.8	-0.012	8	PVC	0.01	1	100	5.5	
GM-GIS-ST_ssGM_436	MH-GIS-ST_ssMH_1551	859.25	MH-GIS-ST_ssMH_1548	860.52	98.6	-0.013	8	PVC	0.01	5	100	3.5	
GM-GIS-ST_ssGM_437	MH-GIS-ST_ssMH_1556	870.35	MH-GIS-ST_ssMH_1554	865.14	151.1	0.034	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-ST_ssGM_438	MH-GIS-ST_ssMH_1557	873.32	MH-GIS-ST_ssMH_1556	870.35	103.9	0.029	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-ST_ssGM_439	MH-GIS-ST_ssMH_1558	875.23	MH-GIS-ST_ssMH_1557	873.32	103.4	0.018	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-ST_ssGM_440	MH-GIS-ST_ssMH_1560	882.81	MH-GIS-ST_ssMH_1559	877.89	159.8	0.031	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-ST_ssGM_441	MH-GIS-ST_ssMH_1559	877.89	MH-GIS-ST_ssMH_1558	875.23	106.9	0.025	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-ST_ssGM_442	MH-GIS-ST_ssMH_1555	871.37	MH-GIS-ST_ssMH_1554	865.14	264.7	0.024	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-ST_ssGM_443	MH-GIS-ST_ssMH_1548	860.52	MH-GIS-ST_ssMH_1552	861.96	96.3	0.015	8	PVC	0.01	12	100	2.2	
GM-GIS-ST_ssGM_444	MH-GIS-ST_ssMH_1553	864	MH-GIS-ST_ssMH_1552	861.96	112.2	0.018	8	PVC	0.01	10	10.3	-0.6	
GM-GIS-ST_ssGM_445	MH-GIS-ST_ssMH_1554	865.14	MH-GIS-ST_ssMH_1553	864	141.7	0.008	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-ST_ssGM_446	MH-GIS-ST_ssMH_1542	864	MH-GIS-ST_ssMH_1541	863.36	251.8	0.003	8	PVC	0.01	32	100	1.7	
GM-GIS-ST_ssGM_447	MH-GIS-ST_ssMH_1543	858.72	MH-GIS-ST_ssMH_1542	864	63	-0.084	8	PVC	0.01	31	100	6.9	
GM-GIS-ST_ssGM_448	MH-GIS-MH-157	862.37	MH-GIS-ST_ssMH_1544	859	128.5	0.026	8	PVC	0.01	1	100	1.7	
GM-GIS-ST_ssGM_449	MH-GIS-ST_ssMH_1544	859	MH-GIS-ST_ssMH_1543	858.72	178.5	0.002	8	PVC	0.01	28	100	5.1	
GM-GIS-TH_ssGM_145	MH-GIS-MH-205	810.83	MH-GIS-SC_ssMH_1399	805.62	257.5	0.02	8	PVC	0.01	236	51	-0.3	
GM-GIS-TH_ssGM_1341	MH-GIS-TH_ssMH_2410	832.92	MH-GIS-TH_ssMH_2411	845.81	261.2	-0.049	8	PVC	0.01	6	100	12.5	
GM-GIS-TH_ssGM_1342	MH-GIS-TH_ssMH_2409	831.23	MH-GIS-TH_ssMH_2410	832.92	85.5	-0.02	8	PVC	0.01	3	100	7	
GM-GIS-TH_ssGM_1343	MH-GIS-TH_ssMH_2411	845.81	MH-GIS-TH_ssMH_2427	845.8	117.2	9E-05	8	PVC	0.01	49	41.7	-0.4	
GM-GIS-TH_ssGM_1344	MH-GIS-TH_ssMH_2412	847.58	MH-GIS-TH_ssMH_2411	845.81	36.7	0.048	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1345	MH-GIS-TH_ssMH_2414	827.68	MH-GIS-TH_ssMH_2406	822.5	238.3	0.022	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1346	MH-GIS-TH_ssMH_2405	814	MH-GIS-TH_ssMH_2407	814	129.2	0	8	PVC	0.01	3	100	2.8	
GM-GIS-TH_ssGM_1347	MH-GIS-TH_ssMH_2408	818.97	MH-GIS-TH_ssMH_2407	814	237.6	0.021	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1348	MH-GIS-TH_ssMH_2406	822.5	MH-GIS-TH_ssMH_2408	818.97	219.6	0.016	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1349	MH-GIS-TH_ssMH_2415	824	MH-GIS-TH_ssMH_2416	819	239.9	0.021	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1350	MH-GIS-TH_ssMH_2416	819	MH-GIS-TH_ssMH_2417	819	71.4	0	8	PVC	0.01	6	100	3	
GM-GIS-TH_ssGM_1351	MH-GIS-TH_ssMH_2417	819	MH-GIS-TH_ssMH_2418	816.63	84	0.028	8	PVC	0.01	9	100	3	
GM-GIS-TH_ssGM_1352	MH-GIS-TH_ssMH_2407	814	MH-GIS-TH_ssMH_2419	814	171.7	0	8	PVC	0.01	15	100	2.8	
GM-GIS-TH_ssGM_1353	MH-GIS-TH_ssMH_2450	887.77	MH-GIS-TH_ssMH_2449	883.57	209	0.02	8	PVC	0.01	31	17.8	-0.5	
GM-GIS-TH_ssGM_1354	MH-GIS-TH_ssMH_2423	867.07	MH-GIS-TH_ssMH_2424	862.29	356	0.013	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1355	MH-GIS-TH_ssMH_2424	862.29	MH-GIS-TH_ssMH_2444	861.48	53.6	0.015	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1356	MH-GIS-TH_ssMH_2426	851.47	MH-GIS-TH_ssMH_2509	829	339.7	0.066	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1357	MH-GIS-TH_ssMH_2419	814	MH-GIS-TH_ssMH_2420	812.28	95.3	0.018	8	PVC	0.01	18	100	2.8	
GM-GIS-TH_ssGM_1358	MH-GIS-TH_ssMH_2418	816.63	MH-GIS-TH_ssMH_2421	817.85	62.8	-0.019	8	PVC	0.01	43	100	6.5	
GM-GIS-TH_ssGM_1359	MH-GIS-TH_ssMH_2421	817.85	MH-GIS-TH_ssMH_2429	817.77	109.3	7E-04	8	PVC	0.01	46	100	5.3	
GM-GIS-TH_ssGM_1360	MH-GIS-TH_ssMH_2429	817.77	MH-GIS-MH-127	824	199.8	-0.031	8	PVC	0.01	49	100	7.8	
GM-GIS-TH_ssGM_1361	MH-GIS-TH_ssMH_2436	878.25	MH-GIS-MH-122	882.33	165.9	-0.025	8	PVC	0.01	61	100	3.7	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-TH_ssGM_1362	MH-GIS-TH_ssMH_2430	874	MH-GIS-TH_ssMH_2436	878.25	265.8	-0.016	8	PVC	0.01	58	100	8	
GM-GIS-TH_ssGM_1363	MH-GIS-TH_ssMH_2431	874	MH-GIS-TH_ssMH_2430	874	62.3	0	8	PVC	0.01	55	100	5.3	
GM-GIS-TH_ssGM_1364	MH-GIS-TH_ssMH_2448	880.86	MH-GIS-TH_ssMH_2431	874	233.9	0.029	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-TH_ssGM_1365	MH-GIS-TH_ssMH_2433	889.23	MH-GIS-TH_ssMH_2432	883.44	165.9	0.035	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-TH_ssGM_1366	MH-GIS-TH_ssMH_2434	891.21	MH-GIS-TH_ssMH_2433	889.23	60.7	0.033	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1367	MH-GIS-TH_ssMH_2447	852.59	MH-GIS-TH_ssMH_2411	845.81	181.1	0.037	8	PVC	0.01	31	17.8	-0.5	
GM-GIS-TH_ssGM_1368	MH-GIS-TH_ssMH_2451	889	MH-GIS-TH_ssMH_2434	891.21	150.2	-0.015	8	PVC	0.01	6	100	1.6	
GM-GIS-TH_ssGM_1369	MH-GIS-TH_ssMH_2413	851.14	MH-GIS-TH_ssMH_2412	847.58	101	0.035	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1370	MH-GIS-TH_ssMH_2420	812.28	MH-GIS-TH_ssMH_2428	811.46	71	0.012	8	PVC	0.01	22	100	4.5	
GM-GIS-TH_ssGM_1371	MH-GIS-TH_ssMH_2428	811.46	MH-GIS-TH_ssMH_2437	813.12	87.5	-0.019	8	PVC	0.01	25	100	7	
GM-GIS-TH_ssGM_1372	MH-GIS-TH_ssMH_2438	814	MH-GIS-TH_ssMH_2418	816.63	164.2	-0.016	8	PVC	0.01	31	100	8	
GM-GIS-TH_ssGM_1373	MH-GIS-TH_ssMH_2437	813.12	MH-GIS-TH_ssMH_2438	814	71.7	-0.012	8	PVC	0.01	28	100	6.2	
GM-GIS-TH_ssGM_1374	MH-GIS-TH_ssMH_2439	851.96	MH-GIS-TH_ssMH_2413	851.14	87.8	0.009	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1375	MH-GIS-TH_ssMH_2442	862.25	MH-GIS-TH_ssMH_2443	859.08	180.9	0.018	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1376	MH-GIS-TH_ssMH_2441	863.07	MH-GIS-TH_ssMH_2442	862.25	48	0.017	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1377	MH-GIS-TH_ssMH_2440	865.19	MH-GIS-TH_ssMH_2441	863.07	53.8	0.039	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1378	MH-GIS-TH_ssMH_2445	862.69	MH-GIS-TH_ssMH_2444	861.48	101.3	0.012	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1379	MH-GIS-TH_ssMH_2446	866.93	MH-GIS-TH_ssMH_2445	862.69	116.3	0.036	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1380	MH-GIS-TH_ssMH_2444	861.48	MH-GIS-TH_ssMH_2443	859.08	57.1	0.042	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-TH_ssGM_1381	MH-GIS-TH_ssMH_2443	859.08	MH-GIS-TH_ssMH_2447	852.59	148.8	0.044	8	PVC	0.01	28	16.9	-0.6	
GM-GIS-TH_ssGM_1382	MH-GIS-TH_ssMH_2449	883.57	MH-GIS-TH_ssMH_2448	880.86	161	0.017	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-TH_ssGM_1383	MH-GIS-TH_ssMH_2432	883.44	MH-GIS-TH_ssMH_2448	880.86	77.1	0.033	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-TH_ssGM_1384	MH-GIS-MH-102	888.77	MH-GIS-TH_ssMH_2450	887.77	125.1	0.008	8	PVC	0.01	28	16.9	-0.6	
GM-GIS-TH_ssGM_1385	MH-GIS-TH_ssMH_2422	818.06	MH-GIS-MH-107	817.34	113.5	0.006	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1386	MH-GIS-TH_ssMH_2425	853.07	MH-GIS-MH-59	852.02	244.7	0.004	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-TH_ssGM_1387	MH-GIS-TH_ssMH_2435	892.75	MH-GIS-TH_ssMH_2451	889	240.4	0.016	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1388	MH-GIS-TH_ssMH_2427	845.8	MH-GIS-MH-119	845.1	150.8	0.005	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-TH_ssGM_1389	MH-GIS-TH_ssMH_2454	822.12	MH-GIS-TH_ssMH_2452	816.34	144.8	0.04	8	PVC	0.01	224	49.7	-0.3	
GM-GIS-TH_ssGM_1390	MH-GIS-TH_ssMH_2457	829	MH-GIS-TH_ssMH_2453	824	231.3	0.022	8	PVC	0.01	163	42	-0.4	
GM-GIS-TH_ssGM_1391	MH-GIS-TH_ssMH_2452	816.34	MH-GIS-MH-205	810.83	158.4	0.035	8	PVC	0.01	234	50.8	-0.3	
GM-GIS-TH_ssGM_1392	MH-GIS-TH_ssMH_2458	881.69	MH-GIS-TH_ssMH_2465	867.84	238.2	0.058	8	PVC	0.01	68	26.6	-0.5	
GM-GIS-TH_ssGM_1393	MH-GIS-TH_ssMH_2456	863.88	MH-GIS-TH_ssMH_2459	854.04	157.3	0.063	8	PVC	0.01	74	27.8	-0.5	
GM-GIS-TH_ssGM_1394	MH-GIS-MH-107	817.34	MH-GIS-TH_ssMH_2452	816.34	71.8	0.014	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1395	MH-GIS-MH-59	852.02	MH-GIS-TH_ssMH_2464	851.09	39.9	0.023	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1396	MH-GIS-TH_ssMH_2509	829	MH-GIS-TH_ssMH_2457	829	43.6	0	8	PVC	0.01	6	42	-0.4	
GM-GIS-TH_ssGM_1397	MH-GIS-TH_ssMH_2464	851.09	MH-GIS-TH_ssMH_2460	842.8	136.1	0.061	8	PVC	0.01	86	30.2	-0.5	
GM-GIS-TH_ssGM_1398	MH-GIS-MH-119	845.1	MH-GIS-TH_ssMH_2460	842.8	78.7	0.029	8	PVC	0.01	55	24	-0.5	
GM-GIS-TH_ssGM_1399	MH-GIS-MH-127	824	MH-GIS-TH_ssMH_2453	824	85.7	0	8	PVC	0.01	52	100	1.6	
GM-GIS-TH_ssGM_1400	MH-GIS-TH_ssMH_2462	829.3	MH-GIS-TH_ssMH_2457	829	204.4	0.001	8	PVC	0.01	154	54	-0.3	
GM-GIS-TH_ssGM_1401	MH-GIS-TH_ssMH_2463	829	MH-GIS-TH_ssMH_2462	829.3	152	-0.002	8	PVC	0.01	151	100	0.1	
GM-GIS-TH_ssGM_1402	MH-GIS-TH_ssMH_2459	854.04	MH-GIS-TH_ssMH_2464	851.09	49.3	0.06	8	PVC	0.01	77	28.4	-0.5	
GM-GIS-TH_ssGM_1403	MH-GIS-TH_ssMH_2465	867.84	MH-GIS-TH_ssMH_2456	863.88	68.1	0.058	8	PVC	0.01	71	27.2	-0.5	
GM-GIS-TH_ssGM_1404	MH-GIS-MH-122	882.33	MH-GIS-TH_ssMH_2458	881.69	83.1	0.008	8	PVC	0.01	65	26	-0.5	
GM-GIS-TH_ssGM_1405	MH-GIS-TH_ssMH_2466	825.56	MH-GIS-TH_ssMH_2454	822.12	400.2	0.009	8	PVC	0.01	221	49.3	-0.3	
GM-GIS-TH_ssGM_1406	MH-GIS-TH_ssMH_2453	824	MH-GIS-TH_ssMH_2466	825.56	214.6	-0.007	8	PVC	0.01	218	100	1.6	
GM-GIS-TH_ssGM_1407	MH-GIS-TH_ssMH_2460	842.8	MH-GIS-TH_ssMH_2461	837.94	79.3	0.061	8	PVC	0.01	144	39.5	-0.4	
GM-GIS-TH_ssGM_1408	MH-GIS-TH_ssMH_2461	837.94	MH-GIS-TH_ssMH_2463	829	173.6	0.052	8	PVC	0.01	148	39.9	-0.4	
GM-GIS-TH_ssGM_1409	MH-GIS-MH-96	891.26	MH-GIS-TH_ssMH_2467	889.56	60.3	0.028	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-TH_ssGM_1410	MH-GIS-TH_ssMH_2468	886.14	MH-GIS-TH_ssMH_2467	889.56	115.7	-0.03	8	PVC	0.01	3	100	2.9	

City of Snoqualmie
General Sewer Plan
SewerGEMS Results

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-TH_ssGM_1411	MH-GIS-TH_ssMH_2467	889.56	MH-GIS-MH-102	888.77	65.6	0.012	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-TH_ssGM_1412	MH-GIS-MH-39	899.81	MH-GIS-MH-40	899.01	27.4	0.029	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1413	MH-GIS-TH_ssMH_2508	895.72	MH-GIS-MH-96	891.26	227.1	0.02	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-TH_ssGM_1414	MH-GIS-MH-40	899.01	MH-GIS-TH_ssMH_2508	895.72	166.5	0.02	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-TH_ssGM_1415	MH-GIS-TH_ssMH_2469	899.48	MH-GIS-MH-39	899.81	94.7	-0.003	8	PVC	0.01	6	63.4	-0.2	
GM-GIS-TH_ssGM_1416	MH-GIS-TH_ssMH_2470	900.98	MH-GIS-TH_ssMH_2469	899.48	61.6	0.024	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-WC_ssGM_30	MH-GIS-WC_ssMH_1443	584.4	MH-GIS-WC_ssMH_1444	576.86	105.9	0.071	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-WC_ssGM_31	MH-GIS-WC_ssMH_1430	568.76	MH-GIS-WC_ssMH_1444	576.86	119.6	-0.068	8	PVC	0.01	7	100	9.8	
GM-GIS-WC_ssGM_32	MH-GIS-WC_ssMH_1438	586.92	MH-GIS-WC_ssMH_1443	584.4	113	0.022	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-WC_ssGM_33	MH-GIS-WC_ssMH_1444	576.86	MH-GIS-KR_ssMH_1445	579.09	178.7	-0.012	8	PVC	0.01	12	100	1.7	
GM-GIS-WC_ssGM_37	MH-GIS-MH-152	645.99	MH-GIS-WC_ssMH_1433	638.58	120.9	0.061	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_38	MH-GIS-WC_ssMH_1432	627.41	MH-GIS-WC_ssMH_1434	616.89	337.6	0.031	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-WC_ssGM_39	MH-GIS-WC_ssMH_1433	638.58	MH-GIS-WC_ssMH_1432	627.41	257.8	0.043	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-WC_ssGM_40	MH-GIS-WC_ssMH_1437	570.16	MH-GIS-WC_ssMH_1430	568.76	272.9	0.005	8	PVC	0.01	7	100	3.9	
GM-GIS-WC_ssGM_41	MH-GIS-MH-170	634.14	MH-GIS-WC_ssMH_1446	626.21	147.1	0.054	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_42	MH-GIS-WC_ssMH_1446	626.21	MH-GIS-WC_ssMH_1440	607.87	280.7	0.065	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-WC_ssGM_43	MH-GIS-WC_ssMH_1440	607.87	MH-GIS-WC_ssMH_1438	586.92	304	0.069	8	PVC	0.01	2	5	-0.6	
GM-GIS-WC_ssGM_44	MH-GIS-WC_ssMH_1436	600.59	MH-GIS-WC_ssMH_1437	570.16	340.3	0.089	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-WC_ssGM_45	MH-GIS-WC_ssMH_1435	611.95	MH-GIS-WC_ssMH_1436	600.59	130.7	0.087	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-WC_ssGM_46	MH-GIS-WC_ssMH_1434	616.89	MH-GIS-WC_ssMH_1435	611.95	85.2	0.058	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-WC_ssGM_47	MH-GIS-MH-120	629.37	MH-GIS-WC_ssMH_1432	627.41	79.5	0.025	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_108	MH-GIS-WC_ssMH_1561	651.21	MH-IS-107	644.73	77.8	0.083	8	PVC	0.01	1	2.9	-0.6	
GM-IS-2	MH-IS-276	849.3	MH-IS-205	845.9	150.7	0.023	10	PVC	0.01	71	20.6	-0.7	
GM-IS-3	MH-IS-221	840.61	MH-IS-223	839.61	174.8	0.006	10	PVC	0.01	111	25.9	-0.6	
GM-IS-4	MH-IS-201	841.44	MH-IS-221	840.61	69.9	0.012	10	PVC	0.01	110	25.8	-0.6	
GM-IS-5	MH-IS-229	834.38	MH-IS-233	831.11	247	0.013	10	PVC	0.01	115	26.2	-0.6	
GM-IS-6	MH-IS-225	838.58	MH-IS-227	835.69	254.9	0.011	10	PVC	0.01	113	26	-0.6	
GM-IS-7	MH-IS-223	839.61	MH-IS-225	838.58	237.4	0.004	10	PVC	0.01	112	25.9	-0.6	
GM-IS-8	MH-IS-234	862.31	MH-IS-243	858.19	164.3	0.025	10	PVC	0.01	45	16.2	-0.7	
GM-IS-9	MH-IS-227	835.69	MH-IS-229	834.38	95.6	0.014	10	PVC	0.01	114	26.1	-0.6	
GM-IS-10	MH-IS-251	855.2	MH-IS-261	853.85	164.5	0.008	10	PVC	0.01	47	16.5	-0.7	
GM-IS-11	MH-IS-243	858.19	MH-IS-251	855.2	188.2	0.016	10	PVC	0.01	46	16.4	-0.7	
GM-IS-12	MH-IS-269	850.48	MH-IS-276	849.3	264.6	0.004	10	PVC	0.01	48	16.9	-0.7	
GM-IS-13	MH-IS-261	853.85	MH-IS-269	850.48	285.6	0.012	10	PVC	0.01	47	16.7	-0.7	
GM-IS-14	MH-IS-203	843.68	MH-IS-201	841.44	159.9	0.014	10	PVC	0.01	89	23	-0.6	
GM-IS-15	MH-IS-211	869.29	MH-IS-234	862.31	166	0.042	10	PVC	0.01	42	15.8	-0.7	
GM-IS-16	MH-IS-185	875.33	MH-IS-211	869.29	249.3	0.024	10	PVC	0.01	42	15.6	-0.7	
GM-IS-17	MH-IS-146	876.12	MH-IS-185	875.33	147.9	0.005	10	Ductile Iron	0.013	41	16.2	-0.7	
GM-IS-18	MH-IS-18	799.57	MH-IS-235	798.05	144.3	0.011	12	PVC	0.01	70	16.1	-0.8	
GM-IS-19	MH-IS-147	790.4	PSLWW	789.9	57.6	0.009	12	PVC	0.01	439	41.5	-0.6	
GM-IS-20	MH-IS-186	794.7	MH-IS-147	790.4	84.3	0.051	12	PVC	0.01	88	18.1	-0.8	
GM-IS-21	MH-IS-212	795.56	MH-IS-186	794.7	81.7	0.011	12	PVC	0.01	86	17.9	-0.8	
GM-IS-22	MH-IS-235	798.05	MH-IS-212	795.56	92	0.027	12	PVC	0.01	83	17.7	-0.8	
GM-IS-23	MH-IS-3	797.17	MH-IS-117	796.57	128.5	0.005	12	PVC	0.01	7	4.9	-1	
GM-IS-28	MH-IS-187	422.69	MH-IS-213	420.51	310.9	0.007	12	PVC	0.01	556	47	-0.5	
GM-IS-29	MH-IS-27	424.37	MH-IS-187	422.69	270.5	0.006	12	PVC	0.01	554	46.9	-0.5	
GM-IS-30	MH-IS-39	847.91	MH-IS-290	832.16	182.5	0.086	12	PVC	0.01	702	53.1	-0.5	
GM-IS-31	MH-IS-233	831.11	MH-IS-249	830.76	39.8	0.009	10	PVC	0.01	121	27	-0.6	
GM-IS-32	MH-IS-249	830.76	MH-IS-126	830.14	295.5	0.002	10	PVC	0.01	131	32.2	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-33	MH-IS-40	811.95	MH-IS-36	792.15	132.2	0.15	12	PVC	0.01	721	53.8	-0.5	
GM-IS-34	MH-IS-290	832.16	MH-IS-31	830.87	241	0.005	12	PVC	0.01	702	53.1	-0.5	
GM-IS-35	MH-IS-31	830.87	MH-IS-32	829.81	139.4	0.008	12	PVC	0.01	703	53.1	-0.5	
GM-IS-36	MH-IS-32	829.81	MH-IS-33	827.47	336.3	0.007	12	PVC	0.01	704	53.2	-0.5	
GM-IS-37	MH-IS-33	827.47	MH-IS-35	824.02	225.5	0.015	12	PVC	0.01	705	53.2	-0.5	
GM-IS-38	MH-IS-35	824.02	MH-IS-40	811.95	301.4	0.04	12	PVC	0.01	706	53.2	-0.5	
GM-IS-39	MH-IS-36	792.15	MH-IS-37	788.58	65.5	0.054	12	PVC	0.01	722	53.8	-0.5	
GM-IS-40	MH-IS-37	788.58	MH-IS-38	767.46	126.7	0.167	12	PVC	0.01	722	53.9	-0.5	
GM-IS-42	MH-IS-MH-3	801.7	MH-GIS-DH_ssMH_1627	801.8	292	-3E-04	10	PVC	0.01	48	45.7	-0.5	
GM-IS-43	MH-IS-MH-4	873	MH-IS-46	869.81	399.4	0.008	12	PVC	0.01	543	46.4	-0.5	
GM-IS-44	MH-IS-43	861.48	MH-IS-44	849.46	145.7	0.083	12	PVC	0.01	549	46.7	-0.5	
GM-IS-45	MH-IS-44	849.46	MH-IS-39	847.91	70.6	0.022	12	PVC	0.01	550	46.7	-0.5	
GM-IS-46	MH-IS-46	869.81	MH-IS-43	861.48	366.7	0.023	12	PVC	0.01	544	46.4	-0.5	
GM-IS-47(1)	MH-IS-198	779.52	MH-IS-MH-210	778.16	18.4	0.074	10	PVC	0.01	795	71.7	-0.2	
GM-IS-47(2)	MH-IS-MH-210	778.16	MH-IS-195	775.63	34.1	0.074	10	PVC	0.01	798	71.8	-0.2	
GM-IS-48	MH-IS-MH-5	825.27	MH-IS-54	819.68	193.9	0.029	10	PVC	0.01	807	72.2	-0.2	
GM-IS-49	MH-IS-49	804.65	MH-IS-51	801.25	273	0.012	10	PVC	0.01	67	20	-0.7	
GM-IS-50	MH-IS-51	801.25	MH-IS-50	797.44	305.3	0.012	10	PVC	0.01	69	20.2	-0.7	
GM-IS-51	MH-IS-54	819.68	MH-IS-61	800.77	221.8	0.085	10	PVC	0.01	807	72.2	-0.2	
GM-IS-52	MH-IS-50	797.44	MH-IS-198	779.52	269.6	0.066	10	PVC	0.01	73	20.7	-0.7	
GM-IS-53	MH-IS-195	775.63	PSBPWW	775.63	45.7	0	10	PVC	0.01	799	100	0.1	
GM-IS-54	MH-IS-59	828.09	MH-IS-58	819.51	192.3	0.045	10	PVC	0.01	58	18.6	-0.7	
GM-IS-55	MH-IS-53	830.15	MH-IS-59	828.09	188.3	0.011	10	PVC	0.01	57	18.4	-0.7	
GM-IS-56	MH-IS-58	819.51	MH-IS-60	809.95	383.8	0.025	10	PVC	0.01	62	19.2	-0.7	
GM-IS-57	MH-IS-60	809.95	MH-IS-49	804.65	214.5	0.025	10	PVC	0.01	63	19.4	-0.7	
GM-IS-58	MH-IS-64	788.27	MH-IS-65	770.15	350.9	0.052	10	Ductile Iron	0.013	811	72.4	-0.2	
GM-IS-59	MH-IS-63	796.38	MH-IS-64	788.27	45.8	0.177	10	Ductile Iron	0.013	810	72.4	-0.2	
GM-IS-60	MH-IS-61	800.77	MH-IS-62	799.18	294.1	0.005	10	Ductile Iron	0.013	808	100	0.2	
GM-IS-61	MH-IS-65	770.15	MH-IS-116	769.83	183.2	0.002	10	Ductile Iron	0.013	812	100	0.8	
GM-IS-63	MH-IS-62	799.18	MH-IS-63	796.38	321.1	0.009	10	Ductile Iron	0.013	809	72.9	-0.2	
GM-IS-64(1)	MH-IS-152	852.91	MH-IS-BP_ssMH_2512	837.33	197.1	0.079	10	PVC	0.01	49	17	-0.7	
GM-IS-64(2)	MH-IS-BP_ssMH_2512	837.33	MH-IS-67	832.9	282.2	0.016	10	PVC	0.01	51	17.3	-0.7	
GM-IS-66	MH-IS-67	832.9	MH-IS-53	830.15	327.8	0.008	10	PVC	0.01	52	17.5	-0.7	
GM-IS-67	MH-IS-69	876.77	MH-IS-146	876.12	109.3	0.006	10	Ductile Iron	0.013	40	15.6	-0.7	
GM-IS-68	MH-IS-70	866.12	MH-IS-71	858.15	228.3	0.035	10	Ductile Iron	0.013	43	15.8	-0.7	
GM-IS-69	MH-IS-71	858.15	MH-IS-152	852.91	245.9	0.021	10	Ductile Iron	0.013	48	16.8	-0.7	
GM-IS-70	MH-IS-294	409.13	MH-IS-230	408.12	139.2	0.007	12	PVC	0.01	1	75	-0.3	
GM-IS-71	MH-IS-72	415.04	MH-IS-230	408.12	240.6	0.029	15	PVC	0.01	2,027	68.9	-0.4	
GM-IS-72	MH-IS-77	422.01	MH-IS-72	415.04	250	0.028	15	PVC	0.01	2,026	68.9	-0.4	
GM-IS-73	MH-IS-MH-2	408.8	MH-IS-232	406.2	302.4	0.009	36	Concrete	0.013	4,003	31.4	-2.1	
GM-IS-74	MH-IS-230	408.12	MH-IS-MH-2	408.8	32.2	-0.021	24	Concrete	0.013	2,028	88	-0.2	
GM-IS-75	MH-IS-81	438.64	MH-IS-78	430.27	309.1	0.027	15	PVC	0.01	2,024	68.9	-0.4	
GM-IS-76	MH-IS-82	448.73	MH-IS-81	438.64	294.7	0.034	15	PVC	0.01	2,022	68.8	-0.4	
GM-IS-77	MH-IS-76	491.15	MH-IS-75	479.82	294.7	0.038	15	PVC	0.01	2,018	68.8	-0.4	
GM-IS-78	MH-IS-74	465.04	MH-IS-82	448.73	296.4	0.055	15	PVC	0.01	2,019	68.8	-0.4	
GM-IS-79	MH-IS-75	479.82	MH-IS-74	465.04	275	0.054	15	PVC	0.01	2,018	68.8	-0.4	
GM-IS-80	MH-IS-78	430.27	MH-IS-77	422.01	303.5	0.027	15	PVC	0.01	2,025	68.9	-0.4	
GM-IS-81	MH-IS-128	510.28	MH-IS-84	509.54	45.6	0.016	12	PVC	0.01	235	30.1	-0.7	
GM-IS-82	MH-IS-154	499.58	MH-IS-121	498.94	147.4	0.004	12	PVC	0.01	5	21.9	-0.8	

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GM-IS-83	MH-IS-84	509.54	MH-IS-121	498.94	356.1	0.03	15	PVC	0.01	2,010	68.6	-0.4	
GM-IS-84	MH-IS-83	573.01	MH-IS-87	563.08	301	0.033	15	PVC	0.01	1,771	64.3	-0.4	
GM-IS-85	MH-IS-87	563.08	MH-IS-86	543.15	300	0.066	15	PVC	0.01	1,772	64.3	-0.4	
GM-IS-86	MH-IS-86	543.15	MH-IS-85	525.48	251.4	0.07	15	PVC	0.01	1,773	64.3	-0.4	
GM-IS-87	MH-IS-85	525.48	MH-IS-84	509.54	296.7	0.054	15	PVC	0.01	1,774	64.4	-0.4	
GM-IS-88	MH-IS-48	588.13	MH-IS-99	587.49	150.6	0.004	12	PVC	0.01	41	16.2	-0.8	
GM-IS-89	MH-IS-90	583.48	MH-IS-89	577.39	235.4	0.026	15	PVC	0.01	1,757	64	-0.4	
GM-IS-90	MH-IS-99	587.49	MH-IS-90	583.48	306.8	0.013	15	PVC	0.01	1,756	64	-0.4	
GM-IS-91	MH-IS-101	594.05	MH-IS-99	587.49	246	0.027	15	PVC	0.01	1,714	63.2	-0.5	
GM-IS-92	MH-IS-89	577.39	MH-IS-83	573.01	316.6	0.014	15	PVC	0.01	1,771	64.3	-0.4	
GM-IS-93	MH-IS-121	498.94	MH-IS-76	491.15	268.4	0.029	15	PVC	0.01	2,017	68.7	-0.4	
GM-IS-94	MH-IS-112	687.28	MH-IS-111	668.45	304.2	0.062	15	PVC	0.01	1,689	62.7	-0.5	
GM-IS-95	MH-IS-113	708.48	MH-IS-112	687.28	306.5	0.069	15	PVC	0.01	1,688	62.7	-0.5	
GM-IS-96	MH-IS-117	796.57	MH-IS-116	769.83	386.7	0.069	15	PVC	0.01	148	17.8	-1	
GM-IS-97	MH-IS-118	807.25	MH-IS-117	796.57	109.3	0.098	12	PVC	0.01	140	23	-0.8	
GM-IS-98	MH-IS-119	829.53	MH-IS-118	807.25	297.4	0.075	12	PVC	0.01	139	22.9	-0.8	
GM-IS-99	MH-IS-120	850.27	MH-IS-119	829.53	297.3	0.07	12	PVC	0.01	6	4.6	-1	
GM-IS-100	MH-IS-123	863.89	MH-IS-120	850.27	318.5	0.043	12	PVC	0.01	5	4.2	-1	
GM-IS-101	MH-IS-124	870.98	MH-IS-123	863.89	227.3	0.031	12	PVC	0.01	2	3	-1	
GM-IS-102	MH-IS-125	874.79	MH-IS-124	870.98	247.6	0.015	12	PVC	0.01	2	2.5	-1	
GM-IS-103	MH-IS-129	645.79	MH-IS-107	644.73	147.5	0.007	12	PVC	0.01	19	8.4	-0.9	
GM-IS-104	MH-IS-296	797.56	MH-IS-117	796.57	70.4	0.014	12	PVC	0.01	1	1.7	-1	
GM-IS-105	MH-IS-116	769.83	MH-IS-115	750.98	298.9	0.063	15	PVC	0.01	960	46.7	-0.7	
GM-IS-106	MH-IS-291	874.15	MH-IS-125	874.79	46.8	-0.014	12	PVC	0.01	1	67.3	-0.3	
GM-IS-107	MH-IS-111	668.45	MH-IS-108	657.51	300.5	0.036	15	PVC	0.01	1,690	62.8	-0.5	
GM-IS-108	MH-IS-108	657.51	MH-IS-107	644.73	299.4	0.043	15	PVC	0.01	1,691	62.8	-0.5	
GM-IS-109	MH-IS-107	644.73	MH-IS-106	632.04	300.6	0.042	15	PVC	0.01	1,712	63.2	-0.5	
GM-IS-110	MH-IS-106	632.04	MH-IS-105	612.67	299.9	0.065	15	PVC	0.01	1,713	63.2	-0.5	
GM-IS-111	MH-IS-115	750.98	MH-IS-114	728.11	298.5	0.077	15	PVC	0.01	1,687	62.7	-0.5	
GM-IS-112	MH-IS-114	728.11	MH-IS-113	708.48	305.3	0.064	15	PVC	0.01	1,688	62.7	-0.5	
GM-IS-113	MH-IS-126	830.14	MH-IS-119	829.53	121.4	0.005	12	PVC	0.01	132	22.3	-0.8	
GM-IS-114	MH-IS-127	755.09	MH-IS-115	750.98	63.4	0.065	12	PVC	0.01	726	54	-0.5	
GM-IS-115	MH-IS-102	756.47	MH-IS-127	755.09	85.5	0.016	12	PVC	0.01	725	54	-0.5	
GM-IS-116	MH-IS-105	612.67	MH-IS-101	594.05	299.6	0.062	15	PVC	0.01	1,713	63.2	-0.5	
GM-IS-117	MH-IS-214	408.1	MH-IS-188	407.79	51	0.006	10	Concrete	0.013	17	10.2	-0.7	SM4
GM-IS-118	MH-IS-188	407.79	MH-IS-148	404.7	143.4	0.022	10	Concrete	0.013	24	11.8	-0.7	SM4
GM-IS-119	MH-IS-238	409.5	MH-IS-214	408.1	378.8	0.004	10	Concrete	0.013	9	8.8	-0.8	
GM-IS-120	MH-IS-148	404.7	MH-IS-145	404.12	72.9	0.008	10	Concrete	0.013	66	19.8	-0.7	SM4
GM-IS-121	MH-IS-145	404.12	MH-IS-144	403.08	80.2	0.013	10	Concrete	0.013	69	20.2	-0.7	SM4
GM-IS-122	MH-IS-144	403.08	PS2WW	399.5	22.6	0.159	10	Concrete	0.013	78	21.6	-0.7	SM4
GM-IS-124	MH-IS-192	405.19	PS1WW	401	69.8	0.06	15	Concrete	0.013	1,971	67.9	-0.4	SM3A
GM-IS-125	MH-IS-242	406.96	MH-IS-218	405.44	302.2	0.005	15	Concrete	0.013	1,936	100	0.7	SM3A
GM-IS-126	MH-IS-218	405.44	MH-IS-192	405.19	294	9E-04	15	Concrete	0.013	1,945	100	0.8	SM3A
GM-IS-127	MH-IS-248	408.21	MH-IS-242	406.96	304.1	0.004	15	Concrete	0.013	1,927	100	0.8	SM3A
GM-IS-128	MH-IS-245	410.33	MH-IS-238	409.5	339.2	0.002	10	Concrete	0.013	7	8.4	-0.8	
GM-IS-130	MH-IS-162	413.59	MH-IS-156	413.09	173.5	0.003	12	Concrete	0.013	449	51.5	-0.5	
GM-IS-131	MH-IS-278	412.1	MH-IS-271	410.4	374.1	0.005	12	Concrete	0.013	467	100	0.4	
GM-IS-132	MH-IS-156	413.09	MH-IS-278	412.1	264.7	0.004	12	Concrete	0.013	458	61.9	-0.4	
GM-IS-134	MH-IS-140	409.52	MH-IS-256	408.25	330.5	0.004	15	Concrete	0.013	1,900	100	2.3	SM3A

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-135	MH-IS-256	408.25	MH-IS-248	408.21	330.4	1E-04	15	Concrete	0.013	1,909	100	2.2	SM3A
GM-IS-136	MH-IS-MH-6	414.56	MH-IS-267	409.97	156.9	0.029	10	Concrete	0.013	87	22.8	-0.6	
GM-IS-137	MH-IS-134	408.52	MH-IS-193	407.54	156	0.006	10	Concrete	0.013	141	29.1	-0.6	
GM-IS-139	MH-IS-193	407.54	MH-IS-155	406.97	73.7	0.008	10	Concrete	0.013	410	50.9	-0.4	
GM-IS-140	MH-IS-155	406.97	PS3WW	402.5	38.7	0.116	10	Concrete	0.013	414	51.1	-0.4	
GM-IS-141	MH-IS-136	409.7	MH-IS-134	408.52	183.2	0.006	10	Concrete	0.013	134	28.4	-0.6	
GM-IS-142	MH-IS-167	414.72	MH-IS-162	413.59	394.7	0.003	12	Concrete	0.013	440	50.9	-0.5	
GM-IS-143	MH-IS-170	415.38	MH-IS-167	414.72	402.9	0.002	12	Concrete	0.013	431	59.6	-0.4	
GM-IS-144	MH-IS-172	416.48	MH-IS-170	415.38	421.1	0.003	12	Concrete	0.013	422	51	-0.5	SM3B
GM-IS-145	MH-IS-138	409.59	MH-IS-136	409.7	170.6	-6E-04	10	Concrete	0.013	124	65	-0.3	
GM-IS-146	MH-IS-139	410.69	MH-IS-138	409.59	287.4	0.004	10	Concrete	0.013	117	29.7	-0.6	
GM-IS-147	MH-IS-30	415.33	MH-IS-168	415.07	234.8	0.001	10	PVC	0.01	815	100	0.6	SM1A
GM-IS-148	MH-IS-28	415.3	MH-IS-30	415.38	32	-0.003	10	PVC	0.01	798	100	0.7	SM1A
GM-IS-149	MH-IS-26	415.99	MH-IS-28	415.36	243.8	0.003	10	PVC	0.01	789	100	1	SM1A
GM-IS-150	MH-IS-24	416.67	MH-IS-26	415.99	247.7	0.003	10	PVC	0.01	780	100	1.2	SM1B
GM-IS-151	MH-IS-23	417.17	MH-IS-24	416.67	121	0.004	10	PVC	0.01	753	100	1.1	SM1B
GM-IS-152	MH-IS-21	417.29	MH-IS-23	417.17	10.7	0.011	10	PVC	0.01	744	100	1.1	SM1B
GM-IS-153	MH-IS-19	418.18	MH-IS-21	417.29	400.3	0.002	10	PVC	0.01	735	100	1.5	SM1B
GM-IS-154	MH-IS-14	419.81	MH-IS-19	418.18	399.8	0.004	10	PVC	0.01	726	100	1.2	SM1C
GM-IS-155	MH-IS-122	420.49	MH-IS-14	419.81	271.6	0.003	10	PVC	0.01	717	100	1.3	SM1C
GM-IS-156	MH-IS-110	420.69	MH-IS-122	420.49	37.8	0.005	10	PVC	0.01	708	100	1.2	
GM-IS-157	MH-IS-98	421.68	MH-IS-110	420.69	269.9	0.004	10	PVC	0.01	699	100	1.1	
GM-IS-158	MH-IS-80	422.48	MH-IS-98	421.68	122	0.007	10	PVC	0.01	690	100	0.6	
GM-IS-162	MH-IS-213	410.46	MH-GIS-SF_ssMH_1447	410.46	125.9	0	48	Glass	0.013	559	14	-3.4	
GM-IS-166	MH-IS-266	415.38	MH-IS-253	412.61	351	0.008	10	Concrete	0.013	10	7.6	-0.8	
GM-IS-167	MH-IS-253	412.61	MH-IS-137	411.83	356.6	0.002	10	Concrete	0.013	67	25.8	-0.6	
GM-IS-168	MH-IS-260	419.11	MH-IS-259	418.07	388.7	0.003	10	Concrete	0.013	3	5.8	-0.8	
GM-IS-169	MH-IS-259	418.07	MH-SUR-5103	416.7	121.3	0.011	10	Concrete	0.013	7	6.2	-0.8	
GM-IS-170(1)	MH-IS-135	409.66	MH-IS-GS_ssMH_1480	408.77	316.2	0.003	10	Concrete	0.013	90	28.1	-0.6	SM4
GM-IS-171	MH-IS-237	410.7	MH-IS-135	409.66	244	0.004	10	Concrete	0.013	80	24	-0.6	
GM-IS-172	MH-IS-137	411.83	MH-IS-237	410.7	353.6	0.003	10	Concrete	0.013	77	25.1	-0.6	SM4
GM-IS-174	MH-IS-0	414.12	MH-IS-253	412.61	403.5	0.004	10	Concrete	0.013	54	20.2	-0.7	
GM-IS-175	MH-IS-257	414.64	MH-IS-0	414.12	186.8	0.003	10	Concrete	0.013	50	20.9	-0.7	
GM-IS-185	MH-IS-274	415.08	MH-IS-266	415.38	300.2	-1E-03	10	Concrete	0.013	3	46.5	-0.4	
GM-IS-187(1)	MH-SUR-5103	416.7	MH-SUR-5001	414.95	586.6	0.003	10	Concrete	0.013	10	9.5	-0.8	
GM-IS-187(2)	MH-SUR-5001	414.95	MH-IS-257	414.64	53.7	0.006	10	Concrete	0.013	13	9.3	-0.8	
GM-IS-191	MH-IS-232	406.2	KCPSWW	405.5	50.1	0.014	36	Concrete	0.013	4,004	31.4	-2.1	
GM-IS-192	MH-IS-168	414.99	MH-IS-166	414.65	213.7	0.002	12	PVC	0.01	824	79	-0.2	
GM-IS-193	MH-IS-166	414.65	MH-IS-161	413.96	200.6	0.003	12	PVC	0.01	833	69.6	-0.3	
GM-IS-194	MH-IS-161	413.96	MH-IS-1	413.11	256.6	0.003	12	PVC	0.01	842	100	0.1	
GM-IS-198	MH-IS-132	430.98	MH-IS-57	425.87	109.1	0.047	10	PVC	0.01	321	44.7	-0.5	
GM-IS-199	MH-IS-4	435.34	MH-IS-132	430.98	200.3	0.022	10	PVC	0.01	316	44.3	-0.5	
GM-IS-200	MH-IS-5	436.69	MH-IS-4	435.34	150.2	0.009	10	PVC	0.01	307	43.7	-0.5	
GM-IS-201	MH-IS-6	446.59	MH-IS-5	436.69	299.9	0.033	10	PVC	0.01	298	43	-0.5	
GM-IS-202	MH-IS-7	454.62	MH-IS-6	446.59	271.1	0.03	10	PVC	0.01	289	42.4	-0.5	
GM-IS-203	MH-IS-8	461.15	MH-IS-7	454.62	331.7	0.02	10	PVC	0.01	281	41.7	-0.5	
GM-IS-204	MH-IS-9	462.21	MH-IS-8	461.15	263.7	0.004	10	Ductile Iron	0.013	272	46.2	-0.4	
GM-IS-205	MH-IS-10	462.79	MH-IS-9	462.21	184.3	0.003	10	Ductile Iron	0.013	263	48.6	-0.4	
GM-IS-206	MH-IS-11	463.53	MH-IS-10	462.79	260.7	0.003	10	Ductile Iron	0.013	255	49.2	-0.4	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-207	MH-IS-12	464.55	MH-IS-11	463.53	301.3	0.003	10	PVC	0.01	246	39.6	-0.5	
GM-IS-208	MH-IS-13	465.69	MH-IS-12	464.55	286.9	0.004	10	PVC	0.01	237	38.2	-0.5	
GM-IS-209	MH-IS-16	465.97	MH-IS-13	465.69	190.1	0.001	10	Ductile Iron	0.013	228	56.4	-0.4	
GM-IS-302	MH-IS-205	845.9	MH-IS-203	843.68	158.3	0.014	10	PVC	0.01	79	21.7	-0.7	
GM-IS-306	MH-IS-38	767.46	MH-IS-102	756.47	256.2	0.043	12	PVC	0.01	724	53.9	-0.5	
GM-IS-500	MH-IS-1	413.11	MH-IS-96	412.74	165.9	0.002	12	PVC	0.01	869	100	0.6	
GM-IS-501	MH-IS-96	412.74	MH-IS-95	411.63	253.7	0.004	12	PVC	0.01	914	100	0.6	
GM-IS-502	MH-IS-95	411.63	MH-IS-94	411.22	254.7	0.002	15	PVC	0.01	923	100	1	
GM-IS-503	MH-IS-94	411.22	MH-IS-93	410.62	358.1	0.002	15	PVC	0.01	985	100	1.3	
GM-IS-504	MH-IS-93	410.62	MH-IS-92	409.88	276.6	0.003	15	PVC	0.01	1,229	100	1.6	
GM-IS-505	MH-IS-92	409.88	MH-IS-140	409.52	236.8	0.002	18	PVC	0.01	1,361	100	1.8	
GM-IS-506	MH-IS-267	409.97	MH-IS-92	409.88	18	0.005	15	PVC	0.01	123	100	2	
GM-IS-507	MH-IS-97	412.47	MH-IS-94	411.22	158.6	0.008	10	Concrete	0.013	54	100	0.4	SM4
GM-IS-508	MH-IS-275	417.67	MH-IS-97	412.47	203.5	0.026	10	Concrete	0.013	9	7.2	-0.8	
GM-IS-509(1)	MH-GIS-DT_ssMH_2513	414.27	MH-IS-277	413.81	32.9	0.014	10	Concrete	0.013	9	12	-0.7	
GM-RD-SSGM-CO-6	GM-RD-MH-7	902.6	MH-GIS-NJ_ssMH_2565	895.08	195.7	0.038	12		0.013	159	24.5	-0.8	
GM-RD-SSGM-CO-7	GM-RD-MH-8	909.76	GM-RD-MH-7	902.6	223	0.032	12		0.013	157	24.4	-0.8	
GM-RD-SSGM-CO-8	GM-RD-MH-9	910.89	GM-RD-MH-8	909.76	54.1	0.021	12		0.013	133	22.5	-0.8	
GM-RD-SSGM-CO-9	GM-RD-MH-10	920.14	GM-RD-MH-9	910.89	217.2	0.043	12		0.013	132	22.3	-0.8	
GM-RD-SSGM-CO-10	GM-RD-MH-11	928.71	GM-RD-MH-10	920.14	99.4	0.086	12		0.013	130	22.2	-0.8	
GM-RD-SSGM-CO-11	GM-RD-MH-11	928.71	GM-RD-MH-12	955.39	204.3	0.131	12		0.013	83	17.6	25.9	
GM-RD-SSGM-CO-12	GM-RD-MH-12	955.39	GM-RD-MH-13	973.11	125.1	0.142	12		0.013	81	17.4	16.9	
GM-RD-SSGM-CO-13	GM-RD-MH-13	973.11	GM-RD-MH-14	980.3	57.9	0.124	12		0.013	30	10.5	6.3	
GM-RD-SSGM-CO-14	GM-RD-MH-14	980.3	GM-RD-MH-15	1,011.97	230.2	0.138	12		0.013	28	10.2	30.8	
GM-RD-SSGM-CO-15	GM-RD-MH-15	1,011.97	GM-RD-MH-16	1,025.99	104.2	0.135	12		0.013	26	9.8	13.1	
GM-RD-SSGM-CO-16	GM-RD-MH-16	1,025.99	GM-RD-MH-17	1,043.99	150	0.12	12		0.013	25	9.5	17.1	
GM-RD-SSGM-CO-17	GM-RD-MH-17	1,043.99	GM-RD-MH-18	1,053.31	89.7	0.104	12		0.013	23	9.1	8.4	
GM-RD-SSGM-CO-18	GM-RD-MH-18	1,053.31	GM-RD-MH-19	1,065.28	121.3	0.099	12		0.013	21	8.8	11.1	
GM-RD-SSGM-CO-19	GM-RD-MH-19	1,065.28	GM-RD-MH-20	1,090.77	317.5	0.08	12		0.013	9	5.7	24.5	
GM-RD-SSGM-CO-20	GM-RD-MH-20	1,090.77	GM-RD-MH-21	1,092.07	86.3	0.015	8		0.013	7	8.5	0.7	
GM-RD-SSGM-CO-21	GM-RD-MH-21	1,092.07	GM-RD-MH-22	1,106.43	133.2	0.108	8		0.013	5	7.3	13.7	
GM-RD-SSGM-CO-22	GM-RD-MH-22	1,106.43	GM-RD-MH-23	1,119.30	193.9	0.066	8		0.013	4	6	12.2	
GM-RD-SSGM-CO-23	GM-RD-MH-23	1,119.30	GM-RD-MH-24	1,128.16	217.4	0.041	8		0.013	2	4.2	8.2	
GM-RD-SSGM-CO-24	GM-RD-MH-25	1,128.84	GM-RD-MH-26	1,126.66	170	0.013	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-25	GM-RD-MH-26	1,126.66	GM-RD-MH-27	1,115.27	187.2	0.061	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-26	GM-RD-MH-27	1,115.27	GM-RD-MH-28	1,044.72	264.2	0.267	8		0.013	7	8.5	-0.6	
GM-RD-SSGM-CO-27	GM-RD-MH-28	1,044.72	GM-RD-MH-29	1,026.74	124.6	0.144	8		0.013	9	9.4	-0.6	
GM-RD-SSGM-CO-28	GM-RD-MH-29	1,026.74	GM-RD-MH-30	1,018.26	68.8	0.123	8		0.013	11	10.4	-0.6	
GM-RD-SSGM-CO-29	GM-RD-MH-30	1,018.26	GM-RD-MH-31	1,006.12	259	0.047	8		0.013	14	12	-0.6	
GM-RD-SSGM-CO-30	GM-RD-MH-31	1,006.12	GM-RD-MH-32	999.84	80.1	0.078	8		0.013	39	20	-0.5	
GM-RD-SSGM-CO-31	GM-RD-MH-32	999.84	GM-RD-MH-33	994	75	0.078	8		0.013	40	20.5	-0.5	
GM-RD-SSGM-CO-32	GM-RD-MH-33	994	GM-RD-MH-34	989	71.9	0.07	8		0.013	42	20.9	-0.5	
GM-RD-SSGM-CO-33	GM-RD-MH-34	989	GM-RD-MH-35	983.13	219.9	0.027	8		0.013	44	21.4	-0.5	
GM-RD-SSGM-CO-34	GM-RD-MH-35	983.13	GM-RD-MH-36	979.25	64.8	0.06	8		0.013	46	21.8	-0.5	
GM-RD-SSGM-CO-35	GM-RD-MH-36	979.25	GM-RD-MH-37	973.65	81.8	0.068	8		0.013	47	22.2	-0.5	
GM-RD-SSGM-CO-36	GM-RD-MH-37	973.65	GM-RD-MH-13	973.11	55.4	0.01	8		0.013	49	22.6	-0.5	
GM-RD-SSGM-CO-37	GM-RD-MH-38	1,018.43	GM-RD-MH-30	1,018.26	88.7	0.002	8		0.013	2	6.1	-0.6	
GM-RD-SSGM-CO-38	GM-RD-MH-39	1,073.12	GM-RD-MH-40	1,069.72	58.7	0.058	8		0.013	2	4.2	-0.6	
GM-RD-SSGM-CO-39	GM-RD-MH-40	1,069.72	GM-RD-MH-41	1,067.73	67.4	0.03	8		0.013	4	6	-0.6	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-RD-SSGM-CO-40	GM-RD-MH-41	1,067.73	GM-RD-MH-42	1,064.52	194.6	0.016	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-41	GM-RD-MH-42	1,064.52	GM-RD-MH-43	1,045.23	230.8	0.084	8		0.013	16	12.7	-0.6	
GM-RD-SSGM-CO-42	GM-RD-MH-43	1,045.23	GM-RD-MH-44	1,036.63	67.3	0.128	8		0.013	18	13.4	-0.6	
GM-RD-SSGM-CO-43	GM-RD-MH-44	1,036.63	GM-RD-MH-45	1,025.54	81.4	0.136	8		0.013	19	14.1	-0.6	
GM-RD-SSGM-CO-44	GM-RD-MH-45	1,025.54	GM-RD-MH-46	1,015.06	80.5	0.13	8		0.013	21	14.7	-0.6	
GM-RD-SSGM-CO-45	GM-RD-MH-46	1,015.06	GM-RD-MH-31	1,006.12	139.9	0.064	8		0.013	23	15.3	-0.6	
GM-RD-SSGM-CO-46	GM-RD-MH-47	1,109.18	GM-RD-MH-48	1,098.20	120	0.091	8		0.013	2	4.2	-0.6	
GM-RD-SSGM-CO-47	GM-RD-MH-48	1,098.20	GM-RD-MH-49	1,084.11	175.3	0.08	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-48	GM-RD-MH-49	1,084.11	GM-RD-MH-50	1,072.16	112.2	0.107	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-49	GM-RD-MH-50	1,072.16	GM-RD-MH-51	1,067.51	71.6	0.065	8		0.013	7	8.5	-0.6	
GM-RD-SSGM-CO-50	GM-RD-MH-51	1,067.51	GM-RD-MH-42	1,064.52	83.4	0.036	8		0.013	9	9.4	-0.6	
GM-RD-SSGM-CO-51	GM-RD-MH-11	928.71	GM-RD-MH-52	932.05	49.2	0.068	12		0.013	46	13	2.5	
GM-RD-SSGM-CO-52	GM-RD-MH-52	932.05	GM-RD-MH-53	942.75	83.4	0.128	8		0.013	44	21.4	10.2	
GM-RD-SSGM-CO-53	GM-RD-MH-53	942.75	GM-RD-MH-54	941.38	109.6	-0.013	8		0.013	42	100	-0.4	
GM-RD-SSGM-CO-54	GM-RD-MH-54	941.38	GM-RD-MH-55	945.93	125.1	0.036	8		0.013	40	20.5	4	
GM-RD-SSGM-CO-55	GM-RD-MH-55	945.93	GM-RD-MH-56	951.31	95.3	0.056	8		0.013	39	20	4.8	
GM-RD-SSGM-CO-56	GM-RD-MH-56	951.31	GM-RD-MH-57	951.46	124.2	0.001	8		0.013	37	30	-0.3	
GM-RD-SSGM-CO-57	GM-RD-MH-57	951.46	GM-RD-MH-58	954.56	111.1	0.028	8		0.013	35	19	2.6	
GM-RD-SSGM-CO-58	GM-RD-MH-58	954.56	GM-RD-MH-59	955.5	50	0.019	8		0.013	33	18.6	0.4	
GM-RD-SSGM-CO-59	GM-RD-MH-59	955.5	GM-RD-MH-60	956.79	162.2	0.008	8		0.013	32	18.1	0.7	
GM-RD-SSGM-CO-60	GM-RD-MH-60	956.79	GM-RD-MH-61	956.83	60.7	7E-04	8		0.013	30	29.3	-0.4	
GM-RD-SSGM-CO-61	GM-RD-MH-61	956.83	GM-RD-MH-62	959.5	45.9	0.058	8		0.013	28	17	2.1	
GM-RD-SSGM-CO-62	GM-RD-MH-62	959.5	GM-RD-MH-63	965.81	54	0.117	8		0.013	26	16.5	5.8	
GM-RD-SSGM-CO-63	GM-RD-MH-63	965.81	GM-RD-MH-64	974.99	51	0.18	8		0.013	25	15.9	8.6	
GM-RD-SSGM-CO-64	GM-RD-MH-64	974.99	GM-RD-MH-65	980.22	31.5	0.166	8		0.013	23	15.3	4.7	
GM-RD-SSGM-CO-65	GM-RD-MH-65	980.22	GM-RD-MH-66	984.57	48.7	0.089	8		0.013	5	7.3	3.7	
GM-RD-SSGM-CO-66	GM-RD-MH-66	984.57	GM-RD-MH-67	985.09	49	0.011	8		0.013	4	6	-0.1	
GM-RD-SSGM-CO-67	GM-RD-MH-67	985.09	GM-RD-MH-68	986.37	112.9	0.011	8		0.013	2	4.2	0.6	
GM-RD-SSGM-CO-68	GM-RD-MH-65	980.22	GM-RD-MH-69	983.64	29.6	0.116	8		0.013	16	12.7	2.8	
GM-RD-SSGM-CO-69	GM-RD-MH-69	983.64	GM-RD-MH-70	996.1	49.5	0.252	8		0.013	14	12	11.9	
GM-RD-SSGM-CO-70	GM-RD-MH-70	996.1	GM-RD-MH-71	1,022.88	97.9	0.273	8		0.013	12	11.2	26.2	
GM-RD-SSGM-CO-71	GM-RD-MH-71	1,022.88	GM-RD-MH-72	1,021.26	29.9	-0.054	8		0.013	5	100	-0.6	
GM-RD-SSGM-CO-72	GM-RD-MH-72	1,021.26	GM-RD-MH-73	1,021.56	157.3	0.002	8		0.013	4	100	1	
GM-RD-SSGM-CO-73	GM-RD-MH-73	1,021.56	GM-RD-MH-74	1,021.12	97.7	-0.005	8		0.013	2	100	0.7	
GM-RD-SSGM-CO-74	GM-RD-MH-71	1,022.88	GM-RD-MH-75	1,020.90	83.5	-0.024	8		0.013	5	100	-0.6	
GM-RD-SSGM-CO-75	GM-RD-MH-75	1,020.90	GM-RD-MH-76	1,026.26	80.9	0.066	8		0.013	4	6	4.7	
GM-RD-SSGM-CO-76	GM-RD-MH-76	1,026.26	GM-RD-MH-77	1,030.33	30.7	0.133	8		0.013	2	4.2	3.4	
GM-RD-SSGM-CO-77	GM-RD-MH-19	1,065.28	GM-RD-MH-78	1,067.51	67.3	0.033	12		0.013	11	6.2	1.3	
GM-RD-SSGM-CO-78	GM-RD-MH-78	1,067.51	GM-RD-MH-79	1,071.77	88.8	0.048	12		0.013	9	5.7	3.3	
GM-RD-SSGM-CO-79	GM-RD-MH-79	1,071.77	GM-RD-MH-80	1,088.22	247.9	0.066	12		0.013	7	5.1	15.5	
GM-RD-SSGM-CO-80	GM-RD-MH-80	1,088.22	GM-RD-MH-81	1,097.92	142	0.068	12		0.013	5	4.4	8.7	
GM-RD-SSGM-CO-81	MH-GIS-EP_ssMH_2584	1,074.61	GM-RD-MH-82	1,079.02	76.1	0.058	12		0.013	14	7.2	3.5	
GM-RD-SSGM-CO-82	GM-RD-MH-82	1,079.02	GM-RD-MH-83	1,085.84	121	0.056	12		0.013	12	6.7	5.9	
GM-RD-SSGM-CO-83	GM-RD-MH-83	1,085.84	GM-RD-MH-84	1,093.77	148	0.054	12		0.013	11	6.2	7	
GM-RD-SSGM-CO-84	GM-RD-MH-84	1,093.77	GM-RD-MH-85	1,102.24	156.9	0.054	12		0.013	9	5.7	7.5	
GM-RD-SSGM-CO-85	GM-RD-MH-85	1,102.24	GM-RD-MH-86	1,106.41	149.2	0.028	12		0.013	7	5.1	3.2	
GM-RD-SSGM-CO-86	GM-RD-MH-86	1,106.41	GM-RD-MH-87	1,108.92	95.6	0.026	8		0.013	5	7.3	1.9	
GM-RD-SSGM-CO-87	GM-RD-MH-87	1,108.92	GM-RD-MH-88	1,109.78	86.5	0.01	8		0.013	4	6	0.2	
GM-RD-SSGM-CO-88	GM-RD-MH-88	1,109.78	GM-RD-MH-89	1,109.94	125.1	0.001	8		0.013	2	6.8	-0.5	

2040 (20-year) without Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-RD-SSGM-CO-89	MH-GIS-MH-197	1,071.22	GM-RD-MH-90	1,081.74	199.5	0.053	8		0.013	7	8.5	9.9	
GM-RD-SSGM-CO-90	GM-RD-MH-90	1,081.74	GM-RD-MH-91	1,096.59	307.4	0.048	8		0.013	5	7.3	14.2	
GM-RD-SSGM-CO-91	GM-RD-MH-91	1,096.59	GM-RD-MH-92	1,102.46	128.9	0.046	8		0.013	4	6	5.2	
GM-RD-SSGM-CO-92	GM-RD-MH-92	1,102.46	GM-RD-MH-93	1,108.54	143.4	0.042	8		0.013	2	4.2	5.4	
GM-RD-SSGM-CO-93	GM-RD-MH-94	1,108.82	MH-GIS-MH-99	1,100.90	141.1	0.056	8		0.013	7	8.5	-0.6	
GM-RD-SSGM-CO-94	GM-RD-MH-95	1,118.63	GM-RD-MH-94	1,108.82	155.1	0.063	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-95	GM-RD-MH-96	1,123.41	GM-RD-MH-95	1,118.63	101.1	0.047	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-96	GM-RD-MH-97	1,128.94	GM-RD-MH-96	1,123.41	140.5	0.039	8		0.013	2	4.2	-0.6	
GM-RD-SSGM-CO-97	GM-RD-MH-99	978.38	GM-RD-MH-98	985.89	85.6	0.088	8		0.013	1	3.1	6.9	
GM-RD-SSGM-CO-98	GM-RD-MH-100	977.51	GM-RD-MH-99	978.38	95.9	0.009	8		0.013	2	4.4	0.2	
GM-RD-SSGM-CO-99	GM-RD-MH-101	971.18	GM-RD-MH-100	977.51	141.5	0.045	8		0.013	3	5.4	5.7	
GM-RD-SSGM-CO-100	GM-RD-MH-102	968.37	GM-RD-MH-101	971.18	122.5	0.023	8		0.013	4	6.3	2.2	
GM-RD-SSGM-CO-101	GM-RD-MH-103	965.89	GM-RD-MH-102	968.37	138.9	0.018	8		0.013	5	100	2.6	
GM-RD-SSGM-CO-102	GM-RD-MH-104	969.05	GM-RD-MH-103	965.89	103.3	-0.031	8		0.013	6	100	-0.5	
GM-RD-SSGM-CO-103	GM-RD-MH-105	962.62	GM-RD-MH-104	969.05	193.1	0.033	8		0.013	7	8.2	5.8	
GM-RD-SSGM-CO-104	GM-RD-MH-106	958.2	GM-RD-MH-105	962.62	161.8	0.027	8		0.013	8	8.8	3.8	
GM-RD-SSGM-CO-105	GM-RD-MH-107	961.88	GM-RD-MH-106	958.2	108.8	-0.034	8		0.013	9	100	-0.5	
GM-RD-SSGM-CO-106	GM-RD-MH-108	962.13	GM-RD-MH-107	961.88	36.4	0.007	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-107	GM-RD-MH-109	965.58	GM-RD-MH-108	962.13	43.9	0.079	8		0.013	4	6.3	-0.6	
GM-RD-SSGM-CO-108	GM-RD-MH-110	975.13	GM-RD-MH-109	965.58	64	0.149	8		0.013	3	5.4	-0.6	
GM-RD-SSGM-CO-109	GM-RD-MH-111	977.36	GM-RD-MH-110	975.13	149.8	0.015	8		0.013	2	4.4	-0.6	
GM-RD-SSGM-CO-110	GM-RD-MH-112	977.65	GM-RD-MH-111	977.36	81.3	0.004	8		0.013	1	4	-0.6	
GM-RD-SSGM-CO-113	GM-RD-MH-107	961.88	Hospital PS-WW	958	13.6	0.284	8		0.013	14	12.1	-0.6	
GM-RD-SSGM-CO-114	GM-RD-MH-113	884	PSS12A-WW	871.69	17.5	0.704	8		0.013	20	14.3	-0.6	
GM-RD-SSGM-CO-115	GM-RD-MH-114	884.05	GM-RD-MH-113	884	37.5	0.001	8		0.013	18	20.3	-0.5	
GM-RD-SSGM-CO-116	GM-RD-MH-115	884.22	GM-RD-MH-114	884.05	131.6	0.001	8		0.013	16	19.6	-0.5	
GM-RD-SSGM-CO-117	GM-RD-MH-116	884.37	GM-RD-MH-115	884.22	121.1	0.001	8		0.013	14	18.5	-0.5	
GM-RD-SSGM-CO-118	GM-RD-MH-117	884.76	GM-RD-MH-116	884.37	97.6	0.004	8		0.013	13	13.1	-0.6	
GM-RD-SSGM-CO-119	GM-RD-MH-118	886.88	GM-RD-MH-117	884.76	146.4	0.014	8		0.013	11	10.5	-0.6	
GM-RD-SSGM-CO-120	GM-RD-MH-119	888.51	GM-RD-MH-118	886.88	176.8	0.009	8		0.013	9	9.6	-0.6	
GM-RD-SSGM-CO-121	GM-RD-MH-120	890.76	GM-RD-MH-119	888.51	178.6	0.013	8		0.013	7	8.6	-0.6	
GM-RD-SSGM-CO-122	GM-RD-MH-121	891.95	GM-RD-MH-120	890.76	79.1	0.015	8		0.013	5	7.4	-0.6	
GM-RD-SSGM-CO-123	GM-RD-MH-122	892.48	GM-RD-MH-121	891.95	164.2	0.003	8		0.013	4	7.6	-0.6	
GM-RD-SSGM-CO-124	GM-RD-MH-123	892.86	GM-RD-MH-122	892.48	116.5	0.003	8		0.013	2	5.5	-0.6	
GM-RD-SSGM-CO-125	GM-RD-MH-8	909.76	GM-RD-MH-124	905.29	53.2	-0.084	8		0.013	22	100	-0.4	
GM-RD-SSGM-CO-127	GM-RD-MH-25	1,128.84	GM-RD-MH-125	1,134.00	185.7	0.028	8		0.013	2	4.2	4.5	
GM-RD-SSGM-CO-128	GM-RD-MH-81	1,097.92	GM-RD-MH-126	1,114.04	236.1	0.068	12		0.013	4	3.6	15.2	
GM-RD-SSGM-CO-129	GM-RD-MH-126	1,114.04	GM-RD-MH-127	1,130.57	225.3	0.073	12		0.013	2	2.5	15.6	
GM-RD-SSGM-CO-130	GM-RD-MH-128	1,124.84	MH-GIS-MH-75	1,110.99	148.4	0.093	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-131	GM-RD-MH-129	1,134.00	GM-RD-MH-128	1,124.84	196.7	0.047	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-132	GM-RD-MH-130	1,134.71	GM-RD-MH-129	1,134.00	177.5	0.004	8		0.013	2	5.2	-0.6	
GM-SUR-304	MH-IS-57	425.87	MH-IS-80	422.48	336.3	0.01	10	Ductile Iron	0.013	682	66.3	-0.3	
GM-SUR-5001	MH-IS-271	410.4	MH-SUR-5002	410.5	88.2	-0.001	12	Concrete	0.013	494	100	1.8	
GM-SUR-5002	MH-SUR-5002	410.5	MH-IS-140	409.52	29.8	0.033	12	Concrete	0.013	502.8128	100	1.6	

2040 (20-year) without Improvements - Peak Hour Flow - Wet Well Table

Label	Ground Elevation (ft)	Maximum Elevation (ft)	Initial Elevation (ft)	Minimum Elevation (ft)	Base Elevation (ft)	Flow In (gpm)	Flow Out (gpm)	Net Flow In (gpm)
Hospital PS-WW	968	3.75	1.7	0	958	14	225	-210
IPPS Wetwell	430.65	4	2.5	0	400.65	611	4,852	-4242
KCPSWW	428.11	14	0.6	0	399.5	4,004	9,079	-5075
PS1WW	419.19	7.6	5	0	394.33	1,971	2,066	-94
PS2WW	415.2	4.25	2	0	395.25	78	499	-420
PS3WW	418.23	5.15	2.85	0	401.67	414	756	-342
PS4WW	417.46	4.2	3	0	399.83	133	243	-111
PSBPWW	796.77	9.7	4.5	0	765.5	799	1,039	-240
PSEWW	762.77	6.5	3.5	0	736.5	140	280	-140
PSFWW	721.2	4	2.5	0	704	47	272	-224
PSK3-WW	818.91	7.1	3.1	0	793	101	241	-140
PSLWW	807.37	11.1	5.6	0	777.9	439	493	-54
PSS12A-WW	886.8	4.1	2.1	0	871.69	20	123	-104
Pump Station K2 (Burke St) Wetwell	698.45	6.6	3.1	0	688.45	45	89	-44
Pump Station N6 Wetwell	727.14	4.4	2.9	0	717.14	18	120	-102
Pump Station No. 6 Wetwell	425	4	2	0	415	11	0	11
Pump Station Z (Gala) Wetwell	537.95	7.1	3.5	0	527.95	34	84	-50

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
CO-28	MH-GIS-MH-36	749.5	PSEWW	736.5	15.4	0.847	8	PVC	0.01	84	29.8	-0.5	
CO-30	MH-GIS-MH-77	756.31	PSEWW	736.5	8.8	2.263	8	PVC	0.01	57	24.3	-0.5	
GM-GIS-AC_ssGM_1255	MH-GIS-AC_ssMH_2569	987.01	MH-GIS-RI_ssMH_2320	987.3	60	-0.005	8	PVC	0.01	4	84.4	-0.1	
GM-GIS-AC_ssGM_1266	MH-GIS-AC_ssMH_2570	966.73	MH-GIS-CR_ssMH_2321	968.83	100.7	-0.021	8	PVC	0.01	77	100	1.8	
GM-GIS-AC_ssGM_1419	MH-GIS-AC_ssMH_2543	957.94	MH-GIS-AC_ssMH_2522	961.45	68	0.052	8	PVC	0.01	5	59.5	3.2	
GM-GIS-AC_ssGM_1420	MH-GIS-AC_ssMH_2522	961.45	MH-GIS-AC_ssMH_2530	980.95	400	0.049	8	PVC	0.01	4	6	18.9	
GM-GIS-AC_ssGM_1421	MH-GIS-AC_ssMH_2533	955.84	MH-GIS-AC_ssMH_2521	970.9	260	0.058	8	PVC	0.01	5	7.3	14.4	
GM-GIS-AC_ssGM_1422	MH-GIS-AC_ssMH_2521	970.9	MH-GIS-AC_ssMH_2529	986.8	240	0.066	8	PVC	0.01	4	6	15.3	
GM-GIS-AC_ssGM_1423	MH-GIS-AC_ssMH_2537	990.52	MH-GIS-AC_ssMH_2529	986.8	137.1	0.027	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1424	MH-GIS-AC_ssMH_2539	981.15	MH-GIS-AC_ssMH_2527	977.75	175.8	0.019	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1425	MH-GIS-AC_ssMH_2540	975.33	MH-GIS-AC_ssMH_2544	973.78	90.9	0.017	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1426	MH-GIS-AC_ssMH_2518	963.48	MH-GIS-AC_ssMH_2514	975.79	158.5	0.078	8	PVC	0.01	12	11.2	11.7	
GM-GIS-AC_ssGM_1427	MH-GIS-AC_ssMH_2514	975.79	MH-GIS-AC_ssMH_2534	992.06	244.7	0.066	8	PVC	0.01	5	7.3	15.7	
GM-GIS-AC_ssGM_1428	MH-GIS-AC_ssMH_2569	987.01	MH-GIS-AC_ssMH_2517	987.35	74.8	0.005	8	PVC	0.01	2	33.4	-0.1	
GM-GIS-AC_ssGM_1429	MH-GIS-AC_ssMH_2523	960.92	MH-GIS-AC_ssMH_2524	964.82	121.6	-0.032	8	PVC	0.01	72	100	7.6	
GM-GIS-AC_ssGM_1430	MH-GIS-AC_ssMH_2525	957.38	MH-GIS-AC_ssMH_2535	965.08	175.4	0.044	8	PVC	0.01	33	18.5	7.2	
GM-GIS-AC_ssGM_1431	MH-GIS-AC_ssMH_2535	965.08	MH-GIS-AC_ssMH_2527	977.75	300.5	0.042	8	PVC	0.01	5	7.3	12.1	
GM-GIS-AC_ssGM_1432	MH-GIS-AC_ssMH_2524	964.82	MH-GIS-AC_ssMH_2526	966.2	72.7	-0.019	8	PVC	0.01	74	100	3.7	
GM-GIS-AC_ssGM_1433	MH-GIS-AC_ssMH_2526	966.2	MH-GIS-AC_ssMH_2570	966.73	37.3	-0.014	8	PVC	0.01	75	100	2.3	
GM-GIS-AC_ssGM_1434	MH-GIS-AC_ssMH_2531	960.07	MH-GIS-AC_ssMH_2546	971.34	240.5	0.047	8	PVC	0.01	24	15.8	10.7	
GM-GIS-AC_ssGM_1435	MH-GIS-AC_ssMH_2528	957.15	MH-GIS-AC_ssMH_2525	957.38	35.4	0.006	8	PVC	0.01	35	100	4	
GM-GIS-AC_ssGM_1436	MH-GIS-AC_ssMH_2523	960.92	MH-GIS-AC_ssMH_2532	960.88	126.7	-3E-04	8	PVC	0.01	70	100	5.3	
GM-GIS-AC_ssGM_1437	MH-GIS-AC_ssMH_2532	960.88	MH-GIS-AC_ssMH_2519	957.9	120.4	-0.025	8	PVC	0.01	54	100	5.3	
GM-GIS-AC_ssGM_1438	MH-GIS-AC_ssMH_2519	957.9	MH-GIS-AC_ssMH_2533	955.84	123.8	-0.017	8	PVC	0.01	52	100	5.3	
GM-GIS-AC_ssGM_1439	MH-GIS-AC_ssMH_2520	956.8	MH-GIS-AC_ssMH_2533	955.84	270	0.004	8	PVC	0.01	45	100	4.4	
GM-GIS-AC_ssGM_1440	MH-GIS-AC_ssMH_2515	981.51	MH-GIS-AC_ssMH_2516	977.36	84.2	0.049	8	PVC	0.01	4	6	-0.6	
GM-GIS-AC_ssGM_1441	MH-GIS-AC_ssMH_2518	963.48	MH-GIS-AC_ssMH_2532	960.88	90.8	0.029	8	PVC	0.01	14	100	2.7	
GM-GIS-AC_ssGM_1442	MH-GIS-AC_ssMH_2528	957.15	MH-GIS-AC_ssMH_2520	956.8	244.1	0.001	8	PVC	0.01	37	100	4	
GM-GIS-AC_ssGM_1443	MH-GIS-AC_ssMH_2515	981.51	MH-GIS-AC_ssMH_2536	986.72	122.9	0.042	8	PVC	0.01	2	4.2	4.6	
GM-GIS-AC_ssGM_1444	MH-GIS-AC_ssMH_2538	982.94	MH-GIS-AC_ssMH_2530	980.95	159.3	0.012	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1445	MH-GIS-AC_ssMH_2535	965.08	MH-GIS-AC_ssMH_2531	960.07	276	-0.018	8	PVC	0.01	26	100	-0.5	
GM-GIS-AC_ssGM_1446	MH-GIS-AC_ssMH_2542	992.86	MH-GIS-AC_ssMH_2534	992.06	87.2	0.009	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1447	MH-GIS-AC_ssMH_2516	977.36	MH-GIS-AC_ssMH_2514	975.79	71.6	0.022	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-AC_ssGM_1448	MH-GIS-MH-86	993.66	MH-GIS-AC_ssMH_2534	992.06	54	0.03	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-AC_ssGM_1449	MH-GIS-MH-55	976.71	MH-GIS-AC_ssMH_2527	977.75	37.6	-0.028	8	PVC	0.01	2	100	0.4	
GM-GIS-AC_ssGM_1450	MH-GIS-AC_ssMH_2520	956.8	MH-GIS-AC_ssMH_2543	957.94	32	0.036	8	PVC	0.01	7	100	4.4	
GM-GIS-AC_ssGM_1451	MH-GIS-AC_ssMH_2544	973.78	MH-GIS-AC_ssMH_2545	972.76	41.9	0.024	8	PVC	0.01	4	6	-0.6	
GM-GIS-AC_ssGM_1452	MH-GIS-AC_ssMH_2546	971.34	MH-GIS-AC_ssMH_2545	972.76	53.2	0.027	8	PVC	0.01	23	15.2	0.9	
GM-GIS-AC_ssGM_1453	MH-GIS-AC_ssMH_2547	974.61	MH-GIS-AC_ssMH_2545	972.76	39.9	0.046	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-AC_ssGM_1454	MH-GIS-AC_ssMH_2541	978.1	MH-GIS-AC_ssMH_2547	974.61	162	0.022	8	PVC	0.01	16	12.6	-0.6	
GM-GIS-AC_ssGM_1455	MH-GIS-MH-46	977.43	MH-GIS-AC_ssMH_2541	978.1	30	-0.022	8	PVC	0.01	14	100	0.1	
GM-GIS-AR_ssGM_751	MH-GIS-AR_ssMH_2012	534.92	MH-GIS-AR_ssMH_2015	531.19	92.4	0.04	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AR_ssGM_753	MH-GIS-AR_ssMH_2015	531.19	MH-GIS-AR_ssMH_2017	517.96	169.4	0.078	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-AR_ssGM_754	MH-GIS-AR_ssMH_2014	539.39	MH-GIS-AR_ssMH_2015	531.19	249.8	0.033	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AR_ssGM_755	MH-GIS-AR_ssMH_2013	551.42	MH-GIS-AR_ssMH_2015	531.19	287.7	0.07	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AU_ssGM_218	MH-GIS-AU_ssMH_1599	866.04	MH-GIS-AU_ssMH_1600	851.08	203.6	0.073	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-AU_ssGM_219	MH-GIS-FW_ssMH_1596	871.76	MH-GIS-AU_ssMH_1599	866.04	192.1	0.03	8	PVC	0.01	4	6.1	-0.6	
GM-GIS-AU_ssGM_220	MH-GIS-AU_ssMH_1600	851.08	MH-GIS-DH_ssMH_1601	841.46	194.5	0.049	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-AU_ssGM_367	MH-GIS-AU_ssMH_1767	885.96	MH-GIS-FW_ssMH_1608	884.67	106.1	0.012	8	PVC	0.01	6	7.6	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-AU_ssGM_368	MH-GIS-AU_ssMH_1765	892.62	MH-GIS-AU_ssMH_1766	889	127.1	0.028	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-AU_ssGM_369	MH-GIS-AU_ssMH_1764	894	MH-GIS-AU_ssMH_1765	892.62	263.7	0.005	8	PVC	0.01	2	5	-0.6	
GM-GIS-AU_ssGM_370	MH-GIS-AU_ssMH_1768	892.9	MH-GIS-AU_ssMH_1764	894	127	-0.009	8	PVC	0.01	1	100	0.5	
GM-GIS-AU_ssGM_371	MH-GIS-MH-166	894	MH-GIS-AU_ssMH_1764	894	139.4	0	8	PVC	0.01	1	8.5	-0.6	
GM-GIS-AU_ssGM_372	MH-GIS-MH-191	894	MH-GIS-AU_ssMH_1765	892.62	162.7	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-AU_ssGM_373	MH-GIS-AU_ssMH_1766	889	MH-GIS-AU_ssMH_1767	885.96	213.5	0.014	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-AU_ssGM_374	MH-GIS-AU_ssMH_1761	877.23	MH-GIS-AU_ssMH_1760	876.04	130.6	0.009	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-AU_ssGM_375	MH-GIS-AU_ssMH_1762	882.91	MH-GIS-AU_ssMH_1761	877.23	279.6	0.02	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AU_ssGM_376	MH-GIS-AU_ssMH_1760	876.04	MH-GIS-AU_ssMH_1600	851.08	129.2	0.193	8	PVC	0.01	4	6.1	-0.6	
GM-GIS-AU_ssGM_377	MH-GIS-AU_ssMH_1769	889.03	MH-GIS-AU_ssMH_1763	885.95	170	0.018	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-AU_ssGM_378	MH-GIS-AU_ssMH_1763	885.95	MH-GIS-AU_ssMH_1762	882.91	118.2	0.026	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-AU_ssGM_379	MH-GIS-AU_ssMH_1770	856.12	MH-GIS-AU_ssMH_1771	842.97	132.6	0.099	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-AU_ssGM_380	MH-GIS-AU_ssMH_1771	842.97	MH-GIS-DH_ssMH_1773	832.79	221.5	0.046	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AU_ssGM_382	MH-GIS-MH-85	861.23	MH-GIS-AU_ssMH_1770	856.12	52.7	0.097	6	PVC	0.01	1	3.9	-0.5	
GM-GIS-AZ_ssGM_1106	MH-GIS-AZ_ssMH_2479	751.27	MH-GIS-AZ_ssMH_2495	736.45	117	0.127	8	PVC	0.01	14	12	-0.6	
GM-GIS-AZ_ssGM_1107	MH-GIS-AZ_ssMH_2472	826.5	MH-GIS-AZ_ssMH_2471	823.93	56.8	0.045	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-AZ_ssGM_1108	MH-GIS-AZ_ssMH_2474	822.64	MH-GIS-AZ_ssMH_2475	825.15	283.1	-0.009	8	PVC	0.01	11	100	2	
GM-GIS-AZ_ssGM_1109	MH-GIS-AZ_ssMH_2473	822.85	MH-GIS-AZ_ssMH_2474	822.64	39.4	0.005	8	PVC	0.01	9	100	1.8	
GM-GIS-AZ_ssGM_1110	MH-GIS-AZ_ssMH_2475	825.15	MH-GIS-AZ_ssMH_2485	809.69	332.1	0.047	8	PVC	0.01	16	12.6	-0.6	
GM-GIS-AZ_ssGM_1111	MH-GIS-AZ_ssMH_2483	790.7	MH-GIS-AZ_ssMH_2477	788.86	75.8	0.024	8	PVC	0.01	5	7.4	-0.6	
GM-GIS-AZ_ssGM_1112	MH-GIS-AZ_ssMH_2478	770.13	MH-GIS-AZ_ssMH_2479	751.27	144.5	0.13	8	PVC	0.01	10	9.9	-0.6	
GM-GIS-AZ_ssGM_1113	MH-GIS-AZ_ssMH_2480	725.46	MH-GIS-AZ_ssMH_2481	722.02	56.6	0.061	8	PVC	0.01	16	12.9	-0.6	
GM-GIS-AZ_ssGM_1114	MH-GIS-AZ_ssMH_2505	771.4	MH-GIS-AZ_ssMH_2504	770.86	66.9	0.008	8	PVC	0.01	14	11.8	-0.6	
GM-GIS-AZ_ssGM_1115	MH-GIS-AZ_ssMH_2476	814.59	MH-GIS-AZ_ssMH_2477	788.86	314.7	0.082	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1116	MH-GIS-AZ_ssMH_2498	814.65	MH-GIS-AZ_ssMH_2482	806.69	220.5	0.036	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-AZ_ssGM_1117	MH-GIS-AZ_ssMH_2503	748.41	MH-GIS-AZ_ssMH_2488	733.3	174	0.087	8	PVC	0.01	23	15.2	-0.6	
GM-GIS-AZ_ssGM_1118	MH-GIS-AZ_ssMH_2488	733.3	MH-GIS-AZ_ssMH_2486	724.31	122	0.074	8	PVC	0.01	24	15.6	-0.6	
GM-GIS-AZ_ssGM_1119	MH-GIS-AZ_ssMH_2506	777.34	MH-GIS-AZ_ssMH_2505	771.4	145.7	0.041	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-AZ_ssGM_1120	MH-GIS-AZ_ssMH_2482	806.69	MH-GIS-AZ_ssMH_2484	799.77	225.1	0.031	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1121	MH-GIS-AZ_ssMH_2492	802.29	MH-GIS-AZ_ssMH_2483	790.7	192.3	0.06	8	PVC	0.01	4	6.6	-0.6	
GM-GIS-AZ_ssGM_1122	MH-GIS-AZ_ssMH_2489	806.65	MH-IS-18	799.57	257.4	0.028	8	PVC	0.01	68	26.7	-0.5	
GM-GIS-AZ_ssGM_1123	MH-GIS-AZ_ssMH_2471	823.93	MH-GIS-AZ_ssMH_2473	822.85	148	0.007	8	PVC	0.01	7	100	0.7	
GM-GIS-AZ_ssGM_1124	MH-GIS-AZ_ssMH_2477	788.86	MH-GIS-AZ_ssMH_2478	770.13	151.6	0.124	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-AZ_ssGM_1125	MH-GIS-AZ_ssMH_2485	809.69	MH-GIS-AZ_ssMH_2491	807.92	226.7	0.008	8	PVC	0.01	63	25.8	-0.5	
GM-GIS-AZ_ssGM_1126	MH-GIS-AZ_ssMH_2491	807.92	MH-GIS-AZ_ssMH_2489	806.65	193.7	0.007	8	PVC	0.01	65	26.2	-0.5	
GM-GIS-AZ_ssGM_1127	MH-GIS-AZ_ssMH_2481	722.02	MH-GIS-AZ_ssMH_2486	724.31	231.9	-0.01	8	PVC	0.01	17	100	1.8	
GM-GIS-AZ_ssGM_1128	MH-GIS-AZ_ssMH_2507	793.93	MH-GIS-AZ_ssMH_2506	777.34	311.8	0.053	8	PVC	0.01	5	6.8	-0.6	
GM-GIS-AZ_ssGM_1129	MH-GIS-AZ_ssMH_2484	799.77	MH-GIS-AZ_ssMH_2492	802.29	112.1	-0.022	8	PVC	0.01	3	100	1.9	
GM-GIS-AZ_ssGM_1130	MH-GIS-AZ_ssMH_2504	770.86	MH-GIS-AZ_ssMH_2503	748.41	196.1	0.114	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-AZ_ssGM_1131	MH-GIS-AZ_ssMH_2493	760.45	MH-GIS-AZ_ssMH_2479	751.27	163.2	0.056	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-AZ_ssGM_1132	MH-GIS-AZ_ssMH_2494	777.45	MH-GIS-AZ_ssMH_2493	760.45	193.7	0.088	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1133	MH-GIS-AZ_ssMH_2495	736.45	MH-GIS-AZ_ssMH_2480	725.46	123.1	0.089	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-AZ_ssGM_1134	MH-GIS-AZ_ssMH_2496	827.6	MH-GIS-AZ_ssMH_2475	825.15	82	0.03	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-AZ_ssGM_1135	MH-GIS-AZ_ssMH_2497	817.01	MH-GIS-AZ_ssMH_2476	814.59	110.9	0.022	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-AZ_ssGM_1136	MH-GIS-AZ_ssMH_2499	783.08	MH-GIS-AZ_ssMH_2494	777.45	94.7	0.059	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-AZ_ssGM_1137	MH-GIS-AZ_ssMH_2486	724.31	MH-GIS-AZ_ssMH_2500	713.38	121.3	0.09	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-AZ_ssGM_1138	MH-GIS-AZ_ssMH_2500	713.38	MH-GIS-AZ_ssMH_2487	707.6	37.2	0.155	8	PVC	0.01	43	21.2	-0.5	
GM-GIS-AZ_ssGM_1139	MH-GIS-AZ_ssMH_2487	707.6	MH-GIS-AZ_ssMH_2502	691.99	195.9	0.08	8	PVC	0.01	44	21.5	-0.5	
GM-GIS-AZ_ssGM_1140	MH-GIS-AZ_ssMH_2502	691.99	ump Station K2 (Burke St) Wetw	688.45	7.8	0.453	8	PVC	0.01	45	21.7	-0.5	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-AZ_ssGM_1417	MH-GIS-AZ_ssMH_2501	832.13	MH-GIS-AZ_ssMH_2472	826.5	177.9	0.032	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-BA_ssGM_622	MH-GIS-BR_ssMH_1261	547.04	MH-GIS-BR_ssMH_1256	547.29	34.7	-0.007	8	Glass	0.013	29	63.9	-0.2	
GM-GIS-BA_ssGM_623	MH-GIS-BR_ssMH_1258	534.86	MH-GIS-BR_ssMH_1257	532.52	21.3	0.11	8	Glass	0.013	32	18.1	-0.5	
GM-GIS-BA_ssGM_624	MH-GIS-BR_ssMH_1257	532.52	Pump Station Z (Gala) Wetwell	527.95	6.8	0.676	8	Glass	0.013	34	18.6	-0.5	
GM-GIS-BA_ssGM_625	MH-GIS-BR_ssMH_1262	543.07	MH-GIS-BR_ssMH_1261	547.04	112.7	-0.035	8	Glass	0.013	27	100	3.7	
GM-GIS-BA_ssGM_626	MH-GIS-BR_ssMH_1258	534.86	MH-GIS-BR_ssMH_1256	547.29	123.7	0.1	8	Glass	0.013	30	17.7	11.9	
GM-GIS-BA_ssGM_627	MH-GIS-BR_ssMH_1275	560.87	MH-GIS-BR_ssMH_1274	553.5	109.5	0.067	8	Glass	0.013	3	5.8	-0.6	
GM-GIS-BA_ssGM_628	MH-GIS-BR_ssMH_1260	564	MH-GIS-BR_ssMH_1275	560.87	106.8	0.029	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-BA_ssGM_629	MH-GIS-BR_ssMH_1259	564	MH-GIS-BR_ssMH_1263	564	153.3	0	8	Glass	0.013	2	12.9	-0.6	
GM-GIS-BA_ssGM_630	MH-GIS-BR_ssMH_1269	551.44	MH-GIS-BR_ssMH_1265	548.23	68.3	0.047	8	Glass	0.013	8	100	1.1	
GM-GIS-BA_ssGM_631	MH-GIS-BR_ssMH_1265	548.23	MH-GIS-BR_ssMH_1264	547.25	116.7	0.008	8	Glass	0.013	10	100	4.4	
GM-GIS-BA_ssGM_632	MH-GIS-BR_ssMH_1264	547.25	MH-GIS-BR_ssMH_1266	552.11	140.5	-0.035	8	Glass	0.013	12	100	10.2	
GM-GIS-BA_ssGM_633	MH-GIS-BR_ssMH_1266	552.11	MH-GIS-BR_ssMH_1267	559.23	115.6	-0.062	8	Glass	0.013	13	100	7.7	
GM-GIS-BA_ssGM_634	MH-GIS-BR_ssMH_1267	559.23	MH-GIS-BR_ssMH_1268	560.34	122.1	-0.009	8	Glass	0.013	15	100	0.6	
GM-GIS-BA_ssGM_635	MH-GIS-BR_ssMH_1268	560.34	MH-GIS-BR_ssMH_1272	557.8	102.3	0.025	8	Glass	0.013	17	13.1	-0.6	
GM-GIS-BA_ssGM_636	MH-GIS-BR_ssMH_1270	552.27	MH-GIS-BR_ssMH_1269	551.44	328	0.003	8	Glass	0.013	7	100	0.3	
GM-GIS-BA_ssGM_637	MH-GIS-BR_ssMH_1263	564	MH-GIS-BR_ssMH_1271	563.3	116.1	0.006	8	Glass	0.013	3	6.4	-0.6	
GM-GIS-BA_ssGM_638	MH-GIS-BR_ssMH_1271	563.3	MH-GIS-BR_ssMH_1272	557.8	111.4	0.049	8	Glass	0.013	5	7.1	-0.6	
GM-GIS-BA_ssGM_639	MH-GIS-BR_ssMH_1272	557.8	MH-GIS-BR_ssMH_1273	544	227.8	0.061	8	Glass	0.013	23	15.6	-0.6	
GM-GIS-BA_ssGM_640	MH-GIS-BR_ssMH_1273	544	MH-GIS-BR_ssMH_1262	543.07	92.4	0.01	8	Glass	0.013	25	100	2.8	
GM-GIS-BA_ssGM_641	MH-GIS-BR_ssMH_1274	553.5	MH-GIS-BR_ssMH_1270	552.27	52.5	0.023	8	Glass	0.013	5	7.1	-0.6	
GM-GIS-BA_ssGM_646	MH-GIS-BA_ssMH_1930	789.51	MH-GIS-BA_ssMH_1942	788.17	202.8	0.007	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_647	MH-GIS-BA_ssMH_1919	830.9	MH-GIS-BA_ssMH_1923	831.44	93.5	-0.006	8	PVC	0.01	1	88.3	-0.1	
GM-GIS-BA_ssGM_648	MH-GIS-BA_ssMH_1925	830.88	MH-GIS-BA_ssMH_1924	830.07	46.9	0.017	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-BA_ssGM_649	MH-GIS-BA_ssMH_1926	768.21	MH-GIS-BA_ssMH_1927	766.81	90.4	0.015	8	PVC	0.01	54	23.6	-0.5	
GM-GIS-BA_ssGM_650	MH-GIS-BA_ssMH_1924	830.07	MH-GIS-BA_ssMH_1933	829.47	40.8	0.015	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-BA_ssGM_651	MH-GIS-BA_ssMH_1936	844	MH-GIS-BA_ssMH_1929	839.27	124	0.038	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-BA_ssGM_652	MH-GIS-BA_ssMH_1928	769.11	MH-GIS-BA_ssMH_1926	768.21	59.2	0.015	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-BA_ssGM_653	MH-GIS-BA_ssMH_1931	809	MH-GIS-BA_ssMH_1940	804.21	206.8	0.023	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_654	MH-GIS-BA_ssMH_1941	821.69	MH-GIS-BA_ssMH_1939	818.4	207.3	0.016	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BA_ssGM_655	MH-GIS-BA_ssMH_1932	824.81	MH-GIS-BA_ssMH_1939	818.4	116.8	0.055	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-BA_ssGM_656	MH-GIS-BA_ssMH_1938	828.53	MH-GIS-BA_ssMH_1932	824.81	83.3	0.045	8	PVC	0.01	20	14.2	-0.6	
GM-GIS-BA_ssGM_657	MH-GIS-BA_ssMH_1921	829	MH-GIS-BA_ssMH_1933	829.47	61.7	-0.008	8	PVC	0.01	1	80.3	-0.1	
GM-GIS-BA_ssGM_658	MH-GIS-BA_ssMH_1933	829.47	MH-GIS-BA_ssMH_1934	829	90.8	0.005	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-BA_ssGM_659	MH-GIS-BA_ssMH_1920	830.84	MH-GIS-BA_ssMH_1925	830.88	59.2	-7E-04	8	PVC	0.01	1	14.2	-0.6	
GM-GIS-BA_ssGM_660	MH-GIS-BA_ssMH_1918	843.65	MH-GIS-BA_ssMH_1922	842.94	39.7	0.018	8	PVC	0.01	1	65.2	-0.2	
GM-GIS-BA_ssGM_661	MH-GIS-BA_ssMH_1922	842.94	MH-GIS-BA_ssMH_1935	843.62	53.1	-0.013	8	PVC	0.01	3	100	0.5	
GM-GIS-BA_ssGM_662	MH-GIS-BA_ssMH_1940	804.21	MH-GIS-BA_ssMH_1942	788.17	247.1	0.065	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-BA_ssGM_663	MH-GIS-BA_ssMH_1939	818.4	MH-GIS-BA_ssMH_1940	804.21	255.2	0.056	8	PVC	0.01	24	15.6	-0.6	
GM-GIS-BA_ssGM_664	MH-GIS-BA_ssMH_1937	832.81	MH-GIS-BA_ssMH_1938	828.53	82.4	0.052	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-BA_ssGM_665	MH-GIS-BA_ssMH_1934	829	MH-GIS-BA_ssMH_1938	828.53	113.6	0.004	8	PVC	0.01	11	10.5	-0.6	
GM-GIS-BA_ssGM_666	MH-GIS-BA_ssMH_1935	843.62	MH-GIS-BA_ssMH_1936	844	104.4	-0.004	8	PVC	0.01	4	69.7	-0.2	
GM-GIS-BA_ssGM_667	MH-GIS-BA_ssMH_1929	839.27	MH-GIS-BA_ssMH_1937	832.81	135.3	0.048	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-BA_ssGM_668	MH-GIS-BA_ssMH_1923	831.44	MH-GIS-BA_ssMH_1925	830.88	44.1	0.013	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-BA_ssGM_669	MH-GIS-BA_ssMH_1942	788.17	MH-GIS-BA_ssMH_1943	785.61	60.7	0.042	8	PVC	0.01	29	17.3	-0.6	
GM-GIS-BA_ssGM_670	MH-GIS-BA_ssMH_1943	785.61	MH-GIS-BA_ssMH_1944	781.15	85.3	0.052	8	PVC	0.01	30	17.7	-0.5	
GM-GIS-BA_ssGM_671	MH-GIS-BA_ssMH_1944	781.15	MH-GIS-BA_ssMH_1945	769.62	120.7	0.096	8	PVC	0.01	32	18.1	-0.5	
GM-GIS-BA_ssGM_672	MH-GIS-BA_ssMH_1927	766.81	MH-GIS-BA_ssMH_1284	764.62	108.8	0.02	8	PVC	0.01	55	23.9	-0.5	
GM-GIS-BA_ssGM_673	MH-GIS-BA_ssMH_1945	769.62	MH-GIS-BA_ssMH_1928	769.11	70.6	0.007	8	PVC	0.01	51	23.1	-0.5	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-BP_ssGM_2	MH-GIS-BP_ssMH_1535	839.22	MH-GIS-BP_ssMH_1536	840.96	86.2	-0.02	8	PVC	0.01	3	100	1.1	
GM-GIS-BP_ssGM_3	MH-GIS-BP_ssMH_1536	840.96	MH-IS-53	830.15	89	0.122	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-BP_ssGM_4	MH-GIS-BP_ssMH_1534	855.03	MH-GIS-BP_ssMH_1535	839.22	259.3	0.061	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_5	MH-GIS-BP_ssMH_1537	828.7	MH-GIS-BP_ssMH_1538	830.07	85	-0.016	8	PVC	0.01	1	100	0.8	
GM-GIS-BP_ssGM_6	MH-GIS-BP_ssMH_1539	828.73	MH-GIS-BP_ssMH_1540	825.06	130.9	0.028	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_7	MH-GIS-BP_ssMH_1540	825.06	MH-IS-49	804.65	232	0.088	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_340	MH-GIS-BP_ssMH_1753	780.94	MH-IS-198	779.52	38.9	0.037	8	Ductile Iron	0.013	721	88.2	-0.1	
GM-GIS-BP_ssGM_341	MH-GIS-BP_ssMH_1538	830.07	MH-IS-58	819.51	38	0.278	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_342	MH-GIS-BP_ssMH_1737	845.7	MH-GIS-BP_ssMH_1738	838.64	302.4	0.023	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_345	MH-GIS-BP_ssMH_1741	809	MH-IS-50	797.44	95.4	0.121	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_347	MH-GIS-MH-44	791.82	MH-IS-MH-210	778.16	30	0.456	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_357(1)	MH-GIS-BP_ssMH_1738	838.64	MH-GIS-MH-90	835.24	264	0.013	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-BP_ssGM_357(2)	MH-GIS-MH-90	835.24	MH-IS-MH-5	825.27	73.1	0.136	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-BP_ssGM_359	MH-GIS-BP_ssMH_1755	801.95	MH-GIS-BP_ssMH_1758	796.09	160.6	0.036	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-BP_ssGM_360	MH-GIS-BP_ssMH_1754	788.61	MH-GIS-BP_ssMH_1753	780.94	210	0.037	8	Ductile Iron	0.013	720	88.1	-0.1	
GM-GIS-BP_ssGM_361	MH-GIS-BP_ssMH_1756	807.02	MH-GIS-BP_ssMH_1755	801.95	251.4	0.02	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-BP_ssGM_362	MH-GIS-BP_ssMH_1757	792.54	MH-GIS-BP_ssMH_1754	788.61	107.5	0.037	8	PVC	0.01	719	88.1	-0.1	
GM-GIS-BP_ssGM_363	MH-GIS-BP_ssMH_1758	796.09	MH-GIS-BP_ssMH_1757	792.54	146.8	0.024	8	PVC	0.01	717	88	-0.1	
GM-GIS-BP_ssGM_571	MH-GIS-MH-113	877.1	MH-IS-123	863.89	73.8	0.179	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_572	MH-GIS-MH-171	870.05	MH-IS-123	863.89	147.4	0.042	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_1083	MH-GIS-MH-89	836.77	MH-GIS-MH-90	835.24	56.1	0.027	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-BP_ssGM_1084	MH-GIS-BP_ssMH_2211	840.99	MH-GIS-MH-162	839	182.5	0.011	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-BP_ssGM_1085	MH-GIS-MH-162	839	MH-GIS-BP_ssMH_2210	838.36	135.2	0.005	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-BP_ssGM_1086	MH-GIS-BP_ssMH_2210	838.36	MH-GIS-BP_ssMH_2209	838.39	119.5	-3E-04	8	PVC	0.01	2	15.8	-0.6	
GM-GIS-BP_ssGM_1087	MH-GIS-BP_ssMH_2209	838.39	MH-GIS-MH-89	836.77	47.3	0.034	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-BP_ssGM_1283	MH-GIS-BP_ssMH_2352	835.22	MH-GIS-BP_ssMH_2354	825.07	150.8	0.067	8	PVC	0.01	283	56.1	-0.3	
GM-GIS-BP_ssGM_1284	MH-GIS-BP_ssMH_2354	825.07	MH-GIS-BP_ssMH_2353	824.9	43.2	0.004	8	PVC	0.01	622	100	0.1	
GM-GIS-BP_ssGM_1298	MH-GIS-BP_ssMH_2362	814.43	MH-GIS-BP_ssMH_2361	808.69	309	0.019	8	PVC	0.01	710	87.7	-0.1	
GM-GIS-BP_ssGM_1299	MH-GIS-BP_ssMH_2353	824.9	MH-GIS-BP_ssMH_2362	814.43	168	0.062	8	PVC	0.01	708	87.6	-0.1	
GM-GIS-BP_ssGM_1300	MH-GIS-BP_ssMH_2361	808.69	MH-GIS-BP_ssMH_2363	800.67	342.5	0.023	8	PVC	0.01	712	87.8	-0.1	
GM-GIS-BP_ssGM_1301	MH-GIS-BP_ssMH_2363	800.67	MH-GIS-BP_ssMH_1758	796.09	385.8	0.012	8	PVC	0.01	714	87.8	-0.1	
GM-GIS-BP_ssGM_1458	MH-GIS-MH-70	809.18	MH-GIS-BP_ssMH_1741	809	44.2	0.004	8	PVC	0.01	1	4	-0.6	
GM-GIS-CO-22	MH-GIS-DY_ssMH_2561	721.57	Pump Station N6 Wetwell	717.14	10.7	0.415	8	Glass	0.013	18	13.6	-0.6	
GM-GIS-CO-126	MH-IS-GS_ssMH_1480	408.77	MH-IS-193	407.54	235	0.005	10	Concrete	0.013	256	41.5	-0.5	SM4
GM-GIS-CO_ssGM_109	MH-GIS-CO_ssMH_1372	904.88	MH-GIS-CO_ssMH_1428	902.68	138.3	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_110	MH-GIS-CO_ssMH_1428	902.68	MH-GIS-CO_ssMH_1427	902.11	85.1	0.007	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_111	MH-GIS-CO_ssMH_1371	905.28	MH-GIS-CO_ssMH_1427	902.11	193.4	0.016	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_113	MH-GIS-CO_ssMH_1426	899	MH-GIS-CO_ssMH_1419	896.39	127.3	0.021	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_114	MH-GIS-CO_ssMH_1425	904.06	MH-GIS-CO_ssMH_1426	899	134.1	0.038	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_115	MH-GIS-CO_ssMH_1423	887.13	MH-GIS-CO_ssMH_1424	884.92	121.8	0.018	8	PVC	0.01	33	18.6	-0.5	
GM-GIS-CO_ssGM_116	MH-GIS-CO_ssMH_1422	891.5	MH-GIS-CO_ssMH_1423	887.13	123.9	0.035	8	PVC	0.01	31	17.9	-0.5	
GM-GIS-CO_ssGM_117	MH-GIS-CO_ssMH_1429	894	MH-GIS-CO_ssMH_1422	891.5	153	0.016	8	PVC	0.01	29	17.3	-0.6	
GM-GIS-CO_ssGM_118	MH-GIS-CO_ssMH_1421	894	MH-GIS-CO_ssMH_1429	894	82.7	0	8	PVC	0.01	18	25.9	-0.5	
GM-GIS-CO_ssGM_119	MH-GIS-CO_ssMH_1420	896.71	MH-GIS-CO_ssMH_1421	894	96.8	0.028	8	PVC	0.01	16	12.6	-0.6	
GM-GIS-CO_ssGM_120	MH-GIS-CO_ssMH_1419	896.39	MH-GIS-CO_ssMH_1420	896.71	68.2	-0.005	8	PVC	0.01	13	66.8	-0.2	
GM-GIS-CO_ssGM_121	MH-GIS-CO_ssMH_1418	899.03	MH-GIS-CO_ssMH_1419	896.39	177	0.015	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-CO_ssGM_122	MH-GIS-CO_ssMH_1417	899.91	MH-GIS-CO_ssMH_1418	899.03	45.7	0.019	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-CO_ssGM_123	MH-GIS-CO_ssMH_1416	902.07	MH-GIS-CO_ssMH_1417	899.91	129.1	0.017	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-CO_ssGM_157	MH-GIS-CO_ssMH_1395	851.41	MH-GIS-SC_ssMH_1409	837.73	140.2	0.098	8	PVC	0.01	38	19.8	-0.5	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CO_ssGM_161	MH-GIS-CO_ssMH_1427	902.11	MH-GIS-CO_ssMH_1429	894	234.2	0.035	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-CO_ssGM_170	MH-GIS-CO_ssMH_1424	884.92	MH-GIS-CO_ssMH_1395	851.41	229.8	0.146	8	PVC	0.01	36	19.2	-0.5	
GM-GIS-CO_ssGM_453	MH-GIS-CO_ssMH_1820	903.4	MH-GIS-CO_ssMH_1831	899	138.2	0.032	8	Ductile Iron	0.013	7	8.2	-0.6	
GM-GIS-CO_ssGM_454	MH-GIS-CO_ssMH_1821	909	MH-GIS-CO_ssMH_1820	903.4	227.7	0.025	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-CO_ssGM_455	MH-GIS-CO_ssMH_1822	900.21	MH-GIS-CO_ssMH_1831	899	115.9	0.01	8	Ductile Iron	0.013	12	11.2	-0.6	
GM-GIS-CO_ssGM_456	MH-GIS-CO_ssMH_1830	902.92	MH-GIS-CO_ssMH_1822	900.21	132	0.021	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-CO_ssGM_457	MH-GIS-CO_ssMH_1823	899	MH-GIS-CO_ssMH_1829	901.61	169.9	-0.015	8	PVC	0.01	1	100	3.4	
GM-GIS-CO_ssGM_458	MH-GIS-CO_ssMH_1824	905.92	MH-GIS-CO_ssMH_1832	907.32	89	-0.016	8	PVC	0.01	2	100	0.8	
GM-GIS-CO_ssGM_459	MH-GIS-CO_ssMH_1825	905.89	MH-GIS-CO_ssMH_1830	902.92	282	0.011	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-CO_ssGM_460	MH-GIS-CO_ssMH_1832	907.32	MH-GIS-CO_ssMH_1825	905.89	145.1	0.01	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-CO_ssGM_461	MH-GIS-CO_ssMH_1826	901.33	MH-GIS-CO_ssMH_1827	901.05	166.8	0.002	8	PVC	0.01	1	100	1	
GM-GIS-CO_ssGM_462	MH-GIS-CO_ssMH_1836	902.92	MH-GIS-CO_ssMH_1828	901.53	175.2	0.008	8	PVC	0.01	3	16.3	-0.6	
GM-GIS-CO_ssGM_463	MH-GIS-MH-163	905.76	MH-GIS-CO_ssMH_1827	901.05	138	0.034	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-CO_ssGM_464	MH-GIS-CO_ssMH_1828	901.53	MH-GIS-CO_ssMH_1829	901.61	126.4	-6E-04	8	PVC	0.01	5	100	0.8	
GM-GIS-CO_ssGM_465	MH-GIS-MH-169	904.03	MH-GIS-CO_ssMH_1828	901.53	147	0.017	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-CO_ssGM_466	MH-GIS-CO_ssMH_1829	901.61	MH-GIS-CO_ssMH_1830	902.92	210.1	-0.006	8	PVC	0.01	7	100	0.8	
GM-GIS-CO_ssGM_467	MH-GIS-CO_ssMH_1831	899	MH-IS-69	876.77	261.2	0.085	8	Ductile Iron	0.013	20	14.3	-0.6	
GM-GIS-CO_ssGM_468	MH-GIS-MH-182	905.23	MH-GIS-CO_ssMH_1833	907.18	156.4	-0.012	8	PVC	0.01	1	100	1.5	
GM-GIS-CO_ssGM_469	MH-GIS-CO_ssMH_1835	909	MH-GIS-CO_ssMH_1821	909	149.3	0	8	PVC	0.01	1	9.1	-0.6	
GM-GIS-CO_ssGM_470	MH-GIS-CO_ssMH_1834	908.47	MH-GIS-CO_ssMH_1818	908.92	68.1	-0.007	8	PVC	0.01	2	95.5	0	
GM-GIS-CO_ssGM_471	MH-GIS-MH-192	905.9	MH-GIS-CO_ssMH_1834	908.47	163.1	-0.016	8	PVC	0.01	1	100	2.5	
GM-GIS-CO_ssGM_472	MH-GIS-CO_ssMH_1833	907.18	MH-GIS-CO_ssMH_1824	905.92	93.4	0.013	8	PVC	0.01	2	31.6	-0.5	
GM-GIS-CO_ssGM_473	MH-GIS-CO_ssMH_1827	901.05	MH-GIS-CO_ssMH_1836	902.92	42	-0.045	8	PVC	0.01	2	100	1.3	
GM-GIS-CO_ssGM_1050	MH-GIS-CO_ssMH_1819	909	MH-GIS-CO_ssMH_1821	909	93.9	0	8	PVC	0.01	4	15.2	-0.6	
GM-GIS-CO_ssGM_1051	MH-GIS-CO_ssMH_1818	908.92	MH-GIS-CO_ssMH_1819	909	146.6	-6E-04	8	PVC	0.01	3	28	-0.5	
GM-GIS-CO_ssGM_1052	MH-GIS-CO_ssMH_1817	909	MH-GIS-CO_ssMH_1818	908.92	112.5	7E-04	8	PVC	0.01	1	16	-0.6	
GM-GIS-CR_ssGM_1194	MH-GIS-DP_ssMH_2281	901.58	MH-GIS-DP_ssMH_2302	898.53	183.1	0.017	8	PVC	0.01	322	59.9	-0.3	
GM-GIS-CR_ssGM_1250	MH-GIS-CR_ssMH_2568	970.75	MH-GIS-CR_ssMH_2321	968.83	67	0.029	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-CR_ssGM_1251	MH-GIS-MH-167	916.76	MH-GIS-DP_ssMH_2281	901.58	141.9	0.107	8	PVC	0.01	320	59.8	-0.3	
GM-GIS-CR_ssGM_1252	MH-GIS-DP_ssMH_2328	919	MH-GIS-MH-167	916.76	57.8	0.039	8	PVC	0.01	318	59.6	-0.3	
GM-GIS-CR_ssGM_1254	MH-GIS-CR_ssMH_2323	955.99	MH-GIS-CR_ssMH_2330	955.7	161.5	0.002	8	PVC	0.01	248	69.5	-0.2	
GM-GIS-CR_ssGM_1256	MH-GIS-CR_ssMH_2331	979.07	MH-GIS-CR_ssMH_2321	968.83	146.8	0.07	8	PVC	0.01	157	41.2	-0.4	
GM-GIS-CR_ssGM_1258	MH-GIS-CR_ssMH_2321	968.83	MH-GIS-CR_ssMH_2332	960.9	145.9	0.054	8	PVC	0.01	243	51.7	-0.3	
GM-GIS-CR_ssGM_1259	MH-GIS-CR_ssMH_2332	960.9	MH-GIS-CR_ssMH_2333	955.94	143.9	0.034	8	PVC	0.01	244	51.9	-0.3	
GM-GIS-CR_ssGM_1260	MH-GIS-CR_ssMH_2333	955.94	MH-GIS-CR_ssMH_2323	955.99	126.1	-4E-04	8	PVC	0.01	246	100	0	
GM-GIS-CR_ssGM_1261	MH-GIS-DP_ssMH_2335	934.79	MH-GIS-DP_ssMH_2336	925.87	60.5	0.147	8	PVC	0.01	315	59.2	-0.3	
GM-GIS-CR_ssGM_1262	MH-GIS-DP_ssMH_2336	925.87	MH-GIS-DP_ssMH_2328	919	152.7	0.045	8	PVC	0.01	316	59.4	-0.3	
GM-GIS-CR_ssGM_1263	MH-GIS-CR_ssMH_2334	943.18	MH-GIS-DP_ssMH_2335	934.79	90.3	0.093	8	PVC	0.01	313	59.1	-0.3	
GM-GIS-CR_ssGM_1267	MH-GIS-CR_ssMH_2337	958.27	MH-GIS-CR_ssMH_2338	941.9	203	0.081	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-CR_ssGM_1268	MH-GIS-CR_ssMH_2379	970.91	MH-GIS-CR_ssMH_2337	958.27	101.6	0.124	8	PVC	0.01	46	21.8	-0.5	
GM-GIS-CR_ssGM_1269	MH-GIS-CR_ssMH_2338	941.9	MH-GIS-CR_ssMH_2339	940.05	67.1	0.028	8	PVC	0.01	58	100	1	
GM-GIS-CR_ssGM_1270	MH-GIS-CR_ssMH_2339	940.05	MH-GIS-CR_ssMH_2334	943.18	174.8	-0.018	8	PVC	0.01	60	100	2.9	
GM-GIS-CR_ssGM_1271	MH-GIS-CR_ssMH_2330	955.7	MH-GIS-CR_ssMH_2340	948.55	204.8	0.035	8	PVC	0.01	250	52.5	-0.3	
GM-GIS-CR_ssGM_1272	MH-GIS-CR_ssMH_2340	948.55	MH-GIS-CR_ssMH_2334	943.18	94.8	0.057	8	PVC	0.01	251	52.7	-0.3	
GM-GIS-CR_ssGM_1877	MH-GIS-CR_ssMH_2978	979.6	MH-GIS-CR_ssMH_2568	970.75	77	0.115	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CR_ssGM_1878	MH-GIS-CR_ssMH_2979	986.08	MH-GIS-CR_ssMH_2978	979.6	75.6	0.086	8	PVC	0.01	4	6	-0.6	
GM-GIS-CR_ssGM_1879	MH-GIS-CR_ssMH_2980	990.89	MH-GIS-CR_ssMH_2979	986.08	75.7	0.064	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-CR_ssGM_1880	MH-GIS-CR_ssMH_2990	959.4	MH-GIS-CR_ssMH_2337	958.27	55.5	0.02	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-CR_ssGM_1881	MH-GIS-CR_ssMH_2981	978.58	MH-GIS-CR_ssMH_2990	959.4	249.3	0.077	8	PVC	0.01	7	8.5	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CR_ssGM_1882	MH-GIS-CR_ssMH_2984	988.74	MH-GIS-CR_ssMH_2982	983.25	226.8	0.024	8	PVC	0.01	4	6	-0.6	
GM-GIS-CR_ssGM_1883	MH-GIS-CR_ssMH_2982	983.25	MH-GIS-CR_ssMH_2981	978.58	126.4	0.037	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CR_ssGM_1884	MH-GIS-CR_ssMH_2983	991.74	MH-GIS-CR_ssMH_2984	988.74	86.3	0.035	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-CT_ssGM_8	MH-GIS-CT_ssMH_1278	749.62	MH-GIS-MH-36	749.5	23.3	0.005	8	PVC	0.01	83	29.5	-0.5	
GM-GIS-CT_ssGM_9	MH-GIS-MH-93	762.41	MH-GIS-CT_ssMH_1293	750.54	60.1	0.198	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_10	MH-GIS-CT_ssMH_1293	750.54	MH-GIS-CT_ssMH_1277	750.19	56	0.006	8	PVC	0.01	80	29	-0.5	
GM-GIS-CT_ssGM_11	MH-GIS-CT_ssMH_1277	750.19	MH-GIS-CT_ssMH_1278	749.62	46.1	0.012	8	PVC	0.01	81	29.3	-0.5	
GM-GIS-CT_ssGM_12	MH-GIS-CT_ssMH_1291	754.92	MH-GIS-CT_ssMH_1276	754.24	87.6	0.008	8	PVC	0.01	67	26.4	-0.5	
GM-GIS-CT_ssGM_13	MH-GIS-CT_ssMH_1276	754.24	MH-GIS-CT_ssMH_1294	752.33	82.1	0.023	8	PVC	0.01	68	26.7	-0.5	
GM-GIS-CT_ssGM_14	MH-GIS-CT_ssMH_1286	762.24	MH-GIS-CT_ssMH_1287	761.05	151.9	0.008	8	PVC	0.01	59	24.8	-0.5	
GM-GIS-CT_ssGM_15	MH-GIS-MH-116	765.96	MH-GIS-CT_ssMH_1290	756.86	76.6	0.119	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_16	MH-GIS-CT_ssMH_1280	764	MH-GIS-CT_ssMH_1279	763.04	73.8	0.013	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CT_ssGM_17	MH-GIS-CT_ssMH_1283	769	MH-GIS-CT_ssMH_1282	767.57	230.3	0.006	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CT_ssGM_18	MH-GIS-BA_ssMH_1284	764.62	MH-GIS-CT_ssMH_1285	762.94	157.8	0.011	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-CT_ssGM_19	MH-GIS-CT_ssMH_1290	756.86	MH-GIS-CT_ssMH_1291	754.92	253.1	0.008	8	PVC	0.01	65	26.2	-0.5	
GM-GIS-CT_ssGM_20	MH-GIS-CT_ssMH_1292	751.73	MH-GIS-CT_ssMH_1293	750.54	197.8	0.006	8	PVC	0.01	77	28.5	-0.5	
GM-GIS-CT_ssGM_21	MH-GIS-CT_ssMH_1294	752.33	MH-GIS-CT_ssMH_1292	751.73	108.9	0.006	8	PVC	0.01	76	28.3	-0.5	
GM-GIS-CT_ssGM_22	MH-GIS-CT_ssMH_1289	758.1	MH-GIS-CT_ssMH_1290	756.86	167.8	0.007	8	PVC	0.01	63	25.7	-0.5	
GM-GIS-CT_ssGM_23	MH-GIS-CT_ssMH_1288	760.29	MH-GIS-CT_ssMH_1289	758.1	295.1	0.007	8	PVC	0.01	61	25.4	-0.5	
GM-GIS-CT_ssGM_24	MH-GIS-CT_ssMH_1287	761.05	MH-GIS-CT_ssMH_1288	760.29	80	0.01	8	PVC	0.01	60	25.1	-0.5	
GM-GIS-CT_ssGM_25	MH-GIS-CT_ssMH_1285	762.94	MH-GIS-CT_ssMH_1286	762.24	72.1	0.01	8	PVC	0.01	57	24.5	-0.5	
GM-GIS-CT_ssGM_26	MH-GIS-CT_ssMH_1282	767.57	MH-GIS-CT_ssMH_1281	766.46	218.9	0.005	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-CT_ssGM_27	MH-GIS-CT_ssMH_1279	763.04	MH-GIS-CT_ssMH_1294	752.33	59.9	0.179	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-CT_ssGM_28	MH-GIS-CT_ssMH_1281	766.46	MH-GIS-CT_ssMH_1280	764	307.2	0.008	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-CT_ssGM_246	MH-GIS-CT_ssMH_1692	756.63	MH-GIS-MH-77	756.31	49.4	0.006	8	PVC	0.01	55	24	-0.5	
GM-GIS-CT_ssGM_247	MH-GIS-CT_ssMH_1693	768.42	MH-GIS-CT_ssMH_1692	756.63	202.7	0.058	8	PVC	0.01	54	23.7	-0.5	
GM-GIS-CT_ssGM_248	MH-GIS-GC_ssMH_1622	773.42	MH-GIS-CT_ssMH_1693	768.42	112.9	0.044	8	Ductile Iron	0.013	53	23.4	-0.5	
GM-GIS-CV_ssGM_201	MH-GIS-CV_ssMH_1587	788.2	MH-GIS-CV_ssMH_1586	779.6	113.2	0.076	8	PVC	0.01	25	16	-0.6	
GM-GIS-CV_ssGM_202	MH-GIS-CV_ssMH_1586	779.6	MH-GIS-CV_ssMH_1585	771.51	125.8	0.064	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-CV_ssGM_203	MH-GIS-CV_ssMH_1585	771.51	MH-GIS-CV_ssMH_1584	767.13	180.4	0.024	8	PVC	0.01	28	100	1	
GM-GIS-CV_ssGM_204	MH-GIS-CV_ssMH_1584	767.13	MH-GIS-GC_ssMH_1590	769.6	299	-0.008	8	PVC	0.01	29	100	5.8	
GM-GIS-CV_ssGM_211	MH-GIS-GC_ssMH_1588	794	MH-GIS-CV_ssMH_1587	788.2	176.7	0.033	8	PVC	0.01	24	15.6	-0.6	
GM-GIS-CV_ssGM_212	MH-GIS-CV_ssMH_1598	859.22	MH-GIS-CV_ssMH_1597	850.39	107.1	0.082	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_242	MH-GIS-CV_ssMH_1625	716.37	PSFWW	704	24.3	0.509	8	PVC	0.01	47	22.2	-0.5	
GM-GIS-CV_ssGM_495	MH-GIS-MH-100	732.8	MH-GIS-CV_ssMH_1698	728.76	63.2	0.064	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_496	MH-GIS-CV_ssMH_1699	725.63	MH-GIS-CV_ssMH_1698	728.76	107.6	-0.029	8	PVC	0.01	42	100	2.7	
GM-GIS-CV_ssGM_497	MH-GIS-CV_ssMH_1700	727.16	MH-GIS-CV_ssMH_1699	725.63	103.1	0.015	8	PVC	0.01	41	100	1.2	
GM-GIS-CV_ssGM_498	MH-GIS-CV_ssMH_1701	730.39	MH-GIS-CV_ssMH_1700	727.16	103.7	0.031	8	PVC	0.01	39	20.2	-0.5	
GM-GIS-CV_ssGM_499	MH-GIS-CV_ssMH_1703	742.7	MH-GIS-CV_ssMH_1701	730.39	195.6	0.063	8	PVC	0.01	38	19.9	-0.5	
GM-GIS-CV_ssGM_500	MH-GIS-CV_ssMH_1702	749	MH-GIS-CV_ssMH_1703	742.7	156.5	0.04	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-CV_ssGM_501	MH-GIS-MH-121	752.94	MH-GIS-CV_ssMH_1702	749	81.1	0.049	6	PVC	0.01	1	5.2	-0.5	
GM-GIS-CV_ssGM_502	MH-GIS-CV_ssMH_1705	756.4	MH-GIS-CV_ssMH_1703	742.7	194.6	0.07	8	PVC	0.01	34	18.8	-0.5	
GM-GIS-CV_ssGM_503	MH-GIS-CV_ssMH_1706	767.27	MH-GIS-CV_ssMH_1705	756.4	173.7	0.063	8	Ductile Iron	0.013	33	18.4	-0.5	
GM-GIS-CV_ssGM_504	MH-GIS-CV_ssMH_1707	771.95	MH-GIS-CV_ssMH_1706	767.27	87.8	0.053	8	Ductile Iron	0.013	32	18	-0.5	
GM-GIS-CV_ssGM_505	MH-GIS-CV_ssMH_1704	775.43	MH-GIS-CV_ssMH_1707	771.95	104.4	0.033	8	Ductile Iron	0.013	22	15.1	-0.6	
GM-GIS-CV_ssGM_506	MH-GIS-CV_ssMH_1708	782.07	MH-GIS-CV_ssMH_1704	775.43	102.6	0.065	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-CV_ssGM_507	MH-GIS-CV_ssMH_1711	787.91	MH-GIS-CV_ssMH_1708	782.07	102.2	0.057	8	PVC	0.01	20	14.2	-0.6	
GM-GIS-CV_ssGM_508	MH-GIS-CV_ssMH_1712	795.98	MH-GIS-CV_ssMH_1711	787.91	120.3	0.067	8	Ductile Iron	0.013	18	13.7	-0.6	
GM-GIS-CV_ssGM_509	MH-GIS-CV_ssMH_1715	794	MH-GIS-CV_ssMH_1712	795.98	101.7	-0.019	8	PVC	0.01	4	100	1.4	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-CV_ssGM_510	MH-GIS-CV_ssMH_1717	794	MH-GIS-CV_ssMH_1715	794	54.3	0	8	PVC	0.01	3	100	1.4	
GM-GIS-CV_ssGM_511	MH-GIS-CV_ssMH_1718	803.09	MH-GIS-CV_ssMH_1717	794	134.8	0.067	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_512	MH-GIS-CV_ssMH_1721	804.66	MH-GIS-CV_ssMH_1720	794.25	68.3	0.152	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-CV_ssGM_513	MH-GIS-CV_ssMH_1709	772.62	MH-GIS-CV_ssMH_1707	771.95	70.4	0.01	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_514	MH-GIS-CV_ssMH_1720	794.25	MH-GIS-CV_ssMH_1719	779	182.9	0.083	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-CV_ssGM_515	MH-GIS-CV_ssMH_1719	779	MH-GIS-CV_ssMH_1710	774	207.8	0.024	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-CV_ssGM_516	MH-GIS-CV_ssMH_1710	774	MH-GIS-CV_ssMH_1709	772.62	179.2	0.008	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-CV_ssGM_517	MH-GIS-CV_ssMH_1731	826.6	MH-GIS-CV_ssMH_1729	831.01	260.2	-0.017	8	Ductile Iron	0.013	4	100	3.9	
GM-GIS-CV_ssGM_518	MH-GIS-MH-128	831.4	MH-GIS-CV_ssMH_1732	827.91	86.2	0.04	8	Ductile Iron	0.013	1	3.6	-0.6	
GM-GIS-CV_ssGM_519	MH-GIS-CV_ssMH_1728	825.39	MH-GIS-GC_ssMH_1591	822.34	141.2	0.022	8	Ductile Iron	0.013	9	9.6	-0.6	
GM-GIS-CV_ssGM_520	MH-GIS-CV_ssMH_1727	827.49	MH-GIS-CV_ssMH_1728	825.39	235.2	0.009	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_521	MH-GIS-CV_ssMH_1726	828.67	MH-GIS-CV_ssMH_1727	827.49	192.3	0.006	8	Ductile Iron	0.013	7	8.7	-0.6	
GM-GIS-CV_ssGM_522	MH-GIS-CV_ssMH_1725	824	MH-GIS-CV_ssMH_1726	828.67	189.6	-0.025	8	Ductile Iron	0.013	5	100	4.1	
GM-GIS-CV_ssGM_523	MH-GIS-CV_ssMH_1724	830.43	MH-GIS-CV_ssMH_1725	824	159.8	0.04	8	Ductile Iron	0.013	4	6.3	-0.6	
GM-GIS-CV_ssGM_524	MH-GIS-CV_ssMH_1723	837.84	MH-GIS-CV_ssMH_1724	830.43	357.5	0.021	8	Ductile Iron	0.013	3	5.2	-0.6	
GM-GIS-CV_ssGM_525	MH-GIS-CV_ssMH_1730	842.76	MH-GIS-CV_ssMH_1723	837.84	248.5	0.02	8	Ductile Iron	0.013	1	3.6	-0.6	
GM-GIS-CV_ssGM_526	MH-GIS-CV_ssMH_1732	827.91	MH-GIS-CV_ssMH_1731	826.6	95.1	0.014	8	Ductile Iron	0.013	3	100	2.5	
GM-GIS-CV_ssGM_527	MH-GIS-MH-139	808.6	MH-GIS-CV_ssMH_1721	804.66	100.2	0.039	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-CV_ssGM_528	MH-GIS-CV_ssMH_1597	850.39	MH-GIS-CV_ssMH_1729	831.01	193.6	0.1	8	Ductile Iron	0.013	3	5.2	-0.6	
GM-GIS-CV_ssGM_529	MH-GIS-CV_ssMH_1697	722.01	MH-GIS-CV_ssMH_1625	716.37	75.2	0.075	8	PVC	0.01	46	21.9	-0.5	
GM-GIS-CV_ssGM_530	MH-GIS-CV_ssMH_1698	728.76	MH-GIS-CV_ssMH_1697	722.01	216.6	0.031	8	PVC	0.01	45	21.5	-0.5	
GM-GIS-CV_ssGM_1043	MH-GIS-CV_ssMH_1722	826.36	MH-GIS-CV_ssMH_1716	812.89	206.2	0.065	8	Ductile Iron	0.013	9	9.6	-0.6	
GM-GIS-CV_ssGM_1044	MH-GIS-CV_ssMH_1729	831.01	MH-GIS-CV_ssMH_1722	826.36	250.8	0.019	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-CV_ssGM_1045	MH-GIS-CV_ssMH_1714	807.44	MH-GIS-CV_ssMH_1713	802.34	86.6	0.059	8	PVC	0.01	12	11	-0.6	
GM-GIS-CV_ssGM_1046	MH-GIS-CV_ssMH_1713	802.34	MH-GIS-CV_ssMH_1712	795.98	110.1	0.058	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-CV_ssGM_1047	MH-GIS-CV_ssMH_1716	812.89	MH-GIS-CV_ssMH_1714	807.44	87.8	0.062	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-CV_ssGM_1053	MH-GIS-GC_ssMH_1590	769.6	MH-GIS-GC_ssMH_1622	773.42	80	-0.048	8	PVC	0.01	30	100	3.3	
GM-GIS-DH_ssGM_199	MH-GIS-DH_ssMH_1602	809.49	MH-GIS-DH_ssMH_1627	802	228.7	0.033	8	PVC	0.01	19	14	-0.6	
GM-GIS-DH_ssGM_200	MH-GIS-MU_ssMH_1805	809.96	MH-GIS-DH_ssMH_1602	809.49	80.7	0.006	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-DH_ssGM_213	MH-GIS-MH-30	818.72	MH-GIS-DH_ssMH_1621	814.69	19.2	0.21	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_214	MH-GIS-DH_ssMH_1601	841.46	MH-GIS-DH_ssMH_1772	828	136.4	0.099	8	PVC	0.01	28	17	-0.6	
GM-GIS-DH_ssGM_221	MH-GIS-DH_ssMH_1855	841	MH-GIS-DH_ssMH_1601	841.46	130.8	-0.004	8	PVC	0.01	18	92	-0.1	
GM-GIS-DH_ssGM_243	MH-GIS-DH_ssMH_1627	801.7	PSK3-WW	801.5	54.7	0.004	10	PVC	0.01	68	20.1	-0.7	
GM-GIS-DH_ssGM_244	MH-GIS-DH_ssMH_1772	828	MH-GIS-DH_ssMH_1621	814.69	112.1	0.119	8	PVC	0.01	32	18.1	-0.5	
GM-GIS-DH_ssGM_245	MH-GIS-DH_ssMH_1621	814.69	PSK3-WW	793	133.3	0.163	8	PVC	0.01	33	18.5	-0.5	
GM-GIS-DH_ssGM_264	MH-GIS-DH_ssMH_1643	907.41	MH-GIS-DH_ssMH_1642	904	206	0.017	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-DH_ssGM_265	MH-GIS-DH_ssMH_1631	907.59	MH-GIS-DH_ssMH_1633	902.33	166.9	0.032	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-DH_ssGM_266	MH-GIS-DH_ssMH_1630	907.74	MH-GIS-DH_ssMH_1631	907.59	187.5	8E-04	8	PVC	0.01	2	7.8	-0.6	
GM-GIS-DH_ssGM_267	MH-GIS-DH_ssMH_1629	909	MH-GIS-DH_ssMH_1630	907.74	107.7	0.012	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_268	MH-GIS-MH-149	912.36	MH-GIS-DH_ssMH_1640	911.41	115.9	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_269	MH-GIS-DH_ssMH_1640	911.41	MH-GIS-DH_ssMH_1641	907.27	320.9	0.013	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_270	MH-GIS-DH_ssMH_1650	912.29	MH-GIS-DH_ssMH_1644	908.13	203.6	0.02	8	PVC	0.01	7	8.7	-0.6	
GM-GIS-DH_ssGM_271	MH-GIS-DH_ssMH_1633	902.33	MH-GIS-DH_ssMH_1634	900.81	32.8	0.046	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-DH_ssGM_272	MH-GIS-MH-193	912.64	MH-GIS-DH_ssMH_1632	903.43	164.7	0.056	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_273	MH-GIS-DH_ssMH_1645	916.73	MH-GIS-DH_ssMH_1646	917.3	159.3	-0.004	8	PVC	0.01	1	100	0.5	
GM-GIS-DH_ssGM_274	MH-GIS-DH_ssMH_1646	917.3	MH-GIS-DH_ssMH_1647	917.68	140.8	-0.003	8	PVC	0.01	2	87.1	-0.1	
GM-GIS-DH_ssGM_275	MH-GIS-DH_ssMH_1647	917.68	MH-GIS-DH_ssMH_1648	917.81	84.7	-0.002	8	PVC	0.01	2	30.1	-0.5	
GM-GIS-DH_ssGM_276	MH-GIS-DH_ssMH_1648	917.81	MH-GIS-DH_ssMH_1649	914	274.8	0.014	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-DH_ssGM_277	MH-GIS-DH_ssMH_1651	917.06	MH-GIS-DH_ssMH_1650	912.29	201.9	0.024	8	PVC	0.01	2	5	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DH_ssGM_278	MH-GIS-DH_ssMH_1652	919	MH-GIS-DH_ssMH_1651	917.06	205.7	0.009	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_279	MH-GIS-DH_ssMH_1653	919	MH-GIS-DH_ssMH_1652	919	268.8	0	8	PVC	0.01	1	9.7	-0.6	
GM-GIS-DH_ssGM_280	MH-GIS-DH_ssMH_1635	884.99	MH-GIS-DH_ssMH_1636	887.23	38.1	-0.059	8	PVC	0.01	7	100	7	
GM-GIS-DH_ssGM_281	MH-GIS-DH_ssMH_1634	900.81	MH-GIS-DH_ssMH_1635	884.99	141.7	0.112	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-DH_ssGM_282	MH-GIS-DH_ssMH_1636	887.23	MH-GIS-DH_ssMH_1637	888.71	122.6	-0.012	8	PVC	0.01	8	100	4.8	
GM-GIS-DH_ssGM_283	MH-GIS-DH_ssMH_1637	888.71	MH-GIS-DH_ssMH_1638	888.98	222	-0.001	8	PVC	0.01	9	100	3.3	
GM-GIS-DH_ssGM_284	MH-GIS-DH_ssMH_1638	888.98	MH-GIS-DH_ssMH_1639	892.53	204.7	-0.017	8	PVC	0.01	10	100	3	
GM-GIS-DH_ssGM_285	MH-GIS-DH_ssMH_1639	892.53	MH-GIS-DH_ssMH_1310	888.97	106.7	0.033	8	PVC	0.01	11	10.5	-0.6	
GM-GIS-DH_ssGM_286	MH-GIS-DH_ssMH_1633	902.33	MH-GIS-DH_ssMH_1632	903.43	21.1	0.052	8	PVC	0.01	2	4.1	0.5	
GM-GIS-DH_ssGM_287	MH-GIS-MH-148	911.26	MH-GIS-DH_ssMH_1629	909	114.6	0.02	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_288	MH-GIS-DH_ssMH_1641	907.27	MH-GIS-DH_ssMH_1643	907.41	221.6	-6E-04	8	PVC	0.01	2	33.1	-0.4	
GM-GIS-DH_ssGM_289	MH-GIS-DH_ssMH_1649	914	MH-GIS-DH_ssMH_1650	912.29	85.4	0.02	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-DH_ssGM_290	MH-GIS-DH_ssMH_1644	908.13	MH-GIS-DH_ssMH_1643	907.41	104.9	0.007	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-DH_ssGM_381	MH-GIS-DH_ssMH_1773	832.79	MH-GIS-DH_ssMH_1772	828	28.2	0.17	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-DH_ssGM_383	MH-GIS-DH_ssMH_1796	867.52	MH-GIS-DH_ssMH_1775	858.76	181.9	0.048	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_384	MH-GIS-DH_ssMH_1775	858.76	MH-GIS-DH_ssMH_1795	855.63	126.9	0.025	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_385	MH-GIS-DH_ssMH_1795	855.63	MH-GIS-DH_ssMH_1777	854	91.2	0.018	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_386	MH-GIS-DH_ssMH_1777	854	MH-GIS-DH_ssMH_1776	854	98.8	0	8	PVC	0.01	3	23.5	-0.5	
GM-GIS-DH_ssGM_387	MH-GIS-DH_ssMH_1776	854	MH-GIS-DH_ssMH_1774	854	94.5	0	8	PVC	0.01	4	23.3	-0.5	
GM-GIS-DH_ssGM_388	MH-GIS-DH_ssMH_1774	854	MH-GIS-DH_ssMH_1794	854.06	44.9	-0.001	8	PVC	0.01	4	23	-0.5	
GM-GIS-DH_ssGM_389	MH-GIS-DH_ssMH_1778	857.96	MH-GIS-DH_ssMH_1794	854.06	158.5	0.025	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_390	MH-GIS-DH_ssMH_1782	858.36	MH-GIS-DH_ssMH_1778	857.96	122.3	0.003	8	PVC	0.01	1	4.4	-0.6	
GM-GIS-DH_ssGM_391	MH-GIS-DH_ssMH_1780	878.22	MH-GIS-DH_ssMH_1779	874.82	183.8	0.018	8	PVC	0.01	8	9	-0.6	
GM-GIS-DH_ssGM_392	MH-GIS-DH_ssMH_1784	879	MH-GIS-DH_ssMH_1780	878.22	103.4	0.008	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-DH_ssGM_393	MH-GIS-DH_ssMH_1781	875.18	MH-GIS-DH_ssMH_1780	878.22	126	-0.024	8	PVC	0.01	2	100	2.4	
GM-GIS-DH_ssGM_394	MH-GIS-DH_ssMH_1788	874	MH-GIS-DH_ssMH_1781	875.18	101.8	-0.012	8	PVC	0.01	1	100	3.6	
GM-GIS-DH_ssGM_395	MH-GIS-DH_ssMH_1779	874.82	MH-GIS-DH_ssMH_1783	862.01	106.7	0.12	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-DH_ssGM_396	MH-GIS-DH_ssMH_1783	862.01	MH-GIS-DH_ssMH_1794	854.06	159.3	0.05	8	PVC	0.01	10	9.8	-0.6	
GM-GIS-DH_ssGM_397	MH-GIS-DH_ssMH_1786	902.52	MH-GIS-DH_ssMH_1785	896.55	131	0.046	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_398	MH-GIS-DH_ssMH_1785	896.55	MH-GIS-DH_ssMH_1784	879	213.2	0.082	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-DH_ssGM_399	MH-GIS-DH_ssMH_1787	912.62	MH-GIS-DH_ssMH_1786	902.52	116.9	0.086	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_400	MH-GIS-DH_ssMH_1790	872.4	MH-GIS-DH_ssMH_1788	874	77.4	-0.021	8	PVC	0.01	1	100	5.2	
GM-GIS-DH_ssGM_401	MH-GIS-DH_ssMH_1789	879	MH-GIS-DH_ssMH_1780	878.22	160.3	0.005	8	PVC	0.01	2	4.9	-0.6	
GM-GIS-DH_ssGM_402	MH-GIS-DH_ssMH_1791	880.21	MH-GIS-DH_ssMH_1789	879	193.5	0.006	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-DH_ssGM_403	MH-GIS-DH_ssMH_1792	888.54	MH-GIS-DH_ssMH_1791	880.21	144.5	0.058	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_404	MH-GIS-DH_ssMH_1793	860.37	MH-GIS-DH_ssMH_1782	858.36	108.8	0.018	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-DH_ssGM_405	MH-GIS-DH_ssMH_1794	854.06	MH-GIS-DH_ssMH_1854	847.07	184	0.038	8	PVC	0.01	17	13.1	-0.6	
GM-GIS-DH_ssGM_478	MH-GIS-DH_ssMH_1840	904.51	MH-GIS-DH_ssMH_1841	902.08	121.4	0.02	8	PVC	0.01	17	13	-0.6	
GM-GIS-DH_ssGM_479	MH-GIS-DH_ssMH_1642	904	MH-GIS-DH_ssMH_1840	904.51	90.7	-0.006	8	PVC	0.01	12	95	0	
GM-GIS-DH_ssGM_482	MH-GIS-DH_ssMH_1845	914	MH-GIS-DH_ssMH_1844	908.63	274.7	0.02	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-DH_ssGM_483	MH-GIS-DH_ssMH_1844	908.63	MH-GIS-DH_ssMH_1843	905.71	251.5	0.012	8	PVC	0.01	2	5	-0.6	
GM-GIS-DH_ssGM_484	MH-GIS-DH_ssMH_1843	905.71	MH-GIS-DH_ssMH_1840	904.51	277.1	0.004	8	PVC	0.01	3	6.1	-0.6	
GM-GIS-DH_ssGM_485	MH-GIS-DH_ssMH_1846	915.61	MH-GIS-DH_ssMH_1845	914	277.6	0.006	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-DH_ssGM_494	MH-GIS-DH_ssMH_1854	847.07	MH-GIS-DH_ssMH_1855	841	218.6	0.028	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1141	MH-GIS-DP_ssMH_2226	886.37	MH-GIS-DP_ssMH_2225	875.46	339.3	0.032	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1142	MH-GIS-DP_ssMH_2232	854.82	MH-GIS-DP_ssMH_2231	852.15	45.5	0.059	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-DP_ssGM_1143	MH-GIS-DP_ssMH_2235	900.74	MH-GIS-DP_ssMH_2234	891.07	142.3	0.068	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1144	MH-GIS-DP_ssMH_2234	891.07	MH-GIS-MH-81	886.96	62.1	0.066	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1145	MH-GIS-DP_ssMH_2236	854	MH-GIS-DP_ssMH_2227	854	78.9	0	8	PVC	0.01	9	100	5.3	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1146	MH-GIS-DP_ssMH_2237	884.29	MH-GIS-DP_ssMH_2271	886.47	90.5	-0.024	8	PVC	0.01	2	100	1.6	
GM-GIS-DP_ssGM_1147	MH-GIS-DP_ssMH_2271	886.47	MH-GIS-DP_ssMH_2226	886.37	51.9	0.002	8	PVC	0.01	4	7.5	-0.6	
GM-GIS-DP_ssGM_1148	MH-GIS-DP_ssMH_2267	857.19	MH-GIS-DP_ssMH_2262	860.27	79.6	-0.039	8	PVC	0.01	14	100	8.4	
GM-GIS-DP_ssGM_1149	MH-GIS-DP_ssMH_2238	873.56	MH-GIS-DP_ssMH_2263	872.16	41.6	0.034	8	PVC	0.01	4	39.5	-0.4	
GM-GIS-DP_ssGM_1150	MH-GIS-DP_ssMH_2231	852.15	MH-GIS-MH-32	848.68	70.2	0.049	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-DP_ssGM_1151	MH-GIS-DP_ssMH_2265	857.32	MH-GIS-DP_ssMH_2230	832.03	264.5	0.096	8	PVC	0.01	334	61.1	-0.3	
GM-GIS-DP_ssGM_1152	MH-GIS-DP_ssMH_2270	872.05	MH-GIS-DP_ssMH_2228	859.78	247.7	0.05	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1153(1)	MH-GIS-DP_ssMH_2239	840	MH-GIS-DP_ssMH_2572	839	113.7	0.009	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-DP_ssGM_1153(2)	MH-GIS-DP_ssMH_2572	839	MH-GIS-DP_ssMH_2351	839	25.5	0	8	PVC	0.01	21	86.6	-0.1	
GM-GIS-DP_ssGM_1154	MH-GIS-DP_ssMH_2230	832.03	MH-GIS-DP_ssMH_2573	826.42	113.2	0.05	8	PVC	0.01	336	61.3	-0.3	
GM-GIS-DP_ssGM_1154(1)	MH-GIS-DP_ssMH_2573	826.42	MH-GIS-BP_ssMH_2354	825.07	25	0.054	8	PVC	0.01	337	61.5	-0.3	
GM-GIS-DP_ssGM_1155	MH-GIS-DP_ssMH_2240	826.56	MH-GIS-DP_ssMH_2574	824.46	144.6	0.015	8	PVC	0.01	26	16.5	-0.6	
GM-GIS-DP_ssGM_1156	MH-GIS-DP_ssMH_2243	857.36	MH-GIS-DP_ssMH_2239	840	212.3	0.082	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1157	MH-GIS-DP_ssMH_2241	896.36	MH-GIS-DP_ssMH_2242	889.46	115.1	0.06	8	PVC	0.01	325	60.3	-0.3	
GM-GIS-DP_ssGM_1158	MH-GIS-MH-48	881.7	MH-GIS-DP_ssMH_2244	879.62	32.6	0.064	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-DP_ssGM_1159	MH-GIS-DP_ssMH_2244	879.62	MH-GIS-DP_ssMH_2246	862.14	195.4	0.089	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1160	MH-GIS-DP_ssMH_2251	866.38	MH-GIS-DP_ssMH_2250	853.91	149.5	0.083	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-DP_ssGM_1161	MH-GIS-DP_ssMH_2250	853.91	MH-GIS-DP_ssMH_2249	853.17	59.9	0.012	8	PVC	0.01	26	100	4.6	
GM-GIS-DP_ssGM_1162	MH-GIS-MH-26	894.4	MH-GIS-DP_ssMH_2253	893.86	15	0.036	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-DP_ssGM_1163	MH-GIS-DP_ssMH_2253	893.86	MH-GIS-DP_ssMH_2252	878.79	161.1	0.094	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-DP_ssGM_1164	MH-GIS-DP_ssMH_2252	878.79	MH-GIS-DP_ssMH_2251	866.38	138.5	0.09	8	PVC	0.01	23	15.3	-0.6	
GM-GIS-DP_ssGM_1165	MH-GIS-DP_ssMH_2248	853.14	MH-GIS-DP_ssMH_2247	853.34	85	-0.002	8	PVC	0.01	30	100	5.5	
GM-GIS-DP_ssGM_1166	MH-GIS-DP_ssMH_2249	853.17	MH-GIS-DP_ssMH_2248	853.14	63.8	5E-04	8	PVC	0.01	28	100	5.3	
GM-GIS-DP_ssGM_1167	MH-GIS-DP_ssMH_2233	901.08	MH-GIS-MH-132	897.42	98	0.037	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-DP_ssGM_1168	MH-GIS-DP_ssMH_2257	903.51	MH-GIS-DP_ssMH_2233	901.08	84.4	0.029	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-DP_ssGM_1169	MH-GIS-DP_ssMH_2256	906.73	MH-GIS-DP_ssMH_2257	903.51	96	0.034	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1170	MH-GIS-DP_ssMH_2255	908.98	MH-GIS-DP_ssMH_2256	906.73	136.8	0.016	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1171	MH-GIS-DP_ssMH_2254	912.48	MH-GIS-DP_ssMH_2255	908.98	48.2	0.073	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1172	MH-GIS-DP_ssMH_2258	869	MH-GIS-DP_ssMH_2243	857.36	200.7	0.058	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-DP_ssGM_1173	MH-GIS-DP_ssMH_2259	874.02	MH-GIS-DP_ssMH_2258	869	123.1	0.041	8	PVC	0.01	14	12	-0.6	
GM-GIS-DP_ssGM_1174	MH-GIS-DP_ssMH_2261	899.74	MH-GIS-DP_ssMH_2260	879.52	245.2	0.082	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-DP_ssGM_1175	MH-GIS-DP_ssMH_2260	879.52	MH-GIS-DP_ssMH_2259	874.02	56.4	0.098	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1176	MH-GIS-MH-27	900.33	MH-GIS-DP_ssMH_2261	899.74	17.1	0.035	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-DP_ssGM_1177	MH-GIS-DP_ssMH_2266	855.35	MH-GIS-DP_ssMH_2267	857.19	83.1	-0.022	8	PVC	0.01	12	100	7.2	
GM-GIS-DP_ssGM_1179	MH-GIS-DP_ssMH_2227	854	MH-GIS-DP_ssMH_2266	855.35	130	-0.01	8	PVC	0.01	11	100	6.7	
GM-GIS-DP_ssGM_1180	MH-GIS-DP_ssMH_2268	875.98	MH-GIS-DP_ssMH_2269	875.13	92.9	0.009	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1181	MH-GIS-DP_ssMH_2269	875.13	MH-GIS-DP_ssMH_2270	872.05	54.9	0.056	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1182	MH-GIS-DP_ssMH_2273	871.91	MH-GIS-DP_ssMH_2272	870.72	84.4	0.014	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-DP_ssGM_1183	MH-GIS-DP_ssMH_2274	877.11	MH-GIS-DP_ssMH_2273	871.91	233.8	0.022	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1184	MH-GIS-DP_ssMH_2298	866.27	MH-GIS-DP_ssMH_2232	854.82	205	0.056	8	PVC	0.01	40	20.5	-0.5	
GM-GIS-DP_ssGM_1185	MH-GIS-DP_ssMH_2272	870.72	MH-GIS-DP_ssMH_2298	866.27	77.7	0.057	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1186	MH-GIS-DP_ssMH_2225	875.46	MH-GIS-DP_ssMH_2273	871.91	126.2	0.028	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1187	MH-GIS-DP_ssMH_2275	877.45	MH-GIS-DP_ssMH_2238	873.56	59.9	0.065	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1188	MH-GIS-DP_ssMH_2228	859.78	MH-GIS-DP_ssMH_2236	854	256.6	0.023	8	PVC	0.01	7	33	-0.4	
GM-GIS-DP_ssGM_1189	MH-GIS-DP_ssMH_2277	852.62	MH-GIS-DP_ssMH_2276	849.27	106.1	0.032	8	PVC	0.01	19	14.1	-0.6	
GM-GIS-DP_ssGM_1190	MH-GIS-DP_ssMH_2290	828.38	MH-GIS-DP_ssMH_2240	826.56	70.6	0.026	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-DP_ssGM_1191	MH-GIS-MH-106	902.27	MH-GIS-DP_ssMH_2233	901.08	71.4	0.017	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1192	MH-GIS-MH-135	906.59	MH-GIS-MH-106	902.27	117.5	0.037	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1193	MH-GIS-DP_ssMH_2280	909.09	MH-GIS-MH-135	906.59	99.1	0.025	8	PVC	0.01	2	4.2	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1195	MH-GIS-DP_ssMH_2284	857.2	MH-GIS-DP_ssMH_2282	857.41	123.6	-0.002	8	PVC	0.01	51	69.6	-0.2	
GM-GIS-DP_ssGM_1196	MH-GIS-DP_ssMH_2283	843.58	MH-GIS-MH-38	840.28	35.7	0.093	8	PVC	0.01	54	23.8	-0.5	
GM-GIS-DP_ssGM_1197	MH-GIS-DP_ssMH_2247	853.34	MH-GIS-DP_ssMH_2245	856.11	77.7	-0.036	8	PVC	0.01	32	100	8.1	
GM-GIS-DP_ssGM_1197(1)	MH-GIS-DP_ssMH_2245	856.11	MH-GIS-DP_ssMH_2246	862.14	69.1	-0.087	8	PVC	0.01	33	100	5.6	
GM-GIS-DP_ssGM_1198	MH-GIS-DP_ssMH_2246	862.14	MH-GIS-DP_ssMH_2285	857.88	117.2	0.036	8	PVC	0.01	47	22.2	-0.5	
GM-GIS-DP_ssGM_1199	MH-GIS-DP_ssMH_2285	857.88	MH-GIS-DP_ssMH_2284	857.2	42.8	0.016	8	PVC	0.01	49	22.6	-0.5	
GM-GIS-DP_ssGM_1200	MH-GIS-DP_ssMH_2282	857.41	MH-GIS-DP_ssMH_2283	843.58	131.9	0.105	8	PVC	0.01	53	23.4	-0.5	
GM-GIS-DP_ssGM_1201	MH-GIS-DP_ssMH_2278	868.39	MH-GIS-DP_ssMH_2289	854	258.7	0.056	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-DP_ssGM_1202	MH-GIS-DP_ssMH_2289	854	MH-GIS-DP_ssMH_2277	852.62	88.6	0.016	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1203	MH-GIS-MH-104	874.4	MH-GIS-DP_ssMH_2278	868.39	66.6	0.09	8	PVC	0.01	14	12	-0.6	
GM-GIS-DP_ssGM_1204	MH-GIS-DP_ssMH_2276	849.27	MH-GIS-DP_ssMH_2291	826.74	92.4	0.244	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-DP_ssGM_1205	MH-GIS-DP_ssMH_2291	826.74	MH-GIS-DP_ssMH_2290	828.38	66.6	-0.025	8	PVC	0.01	23	100	1.1	
GM-GIS-DP_ssGM_1206	MH-GIS-DP_ssMH_2294	876.38	MH-GIS-DP_ssMH_2293	847.37	200.4	0.145	8	PVC	0.01	171	43.1	-0.4	
GM-GIS-DP_ssGM_1207	MH-GIS-MH-34	843.8	MH-GIS-DP_ssMH_2292	844.23	23	0.019	8	PVC	0.01	178	44	0.1	
GM-GIS-DP_ssGM_1208	MH-GIS-MH-19	877.92	MH-GIS-DP_ssMH_2294	876.38	10	0.154	8	PVC	0.01	169	42.8	-0.4	
GM-GIS-DP_ssGM_1209	MH-GIS-DP_ssMH_2295	904.7	MH-GIS-MH-52	902.93	37	0.048	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1210	MH-GIS-DP_ssMH_2279	927.21	MH-GIS-DP_ssMH_2254	912.48	208.3	0.071	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1211	MH-GIS-DP_ssMH_2296	867.82	MH-GIS-DP_ssMH_2297	872.58	109.2	-0.044	8	PVC	0.01	23	100	6	
GM-GIS-DP_ssGM_1212	MH-GIS-DP_ssMH_2263	872.16	MH-GIS-DP_ssMH_2296	867.82	94.4	0.046	8	PVC	0.01	5	100	1	
GM-GIS-DP_ssGM_1213	MH-GIS-DP_ssMH_2262	860.27	MH-GIS-DP_ssMH_2296	867.82	155.3	-0.049	8	PVC	0.01	16	100	12.9	
GM-GIS-DP_ssGM_1214	MH-GIS-DP_ssMH_2299	874.3	MH-GIS-DP_ssMH_2298	866.27	247.5	0.032	8	PVC	0.01	26	16.5	-0.6	
GM-GIS-DP_ssGM_1215	MH-GIS-DP_ssMH_2297	872.58	MH-GIS-DP_ssMH_2299	874.3	94.5	-0.018	8	PVC	0.01	25	100	1.2	
GM-GIS-DP_ssGM_1216	MH-GIS-DP_ssMH_2293	847.37	MH-GIS-DP_ssMH_2292	844.23	200	0.016	8	PVC	0.01	176	43.7	-0.4	
GM-GIS-DP_ssGM_1217	MH-GIS-DP_ssMH_2300	849.15	MH-GIS-DP_ssMH_2293	847.37	69.5	0.026	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1218	MH-GIS-DP_ssMH_2300	849.15	MH-GIS-MH-33	853.18	20	0.202	8	PVC	0.01	2	4.2	3.4	
GM-GIS-DP_ssGM_1219	MH-GIS-DP_ssMH_2242	889.46	MH-GIS-DP_ssMH_2301	875.07	181.8	0.079	8	PVC	0.01	327	60.4	-0.3	
GM-GIS-DP_ssGM_1220	MH-GIS-DP_ssMH_2264	864	MH-GIS-DP_ssMH_2265	857.32	144.6	0.046	8	PVC	0.01	332	61	-0.3	
GM-GIS-DP_ssGM_1221	MH-GIS-DP_ssMH_2301	875.07	MH-GIS-DP_ssMH_2229	867.69	99.1	0.074	8	PVC	0.01	329	60.6	-0.3	
GM-GIS-DP_ssGM_1222	MH-GIS-DP_ssMH_2229	867.69	MH-GIS-DP_ssMH_2264	864	111.8	0.033	8	PVC	0.01	330	60.8	-0.3	
GM-GIS-DP_ssGM_1223	MH-GIS-MH-81	886.96	MH-GIS-DP_ssMH_2303	886.09	50	0.017	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1225	MH-GIS-DP_ssMH_2304	893.01	MH-GIS-DP_ssMH_2303	886.09	200.5	0.035	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1226	MH-GIS-DP_ssMH_2308	901.14	MH-GIS-DP_ssMH_2309	902.8	137	-0.012	8	PVC	0.01	5	100	1.1	
GM-GIS-DP_ssGM_1227	MH-GIS-MH-52	902.93	MH-GIS-DP_ssMH_2308	901.14	50	0.036	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1228	MH-GIS-DP_ssMH_2306	886.34	MH-GIS-DP_ssMH_2307	876.14	271.1	0.038	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1229	MH-GIS-DP_ssMH_2303	886.09	MH-GIS-MH-48	881.7	78	0.056	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-DP_ssGM_1230	MH-GIS-MH-132	897.42	MH-GIS-MH-26	894.4	110	0.027	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-DP_ssGM_1231	MH-GIS-DP_ssMH_2309	902.8	MH-GIS-MH-27	900.33	70	0.035	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-DP_ssGM_1232	MH-GIS-DP_ssMH_2302	898.53	MH-GIS-DP_ssMH_2241	896.36	79.8	0.027	8	PVC	0.01	323	60.1	-0.3	
GM-GIS-DP_ssGM_1233	MH-GIS-DP_ssMH_2310	880.97	MH-GIS-MH-50	882.1	35	0.032	8	PVC	0.01	2	4.2	0.5	
GM-GIS-DP_ssGM_1234	MH-GIS-DP_ssMH_2313	874	MH-GIS-DP_ssMH_2312	876.61	124.7	-0.021	8	PVC	0.01	11	100	2.1	
GM-GIS-DP_ssGM_1235	MH-GIS-DP_ssMH_2307	876.14	MH-GIS-DP_ssMH_2313	874	151.3	0.014	8	PVC	0.01	9	90	-0.1	
GM-GIS-DP_ssGM_1236	MH-GIS-DP_ssMH_2312	876.61	MH-GIS-MH-104	874.4	75	0.029	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-DP_ssGM_1237	MH-GIS-DP_ssMH_2310	880.97	MH-GIS-MH-19	877.92	46.6	0.065	8	PVC	0.01	167	42.6	-0.4	
GM-GIS-DP_ssGM_1238	MH-GIS-DP_ssMH_2305	891.12	MH-GIS-DP_ssMH_2314	887.98	54.9	0.057	8	PVC	0.01	4	6	-0.6	
GM-GIS-DP_ssGM_1239	MH-GIS-DP_ssMH_2314	887.98	MH-GIS-DP_ssMH_2306	886.34	59.5	0.028	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1240	MH-GIS-DP_ssMH_2311	896.03	MH-GIS-DP_ssMH_2305	891.12	123.7	0.04	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-DP_ssGM_1241	MH-GIS-DP_ssMH_2315	882.04	MH-GIS-DP_ssMH_2310	880.97	126.6	0.008	8	PVC	0.01	164	42.1	-0.4	
GM-GIS-DP_ssGM_1242	MH-GIS-DP_ssMH_2316	889	MH-GIS-DP_ssMH_2315	882.04	400	0.017	8	PVC	0.01	162	41.9	-0.4	
GM-GIS-DP_ssGM_1243	MH-GIS-NJ_ssMH_2565	895.08	MH-GIS-DP_ssMH_2316	889	211	0.029	8	PVC	0.01	160	41.7	-0.4	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DP_ssGM_1274	MH-GIS-DP_ssMH_2360	836.89	MH-GIS-DP_ssMH_2347	827.82	148.1	0.061	8	PVC	0.01	49	22.6	-0.5	
GM-GIS-DP_ssGM_1275	MH-GIS-MH-173	852.82	MH-GIS-DP_ssMH_2341	849.09	64.9	0.057	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-DP_ssGM_1276	MH-GIS-DP_ssMH_2341	849.09	MH-GIS-DP_ssMH_2348	849	251	4E-04	8	Glass	0.013	7	17.7	-0.5	
GM-GIS-DP_ssGM_1277	MH-GIS-DP_ssMH_2355	840.68	MH-GIS-DP_ssMH_2343	837.64	115	0.026	8	PVC	0.01	192	45.8	-0.4	
GM-GIS-DP_ssGM_1278	MH-GIS-DP_ssMH_2351	839	MH-GIS-DP_ssMH_2344	838.9	112.8	9E-04	8	PVC	0.01	280	86.6	-0.1	
GM-GIS-DP_ssGM_1279	MH-GIS-DP_ssMH_2348	849	MH-GIS-DP_ssMH_2342	844	400	0.013	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-DP_ssGM_1280	MH-GIS-DP_ssMH_2358	834	MH-GIS-DP_ssMH_2349	839	260	-0.019	8	PVC	0.01	255	100	5.6	
GM-GIS-DP_ssGM_1281	MH-GIS-DP_ssMH_2349	839	MH-GIS-DP_ssMH_2351	839	291.8	0	8	PVC	0.01	257	100	0.3	
GM-GIS-DP_ssGM_1282	MH-GIS-DP_ssMH_2344	838.9	MH-GIS-BP_ssMH_2352	835.22	94.5	0.039	8	PVC	0.01	281	55.9	-0.3	
GM-GIS-DP_ssGM_1285	MH-GIS-DP_ssMH_2350	824	MH-GIS-BP_ssMH_2353	824.9	116.1	-0.008	8	PVC	0.01	84	100	0.8	
GM-GIS-DP_ssGM_1286	MH-GIS-DP_ssMH_2345	824	MH-GIS-DP_ssMH_2350	824	119.4	0	8	PVC	0.01	54	100	0.8	
GM-GIS-DP_ssGM_1287	MH-GIS-DP_ssMH_2346	824	MH-GIS-DP_ssMH_2345	824	79.5	0	8	PVC	0.01	53	100	0.8	
GM-GIS-DP_ssGM_1288	MH-GIS-DP_ssMH_2347	827.82	MH-GIS-DP_ssMH_2346	824	139.4	0.027	8	PVC	0.01	51	23.1	-0.5	
GM-GIS-DP_ssGM_1289	MH-GIS-MH-34	843.8	MH-GIS-DP_ssMH_2355	840.68	25	0.125	8	PVC	0.01	180	44.2	-0.4	
GM-GIS-DP_ssGM_1290	MH-GIS-DP_ssMH_2342	844	MH-GIS-DP_ssMH_2355	840.68	71.3	0.047	8	Glass	0.013	11	10.4	-0.6	
GM-GIS-DP_ssGM_1291	MH-GIS-DP_ssMH_2574	824.46	MH-GIS-DP_ssMH_2350	824	25	0.018	8	PVC	0.01	28	100	0.4	
GM-GIS-DP_ssGM_1292	MH-GIS-MH-38	840.28	MH-GIS-DP_ssMH_2343	837.64	25	0.106	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-DP_ssGM_1293	MH-GIS-DP_ssMH_2357	834	MH-GIS-DP_ssMH_2358	834	111.1	0	8	PVC	0.01	253	100	5.5	
GM-GIS-DP_ssGM_1294	MH-GIS-DP_ssMH_2356	834	MH-GIS-DP_ssMH_2357	834	140.9	0	8	PVC	0.01	252	100	5.5	
GM-GIS-DP_ssGM_1295	MH-GIS-DP_ssMH_2343	837.64	MH-GIS-DP_ssMH_2356	834	99.5	0.037	8	PVC	0.01	250	100	1.8	
GM-GIS-DP_ssGM_1296	MH-GIS-MH-32	848.68	MH-GIS-DP_ssMH_2359	847.39	20	0.065	8	PVC	0.01	46	21.8	-0.5	
GM-GIS-DP_ssGM_1297	MH-GIS-DP_ssMH_2359	847.39	MH-GIS-DP_ssMH_2360	836.89	187.4	0.056	8	PVC	0.01	47	22.2	-0.5	
GM-GIS-DT_ssGM_760	MH-GIS-MH-196	418.86	MH-GIS-RW_ssMH_1506	417.71	175	0.007	8	Concrete	0.013	9	9.9	-0.6	SM4
GM-GIS-DT_ssGM_761	MH-GIS-MH-186	419.33	MH-GIS-RW_ssMH_1506	417.71	404.2	0.004	8	Concrete	0.013	18	15.5	-0.6	
GM-GIS-DT_ssGM_762	MH-GIS-MH-185	419.96	MH-GIS-MH-186	419.33	158	0.004	8	Concrete	0.013	9	11.1	-0.6	
GM-GIS-DT_ssGM_763	MH-IS-277	413.81	MH-IS-96	412.74	166.6	0.006	10	Concrete	0.013	36	14.5	-0.7	
GM-GIS-DT_ssGM_770	MH-GIS-DT_ssMH_2022	415.16	MH-GIS-DT_ssMH_2021	414	290.8	0.004	8	Concrete	0.013	9	11.1	-0.6	
GM-GIS-DT_ssGM_771	MH-GIS-DT_ssMH_2021	414	MH-IS-271	410.4	323.6	0.011	8	Concrete	0.013	18	13.5	-0.6	
GM-GIS-DT_ssGM_782	MH-GIS-DT_ssMH_1492	416.47	MH-GIS-DT_ssMH_2026	415.29	296.2	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-DT_ssGM_783	MH-GIS-DT_ssMH_2026	415.29	MH-IS-136	409.7	368.5	0.015	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-DT_ssGM_788	MH-GIS-DT_ssMH_1483	415.09	MH-IS-138	409.59	399.9	0.014	8	Concrete	0.013	3	5.8	-0.6	SM4
GM-GIS-DT_ssGM_791	MH-GIS-RW_ssMH_1485	415.75	MH-IS-139	410.69	189.6	0.027	8	Concrete	0.013	64	25.8	-0.5	
GM-GIS-DT_ssGM_802	MH-GIS-RW_ssMH_1498	414	MH-IS-277	413.81	297	7E-04	8	Glass	0.013	18	24.2	-0.5	
GM-GIS-DT_ssGM_804	MH-GIS-MH-198	414.78	MH-GIS-MH-15	414.08	182.5	0.004	8	Concrete	0.013	3	100	1.9	
GM-GIS-DT_ssGM_805	MH-GIS-DT_ssMH_2029	415.39	MH-IS-139	410.69	316.4	0.015	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-DT_ssGM_806	MH-GIS-MH-168	416.02	MH-GIS-DT_ssMH_2029	415.39	144	0.004	8	Glass	0.013	3	6.9	-0.6	
GM-GIS-DT_ssGM_807	MH-GIS-MH-179	416.76	MH-GIS-DT_ssMH_1472	416.37	150.1	0.003	8	Concrete	0.013	3	45.7	-0.4	
GM-GIS-DT_ssGM_808	MH-GIS-DT_ssMH_2031	412.24	MH-IS-139	410.69	171.5	0.009	8	Concrete	0.013	43	21.2	-0.5	
GM-GIS-DT_ssGM_809	MH-GIS-DT_ssMH_1472	416.37	MH-GIS-DT_ssMH_2030	416.92	184.3	-0.003	8	Concrete	0.013	10	100	0	
GM-GIS-DT_ssGM_810	MH-GIS-DT_ssMH_2030	416.92	MH-GIS-DT_ssMH_2031	412.24	297	0.016	8	Concrete	0.013	13	11.7	-0.6	
GM-GIS-DT_ssGM_813	MH-GIS-RW_ssMH_2034	414	MH-GIS-DT_ssMH_2031	412.24	228.8	0.008	8	Concrete	0.013	27	16.6	-0.6	
GM-GIS-DT_ssGM_920	MH-GIS-DT_ssMH_2107	418.03	MH-GIS-DT_ssMH_1472	416.37	433.8	0.004	8	Concrete	0.013	3	7.1	-0.6	
GM-GIS-DT_ssGM_972	MH-GIS-GS_ssMH_2154	416.74	MH-IS-137	411.83	318.3	0.015	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-DT_ssGM_1011	MH-GIS-RW_ssMH_2095	415.61	MH-IS-140	409.52	115.2	0.053	8	Concrete	0.013	27	16.6	-0.6	
GM-GIS-DT_ssGM_1013	MH-GIS-MH-160	418.62	MH-GIS-RW_ssMH_2094	417.87	130.7	0.006	8	Concrete	0.013	9	10.2	-0.6	
GM-GIS-DT_ssGM_1456	MH-GIS-MH-53	414	MH-IS-192	405.19	64	0.138	15	Concrete	0.013	18	6.1	-1.2	
GM-GIS-DT_ssGM_1457	MH-GIS-MH-54	414	MH-GIS-MH-53	414	37.2	0	15	Concrete	0.013	9	8.6	-1.1	
GM-GIS-DY_ssGM_1459	MH-GIS-DY_ssMH_2562	754	MH-GIS-DY_ssMH_2548	754.07	240.5	-3E-04	8	Glass	0.013	1	20.6	-0.5	
GM-GIS-DY_ssGM_1460	MH-GIS-DY_ssMH_2551	737.26	MH-GIS-DY_ssMH_2549	743.29	74.9	0.081	8	Glass	0.013	10	9.9	5.4	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-DY_ssGM_1461	MH-GIS-DY_ssMH_2548	754.07	MH-GIS-DY_ssMH_2550	745.64	122.1	0.069	8	Glass	0.013	2	4.9	-0.6	
GM-GIS-DY_ssGM_1462	MH-GIS-DY_ssMH_2550	745.64	MH-GIS-DY_ssMH_2549	743.29	37.9	0.062	8	Glass	0.013	4	6	-0.6	
GM-GIS-DY_ssGM_1463	MH-GIS-DY_ssMH_2561	721.57	MH-GIS-DY_ssMH_2551	737.26	171.8	0.091	8	Glass	0.013	11	10.5	15.1	
GM-GIS-DY_ssGM_1464	MH-GIS-DY_ssMH_2555	717.93	MH-GIS-DY_ssMH_2556	716.86	51.1	-0.021	8	Glass	0.013	4	100	3.1	
GM-GIS-DY_ssGM_1465	MH-GIS-DY_ssMH_2555	717.93	MH-GIS-DY_ssMH_2552	718.95	69.9	-0.015	8	Glass	0.013	5	100	3.1	
GM-GIS-DY_ssGM_1466	MH-GIS-DY_ssMH_2561	721.57	MH-GIS-DY_ssMH_2552	718.95	43.5	-0.06	8	Glass	0.013	6	100	-0.6	
GM-GIS-DY_ssGM_1467	MH-GIS-DY_ssMH_2557	739	MH-GIS-DY_ssMH_2558	739	68.4	0	8	Glass	0.013	4	100	3.7	
GM-GIS-DY_ssGM_1468	MH-GIS-DY_ssMH_2560	734	MH-GIS-DY_ssMH_2559	734	83.1	0	8	Glass	0.013	1	100	5.3	
GM-GIS-DY_ssGM_1469	MH-GIS-DY_ssMH_2549	743.29	MH-GIS-DY_ssMH_2557	739	79.3	-0.054	8	Glass	0.013	5	100	-0.6	
GM-GIS-DY_ssGM_1470	MH-GIS-DY_ssMH_2559	734	MH-GIS-DY_ssMH_2558	739	296.5	-0.017	8	Glass	0.013	2	100	8.7	
GM-GIS-DY_ssGM_1471	MH-GIS-DY_ssMH_2553	711.51	MH-GIS-DY_ssMH_2554	713.53	58.5	-0.035	8	Glass	0.013	1	100	7.4	
GM-GIS-DY_ssGM_1472	MH-GIS-DY_ssMH_2556	716.86	MH-GIS-DY_ssMH_2554	713.53	106.5	-0.031	8	Glass	0.013	2	100	4.1	
GM-GIS-EL_ssGM_1	MH-GIS-GC_ssMH_2036	775.66	MH-GIS-GC_ssMH_1622	773.42	52.2	0.043	8	PVC	0.01	21	14.7	-0.6	
GM-GIS-EL_ssGM_825	MH-GIS-EL_ssMH_2037	786.68	MH-GIS-GC_ssMH_2036	775.66	133	0.083	8	PVC	0.01	20	14.2	-0.6	
GM-GIS-EL_ssGM_826	MH-GIS-EL_ssMH_2045	822.1	MH-GIS-EL_ssMH_2039	813.97	63.2	0.129	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-EL_ssGM_827	MH-GIS-EL_ssMH_2052	807.93	MH-GIS-EL_ssMH_2040	802.37	48.4	0.115	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-EL_ssGM_828	MH-GIS-EL_ssMH_2053	820.51	MH-GIS-EL_ssMH_2052	807.93	272.9	0.046	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-EL_ssGM_829	MH-GIS-EL_ssMH_2040	802.37	MH-GIS-EL_ssMH_2051	797.05	55.5	0.096	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-EL_ssGM_830	MH-GIS-EL_ssMH_2050	793.43	MH-GIS-EL_ssMH_2051	797.05	53.2	-0.068	8	PVC	0.01	8	100	3.1	
GM-GIS-EL_ssGM_831	MH-GIS-EL_ssMH_2044	793.41	MH-GIS-EL_ssMH_2050	793.43	66.5	-3E-04	8	PVC	0.01	7	100	3.1	
GM-GIS-EL_ssGM_832	MH-GIS-EL_ssMH_2043	804.53	MH-GIS-EL_ssMH_2057	797.97	68	0.096	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-EL_ssGM_833	MH-GIS-EL_ssMH_2057	797.97	MH-GIS-EL_ssMH_2044	793.41	211.4	0.022	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-EL_ssGM_834	MH-GIS-EL_ssMH_2039	813.97	MH-GIS-EL_ssMH_2043	804.53	69.3	0.136	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-EL_ssGM_835	MH-GIS-EL_ssMH_2051	797.05	MH-GIS-EL_ssMH_2049	793.26	67.6	0.056	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-EL_ssGM_836	MH-GIS-EL_ssMH_2049	793.26	MH-GIS-EL_ssMH_2058	788.67	54.5	0.084	8	PVC	0.01	17	13.2	-0.6	
GM-GIS-EL_ssGM_837	MH-GIS-EL_ssMH_2055	834.28	MH-GIS-EL_ssMH_2054	829.37	73.6	0.067	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-EL_ssGM_838	MH-GIS-EL_ssMH_2058	788.67	MH-GIS-EL_ssMH_2037	786.68	129.2	0.015	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-EL_ssGM_839	MH-GIS-EL_ssMH_2054	829.37	MH-GIS-EL_ssMH_2053	820.51	150.8	0.059	8	PVC	0.01	3	5.2	-0.6	
GM-GIS-EN_ssGM_329	MH-GIS-EN_ssMH_1694	700	MH-GIS-IR_ssMH_1695	661.78	331	0.115	8	PVC	0.01	27	16.5	-0.6	
GM-GIS-EN_ssGM_330	MH-GIS-EN_ssMH_1366	703.34	MH-GIS-EN_ssMH_1694	700	29.9	0.112	8	PVC	0.01	26	16.3	-0.6	
GM-GIS-EN_ssGM_588	MH-GIS-EN_ssMH_1350	786.65	MH-GIS-EN_ssMH_1351	786.96	97.8	-0.003	8	Glass	0.013	2	100	0.4	
GM-GIS-EN_ssGM_589	MH-GIS-EN_ssMH_1351	786.96	MH-GIS-EN_ssMH_1352	787.67	99.2	-0.007	8	Glass	0.013	3	100	0.1	
GM-GIS-EN_ssGM_590	MH-GIS-EN_ssMH_1354	762.16	MH-GIS-EN_ssMH_1353	762.07	120.2	8E-04	8	Glass	0.013	2	9	-0.6	
GM-GIS-EN_ssGM_591	MH-GIS-EN_ssMH_1355	763	MH-GIS-EN_ssMH_1354	762.16	101.1	0.008	8	Glass	0.013	2	4.2	-0.6	
GM-GIS-EN_ssGM_592	MH-GIS-EN_ssMH_1353	762.07	MH-GIS-EN_ssMH_1365	751.94	130.6	0.078	8	Glass	0.013	21	14.6	-0.6	
GM-GIS-EN_ssGM_593	MH-GIS-EN_ssMH_1365	751.94	MH-GIS-EN_ssMH_1356	739.92	120.6	0.1	8	Glass	0.013	22	14.8	-0.6	
GM-GIS-EN_ssGM_594	MH-GIS-EN_ssMH_1356	739.92	MH-GIS-EN_ssMH_1357	727.9	120.8	0.1	8	Glass	0.013	22	15.2	-0.6	
GM-GIS-EN_ssGM_595	MH-GIS-EN_ssMH_1357	727.9	MH-GIS-EN_ssMH_1358	723.94	90	0.044	8	Glass	0.013	23	15.5	-0.6	
GM-GIS-EN_ssGM_596	MH-GIS-EN_ssMH_1358	723.94	MH-GIS-EN_ssMH_1359	703.73	187.4	0.108	8	Glass	0.013	24	15.7	-0.6	
GM-GIS-EN_ssGM_597	MH-GIS-EN_ssMH_1352	787.67	MH-GIS-EN_ssMH_1370	777.86	233.3	0.042	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-EN_ssGM_598	MH-GIS-EN_ssMH_1370	777.86	MH-GIS-EN_ssMH_1369	774.89	78.7	0.038	8	Glass	0.013	5	7.2	-0.6	
GM-GIS-EN_ssGM_599	MH-GIS-EN_ssMH_1369	774.89	MH-GIS-EN_ssMH_1360	769.1	95.6	0.061	8	Glass	0.013	6	7.6	-0.6	
GM-GIS-EN_ssGM_600	MH-GIS-EN_ssMH_1360	769.1	MH-GIS-EN_ssMH_1361	762.16	107.5	0.065	8	Glass	0.013	17	13	-0.6	
GM-GIS-EN_ssGM_601	MH-GIS-EN_ssMH_1361	762.16	MH-GIS-EN_ssMH_1353	762.07	98.2	9E-04	8	Glass	0.013	17	22	-0.5	
GM-GIS-EN_ssGM_602	MH-GIS-EN_ssMH_1362	770.19	MH-GIS-EN_ssMH_1360	769.1	41.2	0.026	8	Glass	0.013	10	10	-0.6	
GM-GIS-EN_ssGM_603	MH-GIS-EN_ssMH_1364	779.77	MH-GIS-EN_ssMH_1362	770.19	104	0.092	8	Glass	0.013	9	9.6	-0.6	
GM-GIS-EN_ssGM_604	MH-GIS-EN_ssMH_1363	787.35	MH-GIS-EN_ssMH_1364	779.77	74.3	0.102	8	Glass	0.013	8	9.2	-0.6	
GM-GIS-EN_ssGM_605	MH-GIS-MH-97	794	MH-GIS-EN_ssMH_1363	787.35	61	0.109	8	Glass	0.013	7	8.7	-0.6	
GM-GIS-EN_ssGM_606	MH-GIS-EN_ssMH_1359	703.73	MH-GIS-EN_ssMH_1366	703.34	41.7	0.009	8	Glass	0.013	25	16	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-EN_ssGM_607	MH-GIS-MH-101	784	MH-GIS-EN_ssMH_1367	784	63.2	0	8	Glass	0.013	1	100	3.1	
GM-GIS-EN_ssGM_608	MH-GIS-EN_ssMH_1367	784	MH-GIS-EN_ssMH_1350	786.65	124.1	-0.021	8	Glass	0.013	2	100	3.1	
GM-GIS-EN_ssGM_609	MH-GIS-EN_ssMH_1368	763.36	MH-GIS-EN_ssMH_1355	763	42.8	0.008	8	Glass	0.013	1	3.1	-0.6	
GM-GIS-EP_ssGM_1253	MH-GIS-EP_ssMH_2571	1,044.00	MH-GIS-EP_ssMH_2317	1,044.00	20	0	8	PVC	0.01	111	100	0.6	
GM-GIS-EP_ssGM_1477	MH-GIS-EP_ssMH_2579	1,063.97	MH-GIS-EP_ssMH_2590	1,059.65	112.1	0.039	8	Glass	0.013	18	13.4	-0.6	
GM-GIS-EP_ssGM_1478	MH-GIS-EP_ssMH_2585	1,067.19	MH-GIS-EP_ssMH_2584	1,074.61	115.1	0.064	8	Glass	0.013	16	12.7	6.8	
GM-GIS-EP_ssGM_1479	MH-GIS-EP_ssMH_2587	1,053.88	MH-GIS-EP_ssMH_2585	1,067.19	204.1	0.065	8	Glass	0.013	18	13.4	12.7	
GM-GIS-EP_ssGM_1480	MH-GIS-EP_ssMH_2600	1,085.09	MH-GIS-EP_ssMH_2583	1,079.32	59.4	0.097	8	Glass	0.013	14	12	-0.6	
GM-GIS-EP_ssGM_1481	MH-GIS-EP_ssMH_2590	1,059.65	MH-GIS-EP_ssMH_2594	1,058.00	129.4	0.013	8	Glass	0.013	60	100	3	
GM-GIS-EP_ssGM_1482	MH-GIS-EP_ssMH_2578	1,064.51	MH-GIS-EP_ssMH_2601	1,069.76	160.9	0.033	8	Glass	0.013	2	4.2	4.6	
GM-GIS-EP_ssGM_1483	MH-GIS-EP_ssMH_2592	1,062.35	MH-GIS-EP_ssMH_2594	1,058.00	186	0.023	8	Glass	0.013	4	100	0.2	
GM-GIS-EP_ssGM_1484	MH-GIS-EP_ssMH_2581	1,107.73	MH-GIS-EP_ssMH_2604	1,097.53	171.2	0.06	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-EP_ssGM_1485	MH-GIS-EP_ssMH_2607	1,058.36	MH-GIS-EP_ssMH_2606	1,061.67	281.4	-0.012	8	Glass	0.013	71	100	5	
GM-GIS-EP_ssGM_1486	MH-GIS-EP_ssMH_2591	1,057.24	MH-GIS-EP_ssMH_2608	1,057.37	48	-0.003	8	Glass	0.013	67	100	5.5	
GM-GIS-EP_ssGM_1487	MH-GIS-EP_ssMH_2603	1,063.73	MH-GIS-EP_ssMH_2589	1,057.65	176.2	0.035	8	Glass	0.013	25	15.9	-0.6	
GM-GIS-EP_ssGM_1488	MH-GIS-EP_ssMH_2602	1,070.56	MH-GIS-EP_ssMH_2603	1,063.73	63.7	0.107	8	Glass	0.013	23	15.3	-0.6	
GM-GIS-EP_ssGM_1489	MH-GIS-EP_ssMH_2595	1,086.22	MH-GIS-EP_ssMH_2596	1,082.11	177.6	0.023	8	Glass	0.013	19	14.1	-0.6	
GM-GIS-EP_ssGM_1490	MH-GIS-MH-197	1,071.22	MH-GIS-EP_ssMH_2578	1,064.51	216.3	0.031	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-EP_ssGM_1491	MH-GIS-EP_ssMH_2608	1,057.37	MH-GIS-EP_ssMH_2607	1,058.36	169.8	-0.006	8	Glass	0.013	69	100	6	
GM-GIS-EP_ssGM_1492	MH-GIS-EP_ssMH_2582	1,062.05	MH-GIS-EP_ssMH_2606	1,061.67	40.7	-0.009	8	Glass	0.013	72	100	1.2	
GM-GIS-EP_ssGM_1493	MH-GIS-EP_ssMH_2605	1,063.65	MH-GIS-EP_ssMH_2587	1,053.88	263.1	0.037	8	Glass	0.013	88	30.6	-0.5	
GM-GIS-EP_ssGM_1494	MH-GIS-EP_ssMH_2605	1,063.65	MH-GIS-EP_ssMH_2582	1,062.05	56	-0.029	8	Glass	0.013	86	100	-0.4	
GM-GIS-EP_ssGM_1495	MH-GIS-EP_ssMH_2586	1,087.41	MH-GIS-EP_ssMH_2597	1,087.13	50.8	0.005	8	Glass	0.013	14	12.8	-0.6	
GM-GIS-EP_ssGM_1496	MH-GIS-EP_ssMH_2604	1,097.53	MH-GIS-EP_ssMH_2588	1,087.69	169.8	0.058	8	Glass	0.013	11	10.4	-0.6	
GM-GIS-EP_ssGM_1497	MH-GIS-EP_ssMH_2596	1,082.11	MH-GIS-EP_ssMH_2602	1,070.56	268	0.043	8	Glass	0.013	21	14.7	-0.6	
GM-GIS-EP_ssGM_1498	MH-GIS-EP_ssMH_2580	1,092.25	MH-GIS-EP_ssMH_2600	1,085.09	109.6	0.065	8	Glass	0.013	12	11.2	-0.6	
GM-GIS-EP_ssGM_1499	MH-GIS-EP_ssMH_2599	1,091.67	MH-GIS-EP_ssMH_2595	1,086.22	202.2	0.027	8	Glass	0.013	2	4.2	-0.6	
GM-GIS-EP_ssGM_1500	MH-GIS-MH-99	1,100.90	MH-GIS-EP_ssMH_2598	1,099.00	153.2	0.012	8	Glass	0.013	9	9.4	-0.6	
GM-GIS-EP_ssGM_1501	MH-GIS-EP_ssMH_2597	1,087.13	MH-GIS-EP_ssMH_2595	1,086.22	167.4	0.005	8	Glass	0.013	16	13.6	-0.6	
GM-GIS-EP_ssGM_1502	MH-GIS-EP_ssMH_2588	1,087.69	MH-GIS-EP_ssMH_2586	1,087.41	51.6	0.005	8	Glass	0.013	12	12	-0.6	
GM-GIS-EP_ssGM_1503	MH-GIS-EP_ssMH_2581	1,107.73	MH-GIS-MH-75	1,110.99	48.3	0.067	8	Glass	0.013	7	8.5	2.6	
GM-GIS-EP_ssGM_1504	MH-GIS-EP_ssMH_2594	1,058.00	MH-GIS-EP_ssMH_2591	1,057.24	96.7	0.008	8	Glass	0.013	65	100	4.6	
GM-GIS-EP_ssGM_1505	MH-GIS-EP_ssMH_2593	1,066.04	MH-GIS-EP_ssMH_2592	1,062.35	170.6	0.022	8	Glass	0.013	2	4.2	-0.6	
GM-GIS-EP_ssGM_1506	MH-GIS-EP_ssMH_2589	1,057.65	MH-GIS-EP_ssMH_2590	1,059.65	134	-0.015	8	Glass	0.013	41	100	5	
GM-GIS-EP_ssGM_1507	MH-GIS-EP_ssMH_2598	1,099.00	MH-GIS-EP_ssMH_2580	1,092.25	300	0.023	8	Glass	0.013	11	10.4	-0.6	
GM-GIS-EP_ssGM_1508	MH-GIS-EP_ssMH_2578	1,064.51	MH-GIS-EP_ssMH_2582	1,062.05	102.8	0.024	8	Glass	0.013	12	11.2	-0.6	
GM-GIS-EP_ssGM_1509	MH-GIS-EP_ssMH_2583	1,079.32	MH-GIS-EP_ssMH_2579	1,063.97	155	0.099	8	Glass	0.013	16	12.7	-0.6	
GM-GIS-EP_ssGM_1510	MH-GIS-EP_ssMH_2609	1,046.79	MH-GIS-EP_ssMH_2587	1,053.88	157	0.045	8	Glass	0.013	108	33.8	6.6	
GM-GIS-EP_ssGM_1511	MH-GIS-EP_ssMH_2571	1,044.00	MH-GIS-EP_ssMH_2609	1,046.79	131.3	0.021	8	Glass	0.013	109	34.1	2.4	
GM-GIS-FW_ssGM_189	MH-GIS-FW_ssMH_1607	894	MH-GIS-FW_ssMH_1606	891.15	175.4	0.016	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_208	MH-GIS-FW_ssMH_1603	862.78	MH-GIS-NE_ssMH_1604	868.35	299.1	0.019	8	PVC	0.01	10	10	5	
GM-GIS-FW_ssGM_209	MH-IS-39	847.91	MH-GIS-FW_ssMH_1603	862.78	345.5	0.043	8	PVC	0.01	11	10.5	14.3	
GM-GIS-FW_ssGM_215	MH-GIS-FW_ssMH_1595	881.15	MH-GIS-FW_ssMH_1596	871.76	240.9	0.039	8	PVC	0.01	3	5.4	-0.6	
GM-GIS-FW_ssGM_216	MH-GIS-FW_ssMH_1593	890.23	MH-GIS-FW_ssMH_1594	885.7	170.8	0.027	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-FW_ssGM_217	MH-GIS-FW_ssMH_1594	885.7	MH-GIS-FW_ssMH_1595	881.15	150.1	0.03	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-FW_ssGM_223	MH-GIS-FW_ssMH_1606	891.15	MH-GIS-FW_ssMH_1608	884.67	299.5	0.022	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_228	MH-GIS-FW_ssMH_1592	894	MH-GIS-FW_ssMH_1593	890.23	150.8	0.025	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-FW_ssGM_291	MH-GIS-FW_ssMH_1664	844	MH-GIS-FW_ssMH_1661	843.39	111.7	0.005	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-FW_ssGM_292	MH-GIS-FW_ssMH_1661	843.39	MH-GIS-FW_ssMH_1660	841.89	222.3	0.007	8	PVC	0.01	5	7.2	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-FW_ssGM_293	MH-GIS-FW_ssMH_1663	844.21	MH-GIS-FW_ssMH_1664	844	48.7	0.004	8	PVC	0.01	2	5.3	-0.6	
GM-GIS-FW_ssGM_294	MH-GIS-FW_ssMH_1662	848.3	MH-GIS-FW_ssMH_1664	844	201.1	0.021	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_295	MH-GIS-FW_ssMH_1908	837.79	MH-GIS-FW_ssMH_1659	831.2	153	0.043	8	PVC	0.01	7	8.7	-0.6	
GM-GIS-FW_ssGM_296	MH-GIS-FW_ssMH_1658	813.49	MH-GIS-GC_ssMH_1612	813.35	165.1	9E-04	8	PVC	0.01	13	17.2	-0.6	
GM-GIS-FW_ssGM_297	MH-GIS-FW_ssMH_1659	831.2	MH-GIS-FW_ssMH_1658	813.49	343.4	0.052	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-FW_ssGM_298	MH-GIS-FW_ssMH_1660	841.89	MH-GIS-FW_ssMH_1908	837.79	155.5	0.026	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-FW_ssGM_299	MH-GIS-FW_ssMH_1666	864.43	MH-GIS-FW_ssMH_1665	860.56	113.6	0.034	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_300	MH-GIS-FW_ssMH_1656	827.21	MH-GIS-FW_ssMH_1657	815.87	190.5	0.06	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-FW_ssGM_301	MH-GIS-MH-145	834.18	MH-GIS-FW_ssMH_1656	827.21	106.8	0.065	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_302	MH-GIS-FW_ssMH_1655	846.35	MH-GIS-FW_ssMH_1656	827.21	365	0.052	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_303	MH-GIS-FW_ssMH_1654	855.98	MH-GIS-FW_ssMH_1655	846.35	162.5	0.059	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_304	MH-GIS-FW_ssMH_1657	815.87	MH-GIS-FW_ssMH_1658	813.49	143.4	0.017	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-FW_ssGM_305	MH-GIS-FW_ssMH_1665	860.56	MH-GIS-FW_ssMH_1663	844.21	222	0.074	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-FW_ssGM_306	MH-GIS-MH-147	842.69	MH-GIS-FW_ssMH_1908	837.79	114.4	0.043	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_307	MH-GIS-FW_ssMH_1676	876.82	MH-GIS-FW_ssMH_1675	875	235.7	0.008	8	PVC	0.01	541	78	-0.1	
GM-GIS-FW_ssGM_308	MH-GIS-FW_ssMH_1675	875	MH-IS-MH-4	873	401.1	0.005	8	PVC	0.01	542	100	0.2	
GM-GIS-FW_ssGM_309	MH-GIS-FW_ssMH_1667	887.28	MH-GIS-FW_ssMH_1668	884	391	0.008	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_313	MH-GIS-FW_ssMH_1669	875.37	MH-GIS-FW_ssMH_1670	872.88	75.7	0.033	8	PVC	0.01	2	5	-0.6	
GM-GIS-FW_ssGM_314	MH-GIS-FW_ssMH_1670	872.88	MH-IS-43	861.48	302.9	0.038	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-FW_ssGM_315	MH-GIS-MH-187	877.48	MH-GIS-FW_ssMH_1670	872.88	158.3	0.029	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-FW_ssGM_316	MH-GIS-FW_ssMH_1668	884	MH-GIS-FW_ssMH_1669	875.37	351.6	0.025	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-GC_ssGM_192	MH-GIS-MH-29	797.76	MH-GIS-GC_ssMH_1578	798	18.4	-0.013	8	Glass	0.013	1	100	5.4	
GM-GIS-GC_ssGM_193	MH-GIS-MH-65	798.64	MH-GIS-GC_ssMH_1578	798	43.3	0.015	8	Glass	0.013	1	100	4.5	
GM-GIS-GC_ssGM_194	MH-GIS-GC_ssMH_1578	798	MH-GIS-GC_ssMH_1579	799.91	132.6	-0.014	8	PVC	0.01	4	100	5.2	
GM-GIS-GC_ssGM_195	MH-GIS-GC_ssMH_1579	799.91	MH-GIS-GC_ssMH_1580	803.06	194.9	-0.016	8	PVC	0.01	5	100	3.3	
GM-GIS-GC_ssGM_196	MH-GIS-GC_ssMH_1580	803.06	MH-GIS-GC_ssMH_1581	803.72	261.4	-0.003	8	PVC	0.01	7	100	0.1	
GM-GIS-GC_ssGM_197	MH-GIS-GC_ssMH_1581	803.72	MH-GIS-GC_ssMH_1582	792.63	287.3	0.039	8	PVC	0.01	8	8.9	-0.6	
GM-GIS-GC_ssGM_198	MH-GIS-GC_ssMH_1582	792.63	MH-GIS-GC_ssMH_1583	794	172.4	-0.008	8	PVC	0.01	9	100	0.8	
GM-GIS-GC_ssGM_205	MH-GIS-GC_ssMH_1583	794	MH-GIS-GC_ssMH_1588	794	57.2	0	8	PVC	0.01	11	20	-0.5	
GM-GIS-GC_ssGM_206	MH-GIS-GC_ssMH_1591	822.34	MH-GIS-GC_ssMH_1589	804.13	208.7	0.087	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-GC_ssGM_210	MH-GIS-GC_ssMH_1589	804.13	MH-GIS-GC_ssMH_1588	794	233.8	0.043	8	PVC	0.01	12	11	-0.6	
GM-GIS-GC_ssGM_232	MH-GIS-GC_ssMH_1612	813.35	MH-IS-40	811.95	77.2	0.018	8	PVC	0.01	14	12	-0.6	
GM-GIS-GC_ssGM_1080	MH-GIS-GC_ssMH_2208	780.56	MH-IS-38	767.46	246.4	0.053	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-GS_ssGM_779	MH-GIS-GS_ssMH_1470	411.77	MH-IS-193	407.54	62.7	0.067	8	Concrete	0.013	10	10.1	-0.6	
GM-GIS-GS_ssGM_780	MH-GIS-GS_ssMH_1493	414	MH-IS-134	408.52	284.5	0.019	8	Concrete	0.013	3	5.8	-0.6	
GM-GIS-GS_ssGM_883	MH-GIS-GS_ssMH_2090	414.88	MH-GIS-GS_ssMH_2091	415.82	47.9	-0.02	8	Concrete	0.013	23	100	3	SM4
GM-GIS-GS_ssGM_884	MH-GIS-GS_ssMH_1528	416.02	MH-GIS-GS_ssMH_2090	414.88	196.2	0.006	8	PVC	0.01	3	100	1.9	
GM-GIS-GS_ssGM_885	MH-GIS-MH-206	419	MH-GIS-GS_ssMH_2091	415.82	258.5	0.012	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-GS_ssGM_886	MH-GIS-GS_ssMH_2091	415.82	MH-GIS-GS_ssMH_1476	418.34	176.4	-0.014	8	Concrete	0.013	30	100	2.1	SM4
GM-GIS-GS_ssGM_887	MH-GIS-GS_ssMH_1476	418.34	MH-IS-257	414.64	242.3	0.015	8	Concrete	0.013	33	18.6	-0.5	SM4
GM-GIS-GS_ssGM_888	MH-GIS-GS_ssMH_2092	417.72	MH-IS-266	415.38	344.4	0.007	8	Concrete	0.013	3	6.2	-0.6	
GM-GIS-GS_ssGM_909	MH-GIS-MB_ssMH_1461	416	MH-GIS-GS_ssMH_1468	415.12	249.2	0.004	8	Concrete	0.013	136	45.3	-0.4	
GM-GIS-GS_ssGM_910	MH-GIS-GS_ssMH_1468	415.12	MH-GIS-GS_ssMH_1467	414.38	299.4	0.002	8	Concrete	0.013	139	50.9	-0.3	
GM-GIS-GS_ssGM_911	MH-GIS-GS_ssMH_1477	412.88	MH-GIS-GS_ssMH_1478	412.68	30.6	0.007	8	Concrete	0.013	149	40.1	-0.4	
GM-GIS-GS_ssGM_913	MH-GIS-GS_ssMH_1478	412.68	MH-GIS-GS_ssMH_2101	411.66	353.3	0.003	8	Concrete	0.013	153	51.4	-0.3	
GM-GIS-GS_ssGM_914	MH-GIS-GS_ssMH_2101	411.66	MH-IS-GS_ssMH_1480	408.77	302.7	0.01	8	Concrete	0.013	156	41.1	-0.4	
GM-GIS-GS_ssGM_918	MH-GIS-GS_ssMH_2106	414.79	MH-GIS-GS_ssMH_2105	414.08	177.7	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-GS_ssGM_919	MH-GIS-GS_ssMH_2105	414.08	MH-IS-GS_ssMH_1480	408.77	152.8	0.035	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-GS_ssGM_973	MH-GIS-GS_ssMH_2104	418.06	MH-GIS-GS_ssMH_2154	416.74	329.4	0.004	8	Concrete	0.013	3	7	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-GS_ssGM_979	MH-GIS-GS_ssMH_2089	415.97	MH-GIS-GS_ssMH_2090	414.88	302.3	0.004	8	PVC	0.01	10	100	1.9	
GM-GIS-GS_ssGM_980	MH-GIS-MC_ssMH_2159	417.2	MH-GIS-GS_ssMH_2089	415.97	267	0.005	8	Ductile Iron	0.013	7	100	0.7	
GM-GIS-GS_ssGM_981	MH-GIS-MH-21	417.4	MH-GIS-MC_ssMH_2159	417.2	11.7	0.017	8	Ductile Iron	0.013	3	100	0.5	
GM-GIS-GS_ssGM_982	MH-GIS-GS_ssMH_2153	414.94	MH-IS-135	409.66	297.3	0.018	8	Concrete	0.013	7	8.2	-0.6	
GM-GIS-GS_ssGM_983	MH-GIS-GS_ssMH_2103	416.1	MH-GIS-GS_ssMH_2153	414.94	291	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-GS_ssGM_1000	MH-GIS-GS_ssMH_1467	414.38	MH-GIS-GS_ssMH_2172	413.45	139.3	0.007	8	Concrete	0.013	143	39.2	-0.4	
GM-GIS-GS_ssGM_1001	MH-GIS-GS_ssMH_2172	413.45	MH-GIS-GS_ssMH_1477	412.88	163.6	0.003	8	Concrete	0.013	146	47.4	-0.4	
GM-GIS-GS_ssGM_1004	MH-GIS-GS_ssMH_2102	414	MH-GIS-GS_ssMH_1470	411.77	363.2	0.006	8	Concrete	0.013	7	8.7	-0.6	
GM-GIS-GS_ssGM_1005	MH-GIS-MH-176	414.6	MH-GIS-GS_ssMH_2102	414	148.8	0.004	8	Concrete	0.013	3	7	-0.6	
GM-GIS-GS_ssGM_1021	MH-GIS-MH-79	415.21	MH-GIS-GS_ssMH_2090	414.88	83.3	0.004	8	Concrete	0.013	7	100	2.7	
GM-GIS-GS_ssGM_1022	MH-GIS-MH-78	416.02	MH-GIS-MH-79	415.21	49.5	0.016	8	PVC	0.01	3	100	1.9	
GM-GIS-IR_ssGM_249	MH-GIS-MH-14	605.02	MH-GIS-MH-41	593.77	28.2	0.399	6	Glass	0.013	12	15.7	-0.4	
GM-GIS-IR_ssGM_250	MH-GIS-MH-13	605.89	MH-GIS-MH-14	605.02	4	0.219	6	Glass	0.013	11	15.1	-0.4	
GM-GIS-IR_ssGM_251	MH-GIS-MH-51	606.69	MH-GIS-MH-13	605.89	97.2	0.008	6	Glass	0.013	10	14.5	-0.4	
GM-GIS-IR_ssGM_252	MH-GIS-IR_ssMH_1623	608.04	MH-GIS-MH-51	606.69	36.1	0.037	6	Glass	0.013	9	13.9	-0.4	
GM-GIS-IR_ssGM_253	MH-GIS-MH-133	618.69	MH-GIS-IR_ssMH_1623	608.04	98	0.109	6	Glass	0.013	8	13.2	-0.4	
GM-GIS-IR_ssGM_254	MH-GIS-MH-137	631.94	MH-GIS-MH-133	618.69	101.2	0.131	6	Glass	0.013	7	12.5	-0.4	
GM-GIS-IR_ssGM_255	MH-GIS-MH-136	641.15	MH-GIS-MH-137	631.94	100	0.092	6	Glass	0.013	7	11.8	-0.4	
GM-GIS-IR_ssGM_256	MH-GIS-MH-138	649.38	MH-GIS-MH-136	641.15	100	0.082	6	Glass	0.013	6	11	-0.4	
GM-GIS-IR_ssGM_257	MH-GIS-MH-61	657.01	MH-GIS-MH-138	649.38	100	0.076	6	Glass	0.013	5	10.2	-0.4	
GM-GIS-IR_ssGM_258	MH-GIS-IR_ssMH_1624	662.95	MH-GIS-MH-61	657.01	41	0.145	6	Glass	0.013	4	9.3	-0.5	
GM-GIS-IR_ssGM_259	MH-GIS-MH-111	676.44	MH-GIS-IR_ssMH_1624	662.95	83.4	0.162	6	Glass	0.013	3	8.3	-0.5	
GM-GIS-IR_ssGM_260	MH-GIS-MH-110	685.5	MH-GIS-MH-111	676.44	73.4	0.123	6	Glass	0.013	2	7.2	-0.5	
GM-GIS-IR_ssGM_261	MH-GIS-MH-23	684.07	MH-GIS-MH-110	685.5	82.7	-0.017	6	Glass	0.013	2	100	1	
GM-GIS-IR_ssGM_262	MH-GIS-MH-22	685.57	MH-GIS-MH-23	684.07	12.3	0.122	6	Glass	0.013	1	4.1	-0.5	
GM-GIS-IR_ssGM_674	MH-GIS-IR_ssMH_1695	661.78	MH-GIS-IR_ssMH_1946	658.6	73.5	0.043	8	Glass	0.013	27	16.8	-0.6	
GM-GIS-IR_ssGM_675	MH-GIS-IR_ssMH_1954	720.01	MH-GIS-IR_ssMH_1948	718.96	30.1	0.035	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_676	MH-GIS-IR_ssMH_1973	674.31	MH-GIS-IR_ssMH_1977	664.88	122.9	0.077	8	Glass	0.013	7	8.2	-0.6	
GM-GIS-IR_ssGM_677	MH-GIS-IR_ssMH_1946	658.6	MH-GIS-IR_ssMH_1979	644.64	157.8	0.088	8	Glass	0.013	28	17.1	-0.6	
GM-GIS-IR_ssGM_678	MH-GIS-IR_ssMH_1949	685.69	MH-GIS-IR_ssMH_1976	677.81	118.5	0.066	8	Glass	0.013	17	13	-0.6	
GM-GIS-IR_ssGM_679	MH-GIS-IR_ssMH_1952	723.4	MH-GIS-IR_ssMH_1954	720.01	183.1	0.019	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_680	MH-GIS-IR_ssMH_1953	717.36	MH-GIS-IR_ssMH_1954	720.01	224.3	-0.012	8	Glass	0.013	1	100	2	
GM-GIS-IR_ssGM_681	MH-GIS-IR_ssMH_1980	639	MH-GIS-IR_ssMH_1981	641.5	151.6	-0.016	8	Glass	0.013	38	100	2.1	
GM-GIS-IR_ssGM_682	MH-GIS-IR_ssMH_1979	644.64	MH-GIS-IR_ssMH_1980	639	160	0.035	8	Glass	0.013	37	19.7	-0.5	
GM-GIS-IR_ssGM_683	MH-GIS-IR_ssMH_1978	655.71	MH-GIS-IR_ssMH_1979	644.64	169.4	0.065	8	Glass	0.013	8	9.2	-0.6	
GM-GIS-IR_ssGM_684	MH-GIS-IR_ssMH_1977	664.88	MH-GIS-IR_ssMH_1978	655.71	171	0.054	8	Glass	0.013	7	8.7	-0.6	
GM-GIS-IR_ssGM_685	MH-GIS-IR_ssMH_1955	707.87	MH-GIS-IR_ssMH_1956	701.78	99	0.062	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-IR_ssGM_686	MH-GIS-IR_ssMH_1948	718.96	MH-GIS-IR_ssMH_1955	707.87	140.9	0.079	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_687	MH-GIS-IR_ssMH_1958	705.64	MH-GIS-IR_ssMH_1959	693	126.7	0.1	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-IR_ssGM_688	MH-GIS-IR_ssMH_1957	730.49	MH-GIS-IR_ssMH_1958	705.64	262.3	0.095	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_689	MH-GIS-IR_ssMH_1959	693	MH-GIS-IR_ssMH_1968	689.98	121.5	0.025	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_690	MH-GIS-IR_ssMH_1962	747.5	MH-GIS-IR_ssMH_1963	734.42	162.3	0.081	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_691	MH-GIS-IR_ssMH_1961	767.17	MH-GIS-IR_ssMH_1962	747.5	255.4	0.077	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_692	MH-GIS-IR_ssMH_1960	766.86	MH-GIS-IR_ssMH_1961	767.17	73.7	-0.004	8	Glass	0.013	2	56.6	-0.3	
GM-GIS-IR_ssGM_693	MH-GIS-MH-114	770.66	MH-GIS-IR_ssMH_1960	766.86	75.3	0.05	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_694	MH-GIS-IR_ssMH_1947	757.4	MH-GIS-IR_ssMH_1969	741.39	147.1	0.109	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_695	MH-GIS-IR_ssMH_1963	734.42	MH-GIS-IR_ssMH_1964	717.96	217.8	0.076	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-IR_ssGM_696	MH-GIS-IR_ssMH_1964	717.96	MH-GIS-IR_ssMH_1965	709.36	93.4	0.092	8	Glass	0.013	5	7.2	-0.6	
GM-GIS-IR_ssGM_697	MH-GIS-IR_ssMH_1965	709.36	MH-GIS-IR_ssMH_1966	701.3	85.6	0.094	8	Glass	0.013	6	7.6	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-IR_ssGM_698	MH-GIS-IR_ssMH_1966	701.3	MH-GIS-IR_ssMH_1967	695.27	91.3	0.066	8	Glass	0.013	12	10.9	-0.6	
GM-GIS-IR_ssGM_699	MH-GIS-IR_ssMH_1956	701.78	MH-GIS-IR_ssMH_1966	701.3	64.4	0.007	8	Glass	0.013	5	7.3	-0.6	
GM-GIS-IR_ssGM_700	MH-GIS-IR_ssMH_1967	695.27	MH-GIS-IR_ssMH_1968	689.98	197.5	0.027	8	Glass	0.013	12	11.2	-0.6	
GM-GIS-IR_ssGM_701	MH-GIS-IR_ssMH_1968	689.98	MH-GIS-IR_ssMH_1949	685.69	158.1	0.027	8	Glass	0.013	16	12.7	-0.6	
GM-GIS-IR_ssGM_702	MH-GIS-IR_ssMH_1969	741.39	MH-GIS-IR_ssMH_1970	713.33	255.2	0.11	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-IR_ssGM_703	MH-GIS-IR_ssMH_1970	713.33	MH-GIS-IR_ssMH_1971	692.5	189.8	0.11	8	Glass	0.013	2	5	-0.6	
GM-GIS-IR_ssGM_704	MH-GIS-IR_ssMH_1971	692.5	MH-GIS-IR_ssMH_1972	677.86	142.1	0.103	8	Glass	0.013	3	5.7	-0.6	
GM-GIS-IR_ssGM_705	MH-GIS-IR_ssMH_1972	677.86	MH-GIS-IR_ssMH_1973	674.31	55.7	0.064	8	Glass	0.013	4	6.5	-0.6	
GM-GIS-IR_ssGM_706	MH-GIS-IR_ssMH_1974	674	MH-GIS-IR_ssMH_1973	674.31	76.9	-0.004	8	Glass	0.013	2	55.5	-0.3	
GM-GIS-IR_ssGM_707	MH-GIS-IR_ssMH_1975	677.11	MH-GIS-IR_ssMH_1974	674	145.1	0.021	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-IR_ssGM_708	MH-GIS-IR_ssMH_1981	641.5	MH-GIS-IR_ssMH_1982	609.69	301.6	0.105	8	Glass	0.013	39	20.1	-0.5	
GM-GIS-IR_ssGM_709	MH-GIS-IR_ssMH_1976	677.81	MH-GIS-IR_ssMH_1951	667.09	127.6	0.084	8	Glass	0.013	17	13.4	-0.6	
GM-GIS-IR_ssGM_710	MH-GIS-IR_ssMH_1951	667.09	MH-IS-129	645.79	117.2	0.182	8	Glass	0.013	18	13.7	-0.6	
GM-GIS-IR_ssGM_735	MH-GIS-IR_ssMH_1982	609.69	MH-IS-48	588.13	104.8	0.206	8	Glass	0.013	40	20.3	-0.5	
GM-GIS-JH_ssGM_1102	MH-GIS-MH-74	466.99	MH-IS-16	465.97	48.5	0.021	8	Ductile Iron	0.013	220	49.1	-0.3	
GM-GIS-KC_ssGM_747	MH-GIS-MH-188	418.46	MH-GIS-MH-189	417.83	158.6	0.004	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-KC_ssGM_748	MH-GIS-MH-189	417.83	MH-GIS-KC_ssMH_2009	417.17	163.9	0.004	8	PVC	0.01	5	7.8	-0.6	
GM-GIS-KC_ssGM_749	MH-GIS-KC_ssMH_2009	417.17	MH-GIS-MH-155	416.67	125.3	0.004	8	PVC	0.01	8	9.4	-0.6	
GM-GIS-KC_ssGM_750	MH-GIS-MH-155	416.67	Pump Station No. 6 Wetwell	415	213.3	0.008	8	PVC	0.01	11	49.6	-0.3	
GM-GIS-KC_ssGM_857	MH-GIS-MH-209	418.15	MH-IS-30	415.36	355.8	0.008	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-KC_ssGM_860	MH-GIS-MH-76	418.62	MH-GIS-KC_ssMH_1509	417.94	49.3	0.014	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-KC_ssGM_861	MH-GIS-KC_ssMH_1509	417.94	MH-IS-24	416.67	281.1	0.005	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-KC_ssGM_870	MH-GIS-KC_ssMH_2084	482.14	MH-GIS-KC_ssMH_2083	463.1	295.4	0.064	8	PVC	0.01	334	61.1	-0.3	
GM-GIS-KC_ssGM_871	MH-GIS-KC_ssMH_2083	463.1	MH-GIS-KC_ssMH_2082	440.53	345.7	0.065	8	PVC	0.01	343	62	-0.3	
GM-GIS-KC_ssGM_872	MH-GIS-KC_ssMH_2082	440.53	MH-IS-57	425.87	240.2	0.061	8	PVC	0.01	351	62.8	-0.2	
GM-GIS-KC_ssGM_891	MH-GIS-MH-195	522.26	MH-GIS-KC_ssMH_2084	482.14	281.4	0.143	8	PVC	0.01	45	21.5	-0.5	
GM-GIS-KC_ssGM_892	MH-GIS-MH-199	557.17	MH-GIS-MH-195	522.26	183	0.191	8	PVC	0.01	27	16.6	-0.6	
GM-GIS-KC_ssGM_893	MH-GIS-MH-165	569.29	MH-GIS-MH-199	557.17	203.7	0.06	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-KC_ssGM_894	MH-GIS-MH-164	577.65	MH-GIS-MH-165	569.29	138.8	0.06	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-KC_ssGM_895	MH-GIS-MH-194	561.05	MH-GIS-MH-195	522.26	173.8	0.223	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-KC_ssGM_922	MH-GIS-KC_ssMH_2108	1,027.84	MH-GIS-KC_ssMH_2109	1,006.90	270.9	0.077	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-KC_ssGM_923	MH-GIS-KC_ssMH_2109	1,006.90	MH-GIS-KC_ssMH_2111	970.9	297.5	0.121	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-KC_ssGM_924	MH-GIS-KC_ssMH_2111	970.9	MH-GIS-KC_ssMH_2110	961.14	117.7	0.083	8	PVC	0.01	26	16.4	-0.6	
GM-GIS-KC_ssGM_925	MH-GIS-KC_ssMH_2110	961.14	MH-GIS-KC_ssMH_2112	946.39	98.7	0.149	8	PVC	0.01	35	18.9	-0.5	
GM-GIS-KC_ssGM_926	MH-GIS-KC_ssMH_2112	946.39	MH-GIS-KC_ssMH_2113	926.05	298.9	0.068	8	PVC	0.01	44	21.3	-0.5	
GM-GIS-KC_ssGM_927	MH-GIS-KC_ssMH_2113	926.05	MH-GIS-MH-123	906.59	236.2	0.082	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-KC_ssGM_928	MH-GIS-MH-123	906.59	MH-GIS-KC_ssMH_2115	900.25	83.5	0.076	8	PVC	0.01	61	25.3	-0.5	
GM-GIS-KC_ssGM_929	MH-GIS-KC_ssMH_2115	900.25	MH-GIS-KC_ssMH_2116	887.69	229.2	0.055	8	PVC	0.01	70	27	-0.5	
GM-GIS-KC_ssGM_930	MH-GIS-KC_ssMH_2116	887.69	MH-GIS-KC_ssMH_2117	874.03	141.2	0.097	8	PVC	0.01	78	28.8	-0.5	
GM-GIS-KC_ssGM_931	MH-GIS-KC_ssMH_2117	874.03	MH-GIS-KC_ssMH_2118	847.41	300.1	0.089	8	PVC	0.01	87	30.4	-0.5	
GM-GIS-KC_ssGM_932	MH-GIS-KC_ssMH_2118	847.41	MH-GIS-KC_ssMH_2119	790.79	349.9	0.162	8	PVC	0.01	96	31.9	-0.5	
GM-GIS-KC_ssGM_933	MH-GIS-KC_ssMH_2119	790.79	MH-GIS-KC_ssMH_2122	729.26	389.2	0.158	8	PVC	0.01	105	33.4	-0.4	
GM-GIS-KC_ssGM_934	MH-GIS-KC_ssMH_2122	729.26	MH-GIS-KC_ssMH_2196	707.3	203.5	0.108	8	PVC	0.01	113	34.8	-0.4	
GM-GIS-KC_ssGM_935	MH-GIS-KC_ssMH_2196	707.3	MH-GIS-KC_ssMH_2197	701.32	62.5	0.096	8	PVC	0.01	122	36.2	-0.4	
GM-GIS-KC_ssGM_936	MH-GIS-KC_ssMH_2197	701.32	MH-GIS-KC_ssMH_2123	691.09	106.9	0.096	8	PVC	0.01	131	37.5	-0.4	
GM-GIS-KC_ssGM_937	MH-GIS-KC_ssMH_2123	691.09	MH-GIS-KC_ssMH_2124	686.29	81	0.059	8	PVC	0.01	139	38.7	-0.4	
GM-GIS-KC_ssGM_938	MH-GIS-KC_ssMH_2124	686.29	MH-GIS-KC_ssMH_2125	653.86	85.6	0.379	8	Ductile Iron	0.013	148	40	-0.4	
GM-GIS-KC_ssGM_939	MH-GIS-KC_ssMH_2125	653.86	MH-GIS-KC_ssMH_2126	651.73	144	0.015	8	PVC	0.01	157	41.2	-0.4	
GM-GIS-KC_ssGM_940	MH-GIS-KC_ssMH_2126	651.73	MH-GIS-KC_ssMH_2168	644.03	103.7	0.074	8	PVC	0.01	166	42.4	-0.4	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-KC_ssGM_941	MH-GIS-KC_ssMH_2168	644.03	MH-GIS-KC_ssMH_2127	641.46	315.3	0.008	8	PVC	0.01	174	43.5	-0.4	
GM-GIS-KC_ssGM_942	MH-GIS-KC_ssMH_2127	641.46	MH-GIS-KC_ssMH_2128	634.26	66.3	0.109	8	PVC	0.01	183	44.6	-0.4	
GM-GIS-KC_ssGM_943	MH-GIS-KC_ssMH_2128	634.26	MH-GIS-KC_ssMH_2129	611.91	210.3	0.106	8	PVC	0.01	192	45.8	-0.4	
GM-GIS-KC_ssGM_944	MH-GIS-KC_ssMH_2129	611.91	MH-GIS-KC_ssMH_2130	603.73	76.9	0.106	8	PVC	0.01	201	46.8	-0.4	
GM-GIS-KC_ssGM_945	MH-GIS-KC_ssMH_2130	603.73	MH-GIS-KC_ssMH_2131	592.15	108.9	0.106	8	PVC	0.01	209	47.9	-0.3	
GM-GIS-KC_ssGM_946	MH-GIS-KC_ssMH_2131	592.15	MH-GIS-KC_ssMH_2132	561.7	286.5	0.106	8	PVC	0.01	218	48.9	-0.3	
GM-GIS-KC_ssGM_947	MH-GIS-KC_ssMH_2132	561.7	MH-GIS-KC_ssMH_2133	549	131.6	0.096	8	PVC	0.01	227	49.9	-0.3	
GM-GIS-KC_ssGM_948	MH-GIS-KC_ssMH_2133	549	MH-GIS-KC_ssMH_2134	535.47	176.1	0.077	8	PVC	0.01	235	50.9	-0.3	
GM-GIS-KC_ssGM_949	MH-GIS-KC_ssMH_2134	535.47	MH-GIS-KC_ssMH_2135	534.13	43.6	0.031	8	PVC	0.01	244	51.9	-0.3	
GM-GIS-KC_ssGM_950	MH-GIS-KC_ssMH_2135	534.13	MH-GIS-KC_ssMH_2120	521.21	135.8	0.095	8	PVC	0.01	253	52.9	-0.3	
GM-GIS-KC_ssGM_984	MH-GIS-KC_ssMH_2084	482.14	MH-GIS-KC_ssMH_2160	482.58	9.6	0.046	8	PVC	0.01	280	55.8	0.1	
GM-GIS-KC_ssGM_987	MH-GIS-KC_ssMH_2121	507.3	MH-GIS-KC_ssMH_2160	482.58	373.8	0.066	8	PVC	0.01	271	54.8	-0.3	
GM-GIS-KC_ssGM_988	MH-GIS-KC_ssMH_2120	521.21	MH-GIS-KC_ssMH_2121	507.3	184.9	0.075	8	PVC	0.01	262	53.9	-0.3	
GM-GIS-KR_ssGM_29	MH-GIS-KR_ssMH_1445	579.09	MH-GIS-KR_ssMH_1442	570.02	120.4	0.075	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-KR_ssGM_34	MH-GIS-KR_ssMH_1442	570.02	MH-GIS-KR_ssMH_1441	558.99	117.6	0.094	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-KR_ssGM_35	MH-GIS-KR_ssMH_1441	558.99	MH-GIS-KR_ssMH_1439	565.63	153.6	-0.043	8	PVC	0.01	17	100	6.1	
GM-GIS-KR_ssGM_36	MH-GIS-KR_ssMH_1439	565.63	MH-GIS-KR_ssMH_1431	552.59	70.1	0.186	8	PVC	0.01	19	14	-0.6	
GM-GIS-KR_ssGM_554	MH-GIS-MH-88	587.38	MH-IS-89	577.39	54.9	0.182	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_557	MH-GIS-MH-41	593.77	MH-IS-89	577.39	124.3	0.132	6	PVC	0.01	12	16.2	-0.4	
GM-GIS-KR_ssGM_610	MH-GIS-MH-43	553.07	MH-GIS-KR_ssMH_1900	546.6	29.5	0.219	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-KR_ssGM_611	MH-GIS-KR_ssMH_1899	550.74	MH-GIS-KR_ssMH_1898	549.33	161.7	0.009	8	PVC	0.01	54	23.8	-0.5	
GM-GIS-KR_ssGM_612	MH-GIS-KR_ssMH_1431	552.59	MH-GIS-KR_ssMH_1899	550.74	181.5	0.01	8	PVC	0.01	53	23.6	-0.5	
GM-GIS-KR_ssGM_613	MH-GIS-KR_ssMH_1898	549.33	MH-GIS-KR_ssMH_1901	548.1	163.4	0.008	8	PVC	0.01	55	24	-0.5	
GM-GIS-KR_ssGM_614	MH-GIS-KR_ssMH_1901	548.1	MH-GIS-KR_ssMH_1900	546.6	141.6	0.011	8	PVC	0.01	56	24.2	-0.5	
GM-GIS-KR_ssGM_615	MH-GIS-KR_ssMH_1900	546.6	MH-GIS-KR_ssMH_1897	535.33	181.1	0.062	8	PVC	0.01	58	24.5	-0.5	
GM-GIS-KR_ssGM_616	MH-GIS-KR_ssMH_1897	535.33	MH-GIS-KR_ssMH_1896	518.29	184.2	0.093	8	PVC	0.01	58	24.7	-0.5	
GM-GIS-KR_ssGM_617	MH-GIS-KR_ssMH_1896	518.29	MH-GIS-KR_ssMH_1902	515.25	160.9	0.019	8	PVC	0.01	232	50.6	-0.3	
GM-GIS-KR_ssGM_618	MH-GIS-KR_ssMH_1902	515.25	MH-GIS-KR_ssMH_1903	513.28	230.4	0.009	8	PVC	0.01	233	50.6	-0.3	
GM-GIS-KR_ssGM_619	MH-GIS-KR_ssMH_1903	513.28	MH-GIS-KR_ssMH_1904	511.5	192.5	0.009	8	PVC	0.01	234	50.8	-0.3	
GM-GIS-KR_ssGM_620	MH-GIS-KR_ssMH_1904	511.5	MH-IS-128	510.28	158.6	0.008	8	PVC	0.01	235	50.8	-0.3	
GM-GIS-KR_ssGM_621	MH-GIS-MH-31	528.89	MH-GIS-KR_ssMH_1896	518.29	19.3	0.55	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_642	MH-GIS-MH-20	570.83	MH-GIS-KR_ssMH_1442	570.02	10.2	0.08	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-KR_ssGM_643	MH-GIS-MH-151	579.54	MH-GIS-MH-20	570.83	118.6	0.073	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KR_ssGM_644	MH-GIS-KR_ssMH_1916	559.83	MH-GIS-KR_ssMH_1439	565.63	104.6	-0.055	8	PVC	0.01	1	100	5.2	
GM-GIS-KR_ssGM_645	MH-GIS-KR_ssMH_1917	585.29	MH-GIS-KR_ssMH_1439	565.63	256.8	0.077	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_536	MH-IS-MH-2	408.8	MH-GIS-KV_ssMH_1913	417.96	20.6	0.444	8	PVC	0.01	2	4.9	8.5	
GM-GIS-KV_ssGM_539	MH-GIS-KV_ssMH_2205	458.37	MH-IS-82	448.73	44.8	0.215	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_558	MH-GIS-MH-108	504.12	MH-IS-121	498.94	71.9	0.072	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-KV_ssGM_752	MH-GIS-AR_ssMH_2017	517.96	MH-IS-154	499.58	185.3	0.099	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-KV_ssGM_970	MH-GIS-KV_ssMH_2150	418.31	MH-GIS-KV_ssMH_1913	417.96	87.6	0.004	8	PVC	0.01	2	4.4	-0.6	
GM-GIS-KV_ssGM_971	MH-GIS-KV_ssMH_2151	419.18	MH-GIS-KV_ssMH_2150	418.31	217.1	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-KV_ssGM_1063	MH-GIS-KV_ssMH_2190	449.99	MH-IS-81	438.64	73.2	0.155	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-KV_ssGM_1064	MH-GIS-KV_ssMH_2191	450.77	MH-GIS-KV_ssMH_2190	449.99	196.2	0.004	8	PVC	0.01	1	3.2	-0.6	
GM-GIS-KV_ssGM_1088	MH-GIS-KV_ssMH_2186	457	MH-IS-82	448.73	154.5	0.054	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-MB_ssGM_842	MH-GIS-MB_ssMH_2062	417.89	MH-GIS-MB_ssMH_1459	415.85	296.9	0.007	8	Glass	0.013	12	11.4	-0.6	
GM-GIS-MB_ssGM_843	MH-GIS-MB_ssMH_1459	415.85	MH-GIS-MB_ssMH_1460	414.21	235.7	0.007	8	Concrete	0.013	37	19.6	-0.5	
GM-GIS-MB_ssGM_844	MH-GIS-MB_ssMH_1458	415.48	MH-GIS-MB_ssMH_1459	415.85	258.2	-0.001	8	Glass	0.013	12	79.6	-0.1	
GM-GIS-MB_ssGM_845	MH-GIS-MB_ssMH_1457	416.2	MH-GIS-MB_ssMH_1458	415.48	257.9	0.003	8	Glass	0.013	8	11.7	-0.6	
GM-GIS-MB_ssGM_846	MH-GIS-MB_ssMH_1460	414.21	MH-GIS-MB_ssMH_2063	415.06	147.3	-0.006	8	Glass	0.013	46	100	0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-MB_ssGM_847	MH-GIS-MB_ssMH_2063	415.06	MH-GIS-MB_ssMH_2064	415.09	272.7	-1E-04	8	Concrete	0.013	54	60.3	-0.3	
GM-GIS-MB_ssGM_848	MH-GIS-MB_ssMH_2064	415.09	MH-GIS-MB_ssMH_2066	412.31	270.3	0.01	8	Concrete	0.013	58	24.6	-0.5	
GM-GIS-MB_ssGM_849	MH-GIS-MB_ssMH_2066	412.31	MH-GIS-MB_ssMH_2065	405.51	52.5	0.129	8	Concrete	0.013	62	25.5	-0.5	SM2
GM-GIS-MB_ssGM_850	MH-GIS-MB_ssMH_2065	405.51	MH-GIS-MB_ssMH_2067	408.72	220.6	-0.015	8	Concrete	0.013	66	100	5.6	SM2
GM-GIS-MB_ssGM_851	MH-GIS-MB_ssMH_2068	416.46	MH-GIS-MB_ssMH_2063	415.06	293	0.005	8	Concrete	0.013	4	7.4	-0.6	
GM-GIS-MB_ssGM_852	MH-GIS-MB_ssMH_2070	414	MH-GIS-MB_ssMH_2069	416.57	297.5	-0.009	8	Concrete	0.013	21	100	2.9	
GM-GIS-MB_ssGM_853	MH-GIS-MB_ssMH_2071	414.51	MH-GIS-MB_ssMH_2070	414	236.3	0.002	8	Concrete	0.013	4	100	2.4	
GM-GIS-MB_ssGM_854	MH-GIS-MB_ssMH_2072	417.27	MH-GIS-MB_ssMH_2073	409.91	101.6	0.072	8	Concrete	0.013	54	23.7	-0.5	
GM-GIS-MB_ssGM_896	MH-GIS-MB_ssMH_2073	409.91	MH-GIS-MB_ssMH_2096	411.42	87.3	-0.017	8	PVC	0.01	58	100	1.1	
GM-GIS-MB_ssGM_897	MH-GIS-MB_ssMH_2097	415.13	MH-GIS-MB_ssMH_1460	414.21	432.2	0.002	8	Concrete	0.013	4	51.9	-0.3	
GM-GIS-MB_ssGM_898	MH-GIS-MH-150	418.93	MH-GIS-MB_ssMH_2098	418.47	117	0.004	8	Glass	0.013	4	7.7	-0.6	
GM-GIS-MB_ssGM_899	MH-GIS-MB_ssMH_2098	418.47	MH-GIS-MB_ssMH_2062	417.89	143.9	0.004	8	Vitrified Clay	0.013	8	10.7	-0.6	
GM-GIS-MB_ssGM_902	MH-GIS-MB_ssMH_1456	414	MH-GIS-MB_ssMH_1455	414	185.5	0	8	Concrete	0.013	4	100	2.9	
GM-GIS-MB_ssGM_903	MH-GIS-MB_ssMH_1455	414	MH-GIS-MB_ssMH_2070	414	256.9	0	8	Concrete	0.013	12	100	2.9	
GM-GIS-MB_ssGM_904	MH-GIS-MB_ssMH_2069	416.57	MH-GIS-MB_ssMH_1463	415.51	204.1	0.005	8	Concrete	0.013	33	100	0.4	
GM-GIS-MB_ssGM_905	MH-GIS-MB_ssMH_1463	415.51	MH-GIS-MB_ssMH_1462	414	146.3	0.01	8	Concrete	0.013	37	100	1.4	
GM-GIS-MB_ssGM_906	MH-GIS-MB_ssMH_1462	414	MH-GIS-MB_ssMH_2099	414	152.2	0	8	Concrete	0.013	41	100	2.9	
GM-GIS-MB_ssGM_907	MH-GIS-MB_ssMH_2099	414	MH-GIS-MB_ssMH_2100	412.94	189.2	0.006	8	Concrete	0.013	46	100	2.9	
GM-GIS-MB_ssGM_908	MH-GIS-MB_ssMH_2100	412.94	MH-GIS-MB_ssMH_2072	417.27	140.4	-0.031	8	Concrete	0.013	50	100	3.9	
GM-GIS-MB_ssGM_912	MH-GIS-MH-180	414	MH-GIS-MB_ssMH_1455	414	154	0	8	Concrete	0.013	4	100	2.9	
GM-GIS-MB_ssGM_921	MH-GIS-MB_ssMH_2152	416.16	MH-GIS-MB_ssMH_2069	416.57	399	-0.001	8	Concrete	0.013	8	100	0.8	
GM-GIS-MB_ssGM_997	MH-GIS-MB_ssMH_2170	417.01	MH-GIS-MB_ssMH_1459	415.85	163.5	0.007	8	Concrete	0.013	8	9.4	-0.6	
GM-GIS-MB_ssGM_998	MH-GIS-MB_ssMH_2171	417.99	MH-GIS-MB_ssMH_2170	417.01	263	0.004	8	Concrete	0.013	4	7.8	-0.6	
GM-GIS-MB_ssGM_999	MH-GIS-MH-141	416.19	MH-GIS-MB_ssMH_1457	416.2	101	-1E-04	8	Concrete	0.013	4	17.6	-0.5	
GM-GIS-MB_ssGM_1014	MH-GIS-MB_ssMH_2096	411.42	PS4WW	399.83	3.1	3.713	8	Cast iron	0.013	133	37.7	-0.4	
GM-GIS-MB_ssGM_1017	MH-GIS-MB_ssMH_2067	408.72	MH-GIS-MB_ssMH_2096	411.42	21.2	-0.127	8	Concrete	0.013	70	100	2.3	SM2
GM-GIS-MB_ssGM_1089	MH-GIS-MH-143	417.14	MH-GIS-MB_ssMH_2152	416.16	103.1	0.01	8	Concrete	0.013	4	67.7	-0.2	
GM-GIS-MU_ssGM_332	MH-GIS-MH-130	824.65	MH-GIS-MH-28	822.32	100	0.023	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_333	MH-GIS-MH-129	830.87	MH-GIS-MH-130	824.65	90	0.069	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_334	MH-GIS-MH-201	814.99	MH-GIS-MH-80	819.26	202.5	-0.021	8	PVC	0.01	1	100	6	
GM-GIS-MU_ssGM_335	MH-GIS-MH-204	820.15	MH-GIS-MH-201	814.99	221.1	0.023	8	PVC	0.01	1	100	0.2	
GM-GIS-MU_ssGM_336	MH-GIS-MH-80	819.26	MH-GIS-MU_ssMH_1810	821.61	50	-0.047	8	PVC	0.01	2	100	1.8	
GM-GIS-MU_ssGM_406	MH-GIS-MU_ssMH_1797	844.97	MH-GIS-MU_ssMH_1798	840.84	109.8	0.038	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_407	MH-GIS-MU_ssMH_1798	840.84	MH-GIS-MU_ssMH_1799	841.52	151.2	-0.005	8	PVC	0.01	2	100	0.1	
GM-GIS-MU_ssGM_408	MH-GIS-MU_ssMH_1799	841.52	MH-GIS-MU_ssMH_1809	832.29	149	0.062	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-MU_ssGM_409	MH-GIS-MU_ssMH_1801	839	MH-GIS-MU_ssMH_1800	831.63	206.8	0.036	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_410	MH-GIS-MU_ssMH_1800	831.63	MH-GIS-MU_ssMH_1802	829	42.5	0.062	8	PVC	0.01	1	100	0.1	
GM-GIS-MU_ssGM_411	MH-GIS-MU_ssMH_1803	828.62	MH-GIS-MU_ssMH_1809	832.29	198.9	-0.018	8	PVC	0.01	4	100	3.1	
GM-GIS-MU_ssGM_412	MH-GIS-MU_ssMH_1802	829	MH-GIS-MU_ssMH_1804	827.72	137.6	0.009	8	PVC	0.01	2	100	2.7	
GM-GIS-MU_ssGM_413	MH-GIS-MU_ssMH_1804	827.72	MH-GIS-MU_ssMH_1803	828.62	93.8	-0.01	8	PVC	0.01	3	100	4	
GM-GIS-MU_ssGM_414	MH-GIS-MU_ssMH_1806	845.55	MH-GIS-MU_ssMH_1807	837.51	116.7	0.069	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_415	MH-GIS-MU_ssMH_1807	837.51	MH-GIS-MU_ssMH_1808	836.34	107.4	0.011	8	PVC	0.01	1	3.8	-0.6	
GM-GIS-MU_ssGM_416	MH-GIS-MU_ssMH_1808	836.34	MH-GIS-MU_ssMH_1809	832.29	160.6	0.025	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-MU_ssGM_417	MH-GIS-MU_ssMH_1811	818.4	MH-GIS-MU_ssMH_1805	809.96	80.2	0.105	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-MU_ssGM_418	MH-GIS-MU_ssMH_1811	818.4	MH-GIS-MH-28	822.32	17.9	0.219	8	PVC	0.01	2	4.7	3.3	
GM-GIS-MU_ssGM_419	MH-GIS-MU_ssMH_1812	841.15	MH-GIS-MU_ssMH_1799	841.52	68.1	-0.005	8	PVC	0.01	1	63	-0.2	
GM-GIS-MU_ssGM_420	MH-GIS-MH-146	844.16	MH-GIS-MU_ssMH_1812	841.15	109.6	0.027	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_421	MH-GIS-MH-131	847.51	MH-GIS-MU_ssMH_1797	844.97	94.4	0.027	8	PVC	0.01	1	2.7	-0.6	
GM-GIS-MU_ssGM_422	MH-GIS-MU_ssMH_1810	821.61	MH-GIS-MU_ssMH_1811	818.4	327.2	0.01	8	PVC	0.01	15	12.2	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-MU_ssGM_423	MH-GIS-MU_ssMH_1813	831.08	MH-GIS-MU_ssMH_1810	821.61	160.2	0.059	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-MU_ssGM_424	MH-GIS-MU_ssMH_1809	832.29	MH-GIS-MU_ssMH_1813	831.08	32.4	0.037	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-NC_ssGM_713	MH-GIS-MH-159	411.85	MH-GIS-NC_ssMH_1983	411.33	129.6	0.004	8	Glass	0.013	2	6	-0.6	
GM-GIS-NC_ssGM_714	MH-GIS-NC_ssMH_1983	411.33	MH-IS-188	407.79	180.3	0.02	8	Glass	0.013	5	6.9	-0.6	
GM-GIS-NC_ssGM_715	MH-GIS-NC_ssMH_1984	411.05	MH-IS-148	404.7	271.6	0.023	8	Concrete	0.013	40	20.5	-0.5	
GM-GIS-NC_ssGM_716	MH-GIS-NC_ssMH_1985	413.81	MH-GIS-NC_ssMH_1984	411.05	237.1	0.012	8	Concrete	0.013	38	19.8	-0.5	
GM-GIS-NC_ssGM_717	MH-GIS-NC_ssMH_1987	414	MH-GIS-NC_ssMH_1990	414	75	0	8	Concrete	0.013	31	35.2	-0.4	
GM-GIS-NC_ssGM_718	MH-GIS-NC_ssMH_1990	414	MH-GIS-NC_ssMH_1991	413.35	127.3	0.005	8	Concrete	0.013	33	19.8	-0.5	
GM-GIS-NC_ssGM_719	MH-GIS-NC_ssMH_1991	413.35	MH-GIS-NC_ssMH_1985	413.81	73	-0.006	8	Concrete	0.013	36	99.8	0	SM4
GM-GIS-NC_ssGM_720	MH-GIS-NC_ssMH_1986	413.35	MH-GIS-NC_ssMH_1987	414	143.2	-0.005	8	Concrete	0.013	5	100	0.2	
GM-GIS-NC_ssGM_721	MH-GIS-MH-156	410.7	MH-GIS-NC_ssMH_1986	413.35	127.2	-0.021	8	Concrete	0.013	2	100	2.9	
GM-GIS-NC_ssGM_722	MH-GIS-NC_ssMH_1988	414	MH-GIS-NC_ssMH_1987	414	14.9	0	8	Concrete	0.013	24	35.8	-0.4	
GM-GIS-NC_ssGM_723	MH-GIS-NC_ssMH_1989	414	MH-GIS-NC_ssMH_1988	414	49.7	0	8	Concrete	0.013	21	37.2	-0.4	
GM-GIS-NC_ssGM_724	MH-GIS-NC_ssMH_1993	414	MH-GIS-NC_ssMH_1992	414	15.9	0	8	Concrete	0.013	17	40.6	-0.4	
GM-GIS-NC_ssGM_725	MH-GIS-NC_ssMH_1992	414	MH-GIS-NC_ssMH_1989	414	172	0	8	Concrete	0.013	19	40.4	-0.4	
GM-GIS-NC_ssGM_726	MH-GIS-NC_ssMH_1995	412.09	MH-GIS-NC_ssMH_1996	413.4	161.4	-0.008	8	Concrete	0.013	7	100	1.5	
GM-GIS-NC_ssGM_727	MH-GIS-MH-109	412.69	MH-GIS-NC_ssMH_1996	413.4	72.4	-0.01	8	Concrete	0.013	2	100	0.9	
GM-GIS-NC_ssGM_728	MH-GIS-NC_ssMH_1996	413.4	MH-GIS-NC_ssMH_1994	413.99	123.2	-0.005	8	Concrete	0.013	12	100	0.2	
GM-GIS-NC_ssGM_729	MH-GIS-NC_ssMH_1994	413.99	MH-GIS-NC_ssMH_1993	414	192.4	-5E-05	8	Concrete	0.013	14	43.6	-0.4	
GM-GIS-NC_ssGM_730	MH-GIS-NC_ssMH_1998	411.16	MH-IS-248	408.21	455.2	0.006	8	Concrete	0.013	9	9.9	-0.6	
GM-GIS-NC_ssGM_732	MH-GIS-NC_ssMH_2001	414	MH-GIS-NC_ssMH_2000	410.94	267.5	0.011	8	Concrete	0.013	2	4.8	-0.6	
GM-GIS-NC_ssGM_733	MH-GIS-NC_ssMH_2000	410.94	MH-IS-214	408.1	148	0.019	8	Concrete	0.013	5	6.9	-0.6	SM4
GM-GIS-NC_ssGM_739	MH-GIS-NC_ssMH_2004	409.85	MH-GIS-NC_ssMH_1522	409.08	192.1	0.004	8	PVC	0.01	2	5.3	-0.6	
GM-GIS-NC_ssGM_740	MH-GIS-NC_ssMH_1522	409.08	MH-GIS-NC_ssMH_1521	409	164.1	5E-04	8	PVC	0.01	5	12	-0.6	
GM-GIS-NC_ssGM_741	MH-GIS-NC_ssMH_1521	409	MH-IS-144	403.08	174	0.034	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-NC_ssGM_840	MH-GIS-NC_ssMH_2061	411.3	MH-GIS-NC_ssMH_1995	412.09	441.2	-0.002	8	PVC	0.01	2	100	2.3	
GM-GIS-NC_ssGM_841	MH-GIS-MH-56	411.79	MH-GIS-NC_ssMH_1995	412.09	38.2	-0.008	8	PVC	0.01	2	100	1.8	
GM-GIS-NE_ssGM_48	MH-GIS-NE_ssMH_1315	856.39	MH-GIS-NE_ssMH_1297	857.74	45.9	0.029	8	PVC	0.01	4	6.5	0.7	
GM-GIS-NE_ssGM_49	MH-GIS-NE_ssMH_1298	854.31	MH-IS-205	845.9	55	0.153	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-NE_ssGM_50	MH-GIS-NE_ssMH_1295	854.07	MH-IS-205	845.9	36.8	0.222	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_51	MH-GIS-NE_ssMH_1304	862.69	MH-GIS-NE_ssMH_1297	857.74	190.1	0.026	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_52	MH-GIS-NE_ssMH_1303	862.09	MH-GIS-NE_ssMH_1304	862.69	116.7	-0.005	8	PVC	0.01	2	100	0	
GM-GIS-NE_ssGM_53	MH-GIS-NE_ssMH_1296	860.61	MH-GIS-NE_ssMH_1303	862.09	47	-0.031	8	PVC	0.01	2	100	1.5	
GM-GIS-NE_ssGM_54	MH-GIS-NE_ssMH_1300	858.22	MH-GIS-NE_ssMH_1299	857.7	102.5	0.005	8	PVC	0.01	2	5.1	-0.6	
GM-GIS-NE_ssGM_55	MH-GIS-NE_ssMH_1301	858.5	MH-GIS-NE_ssMH_1300	858.22	148.1	0.002	8	PVC	0.01	2	5.3	-0.6	
GM-GIS-NE_ssGM_56	MH-GIS-NE_ssMH_1299	857.7	MH-GIS-NE_ssMH_1298	854.31	131	0.026	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_57	MH-GIS-MH-57	859.16	MH-GIS-NE_ssMH_1301	858.5	38.4	0.017	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_58	MH-GIS-NE_ssMH_1302	857.22	MH-GIS-NE_ssMH_1295	854.07	114.7	0.027	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_59	MH-GIS-MH-124	859	MH-GIS-NE_ssMH_1302	857.22	84.3	0.021	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_60	MH-GIS-NE_ssMH_1296	860.61	MH-GIS-MH-60	857.92	40.2	-0.067	8	PVC	0.01	1	100	1.5	
GM-GIS-NE_ssGM_61	MH-GIS-NE_ssMH_1677	863	MH-GIS-NE_ssMH_1335	861.87	36.8	0.031	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_62	MH-GIS-NE_ssMH_1315	856.39	MH-GIS-NE_ssMH_1339	851.06	154.4	0.035	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_63	MH-GIS-MH-105	852.15	MH-GIS-NE_ssMH_1317	854.61	68.4	-0.036	8	PVC	0.01	1	100	1.8	
GM-GIS-NE_ssGM_64	MH-GIS-NE_ssMH_1339	851.06	MH-GIS-NE_ssMH_1316	851.91	177.9	-0.005	8	PVC	0.01	7	100	0.3	
GM-GIS-NE_ssGM_66	MH-GIS-MH-125	891.48	MH-GIS-NE_ssMH_1308	889	85.6	0.029	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_67	MH-GIS-NE_ssMH_1343	869	MH-GIS-NE_ssMH_1324	871.3	226.4	-0.01	8	PVC	0.01	5	100	1.7	
GM-GIS-NE_ssGM_68	MH-GIS-NE_ssMH_1312	876.87	MH-GIS-NE_ssMH_1328	865.28	261.4	0.044	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_69	MH-GIS-MH-126	877.34	MH-GIS-NE_ssMH_1312	876.87	85.7	0.005	8	PVC	0.01	1	3	-0.6	
GM-GIS-NE_ssGM_70	MH-GIS-NE_ssMH_1309	882.54	MH-GIS-NE_ssMH_1348	879.07	155.5	0.022	8	PVC	0.01	12	11.2	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-NE_ssGM_71	MH-GIS-DH_ssMH_1310	888.97	MH-GIS-NE_ssMH_1309	882.54	356.7	0.018	8	PVC	0.01	12	10.9	-0.6	
GM-GIS-NE_ssGM_72	MH-GIS-NE_ssMH_1319	869	MH-GIS-NE_ssMH_1343	869	78.2	0	8	PVC	0.01	3	100	1.7	
GM-GIS-NE_ssGM_73	MH-GIS-NE_ssMH_1307	878.68	MH-GIS-NE_ssMH_1324	871.3	225.9	0.033	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_74	MH-GIS-NE_ssMH_1308	889	MH-GIS-NE_ssMH_1307	878.68	292.2	0.035	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_79	MH-GIS-NE_ssMH_1348	879.07	MH-GIS-NE_ssMH_1334	862.57	346.2	0.048	8	PVC	0.01	13	11.6	-0.6	
GM-GIS-NE_ssGM_86	MH-GIS-NE_ssMH_1317	854.61	MH-GIS-NE_ssMH_1339	851.06	191.8	0.019	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_87	MH-GIS-NE_ssMH_1316	851.91	MH-GIS-NE_ssMH_1318	851.7	190.7	0.001	8	PVC	0.01	8	12.9	-0.6	
GM-GIS-NE_ssGM_88	MH-GIS-NE_ssMH_1336	867.41	MH-GIS-NE_ssMH_1335	861.87	386.3	0.014	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_89	MH-GIS-NE_ssMH_1335	861.87	MH-GIS-NE_ssMH_1334	862.57	149.3	-0.005	8	PVC	0.01	7	100	0.1	
GM-GIS-NE_ssGM_90	MH-GIS-NE_ssMH_1334	862.57	MH-GIS-NE_ssMH_1333	860.25	235.6	0.01	8	PVC	0.01	22	14.8	-0.6	
GM-GIS-NE_ssGM_91	MH-GIS-NE_ssMH_1333	860.25	MH-IS-276	849.3	252.6	0.043	8	PVC	0.01	22	15.2	-0.6	
GM-GIS-NE_ssGM_94	MH-GIS-NE_ssMH_1318	851.7	MH-IS-203	843.68	198.7	0.04	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-NE_ssGM_95	MH-GIS-NE_ssMH_1328	865.28	MH-GIS-NE_ssMH_1329	863.49	157	0.011	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-NE_ssGM_97	MH-GIS-NE_ssMH_1330	859	MH-IS-201	841.44	191.5	0.092	8	PVC	0.01	21	14.6	-0.6	
GM-GIS-NE_ssGM_98	MH-GIS-NE_ssMH_1329	863.49	MH-GIS-NE_ssMH_1330	859	175.2	0.026	8	PVC	0.01	19	14	-0.6	
GM-GIS-NE_ssGM_99	MH-GIS-NE_ssMH_1346	864	MH-GIS-NE_ssMH_1328	865.28	168.9	-0.008	8	PVC	0.01	15	100	0.8	
GM-GIS-NE_ssGM_100	MH-GIS-NE_ssMH_1324	871.3	MH-GIS-NE_ssMH_1325	868.22	155.7	0.02	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-NE_ssGM_101	MH-GIS-NE_ssMH_1327	864	MH-GIS-NE_ssMH_1346	864	158.8	0	8	PVC	0.01	14	100	0.8	
GM-GIS-NE_ssGM_102	MH-GIS-NE_ssMH_1326	865.7	MH-GIS-NE_ssMH_1327	864	117.8	0.014	8	PVC	0.01	10	10	-0.6	
GM-GIS-NE_ssGM_103	MH-GIS-NE_ssMH_1325	868.22	MH-GIS-NE_ssMH_1326	865.7	150.3	0.017	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-NE_ssGM_171	MH-GIS-NE_ssMH_1313	868.11	MH-GIS-NE_ssMH_1343	869	96.8	-0.009	8	PVC	0.01	1	100	2.6	
GM-GIS-NE_ssGM_173	MH-GIS-NE_ssMH_1562	831.9	MH-GIS-NE_ssMH_1563	826	111.8	0.053	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_174	MH-GIS-NE_ssMH_1563	826	MH-GIS-NE_ssMH_1564	823	53	0.057	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_175	MH-GIS-NE_ssMH_1565	822.14	MH-GIS-NE_ssMH_1567	819.88	83.3	0.027	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_176	MH-GIS-NE_ssMH_1566	828.75	MH-GIS-NE_ssMH_1565	822.14	180.5	0.037	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_177	MH-GIS-NE_ssMH_1569	831.92	MH-GIS-NE_ssMH_1566	828.75	57.8	0.055	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_178	MH-GIS-NE_ssMH_1567	819.88	MH-IS-3	797.17	107.5	0.211	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_179	MH-GIS-NE_ssMH_1564	823	MH-GIS-NE_ssMH_1565	822.14	167.6	0.005	8	PVC	0.01	2	5.1	-0.6	
GM-GIS-NE_ssGM_222	MH-GIS-FW_ssMH_1608	884.67	MH-GIS-NE_ssMH_1605	875.6	205.1	0.044	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-NE_ssGM_224	MH-GIS-MH-115	840.44	MH-IS-249	830.76	75.7	0.128	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_227	MH-GIS-NE_ssMH_1610	840.34	MH-IS-249	830.76	207.6	0.046	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-NE_ssGM_229	MH-GIS-NE_ssMH_1611	835.16	MH-GIS-NE_ssMH_1610	840.34	206.8	-0.025	8	PVC	0.01	7	100	4.7	
GM-GIS-NE_ssGM_230	MH-GIS-NE_ssMH_2184	836.06	MH-GIS-NE_ssMH_1611	835.16	43.8	0.021	8	PVC	0.01	7	100	3.8	
GM-GIS-NE_ssGM_231	MH-GIS-NE_ssMH_1605	875.6	MH-GIS-NE_ssMH_1604	868.35	211.3	0.034	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-NE_ssGM_318	MH-GIS-NE_ssMH_1679	872.8	MH-GIS-NE_ssMH_1678	871.46	225.6	0.006	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_319	MH-GIS-NE_ssMH_1680	882.57	MH-GIS-NE_ssMH_1679	872.8	205.6	0.048	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_320	MH-GIS-NE_ssMH_1683	879	MH-GIS-NE_ssMH_1682	877.35	185.7	0.009	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_321	MH-GIS-NE_ssMH_1682	877.35	MH-GIS-NE_ssMH_1681	866.6	200.5	0.054	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_322	MH-GIS-NE_ssMH_1678	871.46	MH-GIS-NE_ssMH_1681	866.6	245.7	0.02	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_323	MH-GIS-NE_ssMH_1681	866.6	MH-GIS-NE_ssMH_1677	863	87.3	0.041	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_324	MH-GIS-NE_ssMH_1689	863.6	MH-GIS-NE_ssMH_1690	859	78	0.059	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NE_ssGM_325	MH-GIS-NE_ssMH_1684	865.93	MH-GIS-NE_ssMH_1327	864	131.7	0.015	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_326	MH-GIS-NE_ssMH_1687	868.98	MH-GIS-NE_ssMH_1684	865.93	100.2	0.03	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_327	MH-GIS-NE_ssMH_1686	869.89	MH-GIS-NE_ssMH_1687	868.98	125.7	0.007	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_328	MH-GIS-NE_ssMH_1685	875.58	MH-GIS-NE_ssMH_1686	869.89	120.2	0.047	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_450	MH-GIS-NE_ssMH_1816	878.47	MH-GIS-NE_ssMH_1319	869	175.5	0.054	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_451	MH-GIS-NE_ssMH_1814	882.73	MH-GIS-NE_ssMH_1816	878.47	76.5	0.056	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_452	MH-GIS-NE_ssMH_1815	880.36	MH-GIS-NE_ssMH_1814	882.73	104.7	-0.023	8	PVC	0.01	1	100	1.7	
GM-GIS-NE_ssGM_476	MH-GIS-ST_ssMH_1541	863.36	MH-IS-70	866.12	62.4	-0.044	8	Ductile Iron	0.013	34	100	2.3	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-NE_ssGM_480	MH-GIS-NE_ssMH_1690	859	MH-IS-71	858.15	143.8	0.006	8	Ductile Iron	0.013	3	5.7	-0.6	
GM-GIS-NE_ssGM_481	MH-GIS-MH-98	858	MH-IS-71	858.15	62.3	-0.002	8	Ductile Iron	0.013	1	43.5	-0.4	
GM-GIS-NE_ssGM_486	MH-GIS-NE_ssMH_1847	871.21	MH-IS-70	866.12	168.5	0.03	8	Ductile Iron	0.013	8	8.9	-0.6	
GM-GIS-NE_ssGM_487	MH-GIS-NE_ssMH_1849	881.09	MH-GIS-NE_ssMH_1848	875.96	197.5	0.026	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_488	MH-GIS-NE_ssMH_1851	886.82	MH-GIS-NE_ssMH_1849	881.09	122.4	0.047	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-NE_ssGM_489	MH-GIS-NE_ssMH_1852	891.98	MH-GIS-NE_ssMH_1851	886.82	137.9	0.037	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-NE_ssGM_490	MH-GIS-NE_ssMH_1850	896.68	MH-GIS-NE_ssMH_1852	891.98	192.4	0.024	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-NE_ssGM_491	MH-GIS-NE_ssMH_1848	875.96	MH-GIS-NE_ssMH_1847	871.21	211.2	0.022	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-NE_ssGM_492	MH-GIS-NE_ssMH_1853	894	MH-IS-69	876.77	174.8	0.099	8	Ductile Iron	0.013	1	2.9	-0.6	
GM-GIS-NE_ssGM_587	MH-GIS-NE_ssMH_1688	874	MH-GIS-NE_ssMH_1312	876.87	130.5	-0.022	8	PVC	0.01	1	100	2.2	
GM-GIS-NE_ssGM_1035	MH-GIS-NE_ssMH_2177	838.01	MH-GIS-NE_ssMH_2184	836.06	62.9	0.031	8	PVC	0.01	6	100	1.8	
GM-GIS-NE_ssGM_1036	MH-GIS-NE_ssMH_2179	840.41	MH-GIS-NE_ssMH_2177	838.01	169.7	0.014	8	PVC	0.01	5	11.5	-0.6	
GM-GIS-NE_ssGM_1037	MH-GIS-NE_ssMH_2181	842.94	MH-GIS-NE_ssMH_2178	842.59	125.8	0.003	8	PVC	0.01	2	5.9	-0.6	
GM-GIS-NE_ssGM_1038	MH-GIS-NE_ssMH_2178	842.59	MH-GIS-NE_ssMH_2179	840.41	30.9	0.071	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-NE_ssGM_1039	MH-GIS-NE_ssMH_2183	844	MH-GIS-NE_ssMH_2181	842.94	122.6	0.009	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NE_ssGM_1040	MH-GIS-NE_ssMH_2180	843.16	MH-GIS-NE_ssMH_2178	842.59	145.7	0.004	8	PVC	0.01	1	3.3	-0.6	
GM-GIS-NE_ssGM_1041	MH-GIS-NE_ssMH_2182	846.38	MH-GIS-NE_ssMH_2183	844	123	0.019	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_1048	MH-GIS-DH_ssMH_1841	902.08	MH-GIS-NE_ssMH_1839	898.53	148.7	0.024	8	PVC	0.01	17	13.4	-0.6	
GM-GIS-NE_ssGM_1049	MH-GIS-NE_ssMH_1839	898.53	MH-IS-69	876.77	141	0.154	8	Ductile Iron	0.013	18	13.7	-0.6	
GM-GIS-NE_ssGM_1068	MH-GIS-NE_ssMH_2195	863.72	MH-GIS-NE_ssMH_1330	859	60.5	0.078	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-NE_ssGM_1071	MH-GIS-NE_ssMH_2198	844	MH-IS-233	831.11	105.7	0.122	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-NE_ssGM_1072	MH-GIS-NE_ssMH_2199	846.87	MH-GIS-NE_ssMH_2198	844	114	0.025	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-NE_ssGM_1073	MH-GIS-NE_ssMH_2200	849	MH-GIS-NE_ssMH_2199	846.87	43	0.05	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-NE_ssGM_1074	MH-GIS-NE_ssMH_2201	853.71	MH-GIS-NE_ssMH_2200	849	114.1	0.041	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-NE_ssGM_1075	MH-GIS-NE_ssMH_2203	854	MH-GIS-NE_ssMH_2201	853.71	44.2	0.007	8	PVC	0.01	2	5	-0.6	
GM-GIS-NE_ssGM_1076	MH-GIS-NE_ssMH_2202	854	MH-GIS-NE_ssMH_2203	854	45.5	0	8	PVC	0.01	2	9.1	-0.6	
GM-GIS-NE_ssGM_1077	MH-GIS-NE_ssMH_2204	854	MH-GIS-NE_ssMH_2202	854	83.8	0	8	PVC	0.01	1	9.6	-0.6	
GM-GIS-NE_ssGM_1081	MH-GIS-NE_ssMH_2176	877.99	MH-GIS-NE_ssMH_1311	872.35	59.6	0.095	6	PVC	0.01	1	4.1	-0.5	
GM-GIS-NE_ssGM_1082	MH-GIS-NE_ssMH_1311	872.35	MH-IS-234	862.31	64.7	0.155	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-NJ_ssGM_581	MH-GIS-MH-174	854.94	MH-GIS-MH-173	852.82	148.4	0.014	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-NJ_ssGM_582	MH-GIS-MH-172	854.95	MH-GIS-MH-173	852.82	147.7	0.014	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-PA_ssGM_817	MH-GIS-PA_ssMH_2041	819.14	MH-GIS-PA_ssMH_2042	811.79	123.1	0.06	8	Glass	0.013	1	2.9	-0.6	
GM-GIS-PA_ssGM_818	MH-GIS-PA_ssMH_2042	811.79	MH-GIS-PA_ssMH_2038	801.05	124.5	0.086	8	Glass	0.013	2	4.1	-0.6	
GM-GIS-PA_ssGM_819	MH-GIS-PA_ssMH_2048	797.66	MH-GIS-PA_ssMH_2047	802.09	122.8	-0.036	8	Glass	0.013	3	100	3.8	
GM-GIS-PA_ssGM_820	MH-GIS-PA_ssMH_2046	800.91	MH-GIS-PA_ssMH_2060	794.84	112.5	0.054	8	Glass	0.013	5	7.2	-0.6	
GM-GIS-PA_ssGM_821	MH-GIS-PA_ssMH_2060	794.84	MH-GIS-GC_ssMH_2059	794	187.5	0.004	8	Glass	0.013	6	8.8	-0.6	
GM-GIS-PA_ssGM_822	MH-GIS-PA_ssMH_2038	801.05	MH-GIS-PA_ssMH_2048	797.66	117.6	0.029	8	Glass	0.013	2	100	0.5	
GM-GIS-PA_ssGM_823	MH-GIS-PA_ssMH_2047	802.09	MH-GIS-PA_ssMH_2046	800.91	400.3	0.003	8	Glass	0.013	4	8.3	-0.6	
GM-GIS-PA_ssGM_824	MH-GIS-GC_ssMH_2059	794	MH-GIS-MH-97	794	36.9	0	8	Glass	0.013	7	16.9	-0.6	
GM-GIS-RI_ssGM_1244	MH-GIS-EP_ssMH_2317	1,044.00	MH-GIS-RI_ssMH_2318	1,044.79	392.6	-0.002	8	PVC	0.01	113	100	0.6	
GM-GIS-RI_ssGM_1245	MH-GIS-RI_ssMH_2318	1,044.79	MH-GIS-RI_ssMH_2326	1,044.00	75.5	0.01	8	PVC	0.01	115	35	-0.4	
GM-GIS-RI_ssGM_1246	MH-GIS-RI_ssMH_2319	1,043.14	MH-GIS-RI_ssMH_2329	1,034.10	162.8	0.056	8	PVC	0.01	118	35.5	-0.4	
GM-GIS-RI_ssGM_1247	MH-GIS-RI_ssMH_2327	1,009.32	MH-GIS-RI_ssMH_2322	995.97	127.4	0.105	8	PVC	0.01	148	39.9	-0.4	
GM-GIS-RI_ssGM_1248	MH-GIS-RI_ssMH_2322	995.97	MH-GIS-RI_ssMH_2320	987.3	88.6	0.098	8	PVC	0.01	150	40.2	-0.4	
GM-GIS-RI_ssGM_1249	MH-GIS-RI_ssMH_2326	1,044.00	MH-GIS-RI_ssMH_2319	1,043.14	102.7	0.008	8	PVC	0.01	116	35.3	-0.4	
GM-GIS-RI_ssGM_1257	MH-GIS-RI_ssMH_2320	987.3	MH-GIS-CR_ssMH_2331	979.07	98.4	0.084	8	PVC	0.01	155	40.9	-0.4	
GM-GIS-RI_ssGM_1264	MH-GIS-RI_ssMH_2329	1,034.10	MH-GIS-RI_ssMH_2327	1,009.32	233.9	0.106	8	PVC	0.01	146	39.7	-0.4	
GM-GIS-RI_ssGM_1265	MH-GIS-RI_ssMH_2567	1,034.71	MH-GIS-RI_ssMH_2329	1,034.10	75	0.008	8	PVC	0.01	26	16.5	-0.6	
GM-GIS-RI_ssGM_1302	MH-GIS-RI_ssMH_2376	1,051.81	MH-GIS-RI_ssMH_2389	1,049.11	213.9	0.013	8	PVC	0.01	2	4.2	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-RI_ssGM_1303	MH-GIS-RI_ssMH_2389	1,049.11	MH-GIS-RI_ssMH_2366	1,048.11	52.9	0.019	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1304	MH-GIS-RI_ssMH_2375	1,029.15	MH-GIS-RI_ssMH_2371	1,019.04	178.5	0.057	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1305	MH-GIS-RI_ssMH_2371	1,019.04	MH-GIS-RI_ssMH_2384	1,014.00	142.3	0.035	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-RI_ssGM_1306	MH-GIS-RI_ssMH_2384	1,014.00	MH-GIS-RI_ssMH_2381	1,010.84	138.8	0.023	8	PVC	0.01	14	12	-0.6	
GM-GIS-RI_ssGM_1307	MH-GIS-RI_ssMH_2377	1,003.28	MH-GIS-RI_ssMH_2378	992.3	95.6	0.115	8	PVC	0.01	40	20.5	-0.5	
GM-GIS-RI_ssGM_1308	MH-GIS-RI_ssMH_2373	1,023.44	MH-GIS-RI_ssMH_2371	1,019.04	85	0.052	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1309	MH-GIS-RI_ssMH_2368	1,044.30	MH-GIS-RI_ssMH_2369	1,017.04	363.5	0.075	8	PVC	0.01	9	9.4	-0.6	
GM-GIS-RI_ssGM_1310	MH-GIS-RI_ssMH_2372	1,028.88	MH-GIS-RI_ssMH_2373	1,023.44	43.3	0.126	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1311	MH-GIS-RI_ssMH_2374	1,040.14	MH-GIS-RI_ssMH_2372	1,028.88	144.1	0.078	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1312	MH-GIS-RI_ssMH_2378	992.3	MH-GIS-RI_ssMH_2380	976.93	128.1	0.12	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-RI_ssGM_1313	MH-GIS-RI_ssMH_2380	976.93	MH-GIS-CR_ssMH_2379	970.91	51.8	0.116	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-RI_ssGM_1314	MH-GIS-RI_ssMH_2381	1,010.84	MH-GIS-RI_ssMH_2390	1,009.47	70.7	0.019	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-RI_ssGM_1315	MH-GIS-RI_ssMH_2390	1,009.47	MH-GIS-RI_ssMH_2377	1,003.28	62.9	0.098	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-RI_ssGM_1316	MH-GIS-RI_ssMH_2382	1,011.10	MH-GIS-RI_ssMH_2370	1,008.28	173.5	0.016	8	PVC	0.01	14	12	-0.6	
GM-GIS-RI_ssGM_1317	MH-GIS-RI_ssMH_2369	1,017.04	MH-GIS-RI_ssMH_2386	1,013.87	37.7	0.084	8	PVC	0.01	11	10.4	-0.6	
GM-GIS-RI_ssGM_1318	MH-GIS-RI_ssMH_2370	1,008.28	MH-GIS-RI_ssMH_2383	1,007.11	182	0.006	8	PVC	0.01	16	12.7	-0.6	
GM-GIS-RI_ssGM_1319	MH-GIS-RI_ssMH_2367	1,046.50	MH-GIS-RI_ssMH_2368	1,044.30	81.4	0.027	8	PVC	0.01	7	8.5	-0.6	
GM-GIS-RI_ssGM_1320	MH-GIS-RI_ssMH_2366	1,048.11	MH-GIS-RI_ssMH_2367	1,046.50	162.4	0.01	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1321	MH-GIS-RI_ssMH_2385	1,019.49	MH-GIS-RI_ssMH_2384	1,014.00	81.2	0.068	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1322	MH-GIS-RI_ssMH_2386	1,013.87	MH-GIS-RI_ssMH_2382	1,011.10	71.9	0.039	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-RI_ssGM_1323	MH-GIS-RI_ssMH_2388	1,027.47	MH-GIS-RI_ssMH_2385	1,019.49	58.3	0.137	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1324	MH-GIS-RI_ssMH_2391	1,000.58	MH-GIS-RI_ssMH_2377	1,003.28	88.8	-0.03	8	PVC	0.01	21	100	2.2	
GM-GIS-RI_ssGM_1325	MH-GIS-RI_ssMH_2383	1,007.11	MH-GIS-RI_ssMH_2387	1,000.16	291.1	0.024	8	PVC	0.01	18	13.4	-0.6	
GM-GIS-RI_ssGM_1326	MH-GIS-RI_ssMH_2387	1,000.16	MH-GIS-RI_ssMH_2391	1,000.58	44.8	-0.009	8	PVC	0.01	19	100	2.6	
GM-GIS-RI_ssGM_1327	MH-GIS-RI_ssMH_2392	1,037.74	MH-GIS-RI_ssMH_2396	1,030.17	175.3	0.043	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1328	MH-GIS-RI_ssMH_2394	1,033.48	MH-GIS-RI_ssMH_2393	1,025.56	221	0.036	8	PVC	0.01	5	7.3	-0.6	
GM-GIS-RI_ssGM_1329	MH-GIS-RI_ssMH_2566	1,032.26	MH-GIS-RI_ssMH_2395	1,034.00	142	-0.012	8	PVC	0.01	2	100	1.1	
GM-GIS-RI_ssGM_1330	MH-GIS-RI_ssMH_2395	1,034.00	MH-GIS-RI_ssMH_2394	1,033.48	43.7	0.012	8	PVC	0.01	4	6	-0.6	
GM-GIS-RI_ssGM_1331	MH-GIS-RI_ssMH_2400	1,039.67	MH-GIS-RI_ssMH_2392	1,037.74	63	0.031	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1332	MH-GIS-RI_ssMH_2399	1,037.54	MH-GIS-RI_ssMH_2392	1,037.74	77.9	-0.003	8	PVC	0.01	2	38.3	-0.4	
GM-GIS-RI_ssGM_1333	MH-GIS-RI_ssMH_2393	1,025.56	MH-GIS-RI_ssMH_2401	1,025.26	79.7	0.004	8	PVC	0.01	7	100	5	
GM-GIS-RI_ssGM_1334	MH-GIS-RI_ssMH_2401	1,025.26	MH-GIS-RI_ssMH_2404	1,026.47	33.5	-0.036	8	PVC	0.01	9	100	6.5	
GM-GIS-RI_ssGM_1335	MH-GIS-RI_ssMH_2397	1,027.19	MH-GIS-RI_ssMH_2567	1,034.71	256.3	-0.029	8	PVC	0.01	25	100	7.1	
GM-GIS-RI_ssGM_1336	MH-GIS-RI_ssMH_2398	1,033.56	MH-GIS-RI_ssMH_2396	1,030.17	81.7	0.042	8	PVC	0.01	2	4.2	-0.6	
GM-GIS-RI_ssGM_1337	MH-GIS-RI_ssMH_2396	1,030.17	MH-GIS-RI_ssMH_2402	1,028.72	62.6	0.023	8	PVC	0.01	9	100	2.4	
GM-GIS-RI_ssGM_1338	MH-GIS-RI_ssMH_2402	1,028.72	MH-GIS-RI_ssMH_2403	1,028.11	119.1	0.005	8	PVC	0.01	21	100	3.8	
GM-GIS-RI_ssGM_1339	MH-GIS-RI_ssMH_2404	1,026.47	MH-GIS-RI_ssMH_2402	1,028.72	84.5	-0.027	8	PVC	0.01	11	100	6.1	
GM-GIS-RI_ssGM_1340	MH-GIS-RI_ssMH_2403	1,028.11	MH-GIS-RI_ssMH_2397	1,027.19	39.3	0.023	8	PVC	0.01	23	100	4.4	
GM-GIS-RW_ssGM_731	MH-GIS-RW_ssMH_1999	416.83	MH-GIS-RW_ssMH_1527	415.93	225.3	0.004	8	Concrete	0.013	9	11.1	-0.6	
GM-GIS-RW_ssGM_757	MH-GIS-RW_ssMH_1506	417.71	MH-IS-97	412.47	183	0.029	8	Concrete	0.013	36	19.2	-0.5	SM4
GM-GIS-RW_ssGM_758	MH-GIS-RW_ssMH_2019	417	MH-GIS-RW_ssMH_2018	416.02	278.1	0.004	8	Glass	0.013	2	6.1	-0.6	
GM-GIS-RW_ssGM_759	MH-GIS-RW_ssMH_2018	416.02	MH-IS-245	410.33	46.7	0.122	8	Concrete	0.013	5	6.9	-0.6	
GM-GIS-RW_ssGM_772	MH-GIS-RW_ssMH_1527	415.93	MH-GIS-RW_ssMH_1526	414.56	342.1	0.004	8	Concrete	0.013	18	15.5	-0.6	
GM-GIS-RW_ssGM_773	MH-GIS-RW_ssMH_1526	414.56	MH-IS-267	409.97	102.7	0.045	8	Concrete	0.013	27	16.6	-0.6	
GM-GIS-RW_ssGM_790	MH-GIS-RW_ssMH_1486	417.09	MH-GIS-RW_ssMH_1485	415.75	164.7	0.008	8	Concrete	0.013	57	24.4	-0.5	
GM-GIS-RW_ssGM_792	MH-GIS-RW_ssMH_1469	414.1	MH-GIS-RW_ssMH_1485	415.75	250.1	-0.007	8	Concrete	0.013	3	100	1.2	SM4
GM-GIS-RW_ssGM_793	MH-GIS-RW_ssMH_1502	416.26	MH-GIS-RW_ssMH_1487	416.66	173.4	-0.002	8	Concrete	0.013	43	100	0.4	
GM-GIS-RW_ssGM_794	MH-GIS-RW_ssMH_1487	416.66	MH-GIS-RW_ssMH_1486	417.09	126.5	-0.003	8	Concrete	0.013	54	100	0	
GM-GIS-RW_ssGM_795	MH-GIS-MH-203	418.22	MH-GIS-RW_ssMH_1487	416.66	220.3	0.007	8	Concrete	0.013	3	6.1	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-RW_ssGM_796	MH-GIS-RW_ssMH_1488	414.61	MH-GIS-RW_ssMH_1487	416.66	419.1	-0.005	8	Concrete	0.013	3	100	2.1	SM4
GM-GIS-RW_ssGM_797	MH-GIS-RW_ssMH_2027	414.03	MH-GIS-RW_ssMH_2028	415.82	340	-0.005	8	Concrete	0.013	13	100	2.7	
GM-GIS-RW_ssGM_798	MH-GIS-RW_ssMH_2028	415.82	MH-GIS-RW_ssMH_1502	416.26	62.1	-0.007	8	Concrete	0.013	30	100	0.9	
GM-GIS-RW_ssGM_799	MH-GIS-RW_ssMH_1500	415.02	MH-GIS-RW_ssMH_1501	415.3	35.3	-0.008	8	PVC	0.01	10	100	1.7	
GM-GIS-RW_ssGM_800	MH-GIS-RW_ssMH_1501	415.3	MH-GIS-RW_ssMH_2028	415.82	127.5	-0.004	8	PVC	0.01	13	100	1.4	
GM-GIS-RW_ssGM_801	MH-GIS-RW_ssMH_1499	414	MH-GIS-RW_ssMH_1500	415.02	153.5	-0.007	8	PVC	0.01	7	100	2.7	
GM-GIS-RW_ssGM_803	MH-GIS-MH-208	415.42	MH-GIS-RW_ssMH_1498	414	352	0.004	8	Glass	0.013	9	11.1	-0.6	
GM-GIS-RW_ssGM_811	MH-GIS-RW_ssMH_2032	419	MH-GIS-RW_ssMH_2033	415.4	230.7	0.016	8	Concrete	0.013	13	11.7	-0.6	
GM-GIS-RW_ssGM_812	MH-GIS-RW_ssMH_2033	415.4	MH-GIS-RW_ssMH_2034	414	87.2	0.016	8	Concrete	0.013	23	15.5	-0.6	
GM-GIS-RW_ssGM_814	MH-GIS-RW_ssMH_2035	417.46	MH-GIS-RW_ssMH_2032	419	228.5	-0.007	8	Concrete	0.013	7	100	1	
GM-GIS-RW_ssGM_815	MH-GIS-MH-153	419	MH-GIS-RW_ssMH_2032	419	123.5	0	8	Concrete	0.013	3	15.9	-0.6	
GM-GIS-RW_ssGM_816	MH-GIS-MH-58	417.61	MH-GIS-RW_ssMH_2035	417.46	39.9	0.004	8	Glass	0.013	3	100	0.8	
GM-GIS-RW_ssGM_873	MH-GIS-RW_ssMH_2085	418.19	MH-GIS-RW_ssMH_2086	416.31	246	0.008	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-RW_ssGM_874	MH-GIS-RW_ssMH_2086	416.31	MH-GIS-RW_ssMH_1502	416.26	83.6	6E-04	8	PVC	0.01	10	100	0.4	
GM-GIS-RW_ssGM_976	MH-GIS-RW_ssMH_2156	415.17	MH-GIS-RW_ssMH_2033	415.4	20.6	-0.011	8	PVC	0.01	7	50.6	-0.3	
GM-GIS-RW_ssGM_977	MH-GIS-RW_ssMH_2157	417.22	MH-GIS-RW_ssMH_2156	415.17	184.2	0.011	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-RW_ssGM_1006	MH-GIS-MH-181	417.73	MH-GIS-RW_ssMH_2085	418.19	154.4	-0.003	8	PVC	0.01	3	80.5	-0.1	
GM-GIS-RW_ssGM_1012	MH-GIS-RW_ssMH_2094	417.87	MH-GIS-RW_ssMH_2095	415.61	328.5	0.007	8	Concrete	0.013	18	13.6	-0.6	
GM-GIS-RW_ssGM_1032	MH-GIS-MH-35	414	MH-IS-1	413.11	23	0.039	8	PVC	0.01	18	13.5	-0.6	
GM-GIS-RW_ssGM_1033	MH-GIS-RW_ssMH_1514	414.67	MH-GIS-MH-35	414	413.4	0.002	8	Concrete	0.013	9	13.8	-0.6	
GM-GIS-RW_ssGM_1103	MH-GIS-MH-15	414.08	MH-GIS-MH-11	414.05	4.5	0.007	8	PVC	0.01	7	100	2.6	
GM-GIS-RW_ssGM_1104	MH-GIS-RW_ssMH_2027	414.03	MH-GIS-MH-11	414.05	2.8	0.007	8	Concrete	0.013	10	100	2.7	
GM-GIS-RW_ssGM_1105	MH-GIS-MH-82	414	MH-GIS-RW_ssMH_1499	414	51.2	0	8	PVC	0.01	3	100	2.7	
GM-GIS-SC_ssGM_124	MH-GIS-SC_ssMH_1387	832.42	MH-GIS-SC_ssMH_1388	826.75	115.7	0.049	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_125	MH-GIS-SC_ssMH_1393	827.52	MH-GIS-SC_ssMH_1414	821.04	88.4	0.073	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_126	MH-GIS-SC_ssMH_1414	821.04	MH-GIS-SC_ssMH_1415	816.57	117.4	0.038	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_127	MH-GIS-SC_ssMH_1415	816.57	MH-GIS-SC_ssMH_1394	817.44	123.6	-0.007	8	PVC	0.01	7	100	2.5	
GM-GIS-SC_ssGM_128	MH-GIS-MH-64	823.45	MH-GIS-SC_ssMH_1413	818.04	42.7	0.127	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_129	MH-GIS-SC_ssMH_1409	837.73	MH-GIS-SC_ssMH_1410	826.59	124.1	0.09	8	PVC	0.01	40	20.4	-0.5	
GM-GIS-SC_ssGM_130	MH-GIS-SC_ssMH_1408	876.06	MH-GIS-SC_ssMH_1385	868.7	62	0.119	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_131	MH-GIS-SC_ssMH_1407	882.65	MH-GIS-SC_ssMH_1408	876.06	62.9	0.105	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_132	MH-GIS-SC_ssMH_1384	888.26	MH-GIS-SC_ssMH_1407	882.65	62.5	0.09	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-SC_ssGM_133	MH-GIS-SC_ssMH_1406	893.38	MH-GIS-SC_ssMH_1384	888.26	61.8	0.083	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_134	MH-GIS-SC_ssMH_1383	900.79	MH-GIS-SC_ssMH_1406	893.38	105	0.071	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_135	MH-GIS-SC_ssMH_1405	844.7	MH-GIS-SC_ssMH_1382	850.2	58.7	0.094	8	PVC	0.01	20	14.3	4.9	
GM-GIS-SC_ssGM_136	MH-GIS-SC_ssMH_1404	853.62	MH-GIS-SC_ssMH_1382	850.2	57.5	0.059	8	PVC	0.01	4	6.7	-0.6	
GM-GIS-SC_ssGM_137	MH-GIS-SC_ssMH_1394	817.44	MH-GIS-SC_ssMH_1401	819.51	60.7	-0.034	8	PVC	0.01	33	100	1.6	
GM-GIS-SC_ssGM_138	MH-GIS-SC_ssMH_1412	821.98	MH-GIS-SC_ssMH_1401	819.51	98.4	0.025	8	PVC	0.01	47	22.1	-0.5	
GM-GIS-SC_ssGM_139	MH-GIS-SC_ssMH_1403	801.9	MH-GIS-SC_ssMH_1386	800.02	89.6	0.021	8	PVC	0.01	87	100	3.5	
GM-GIS-SC_ssGM_140	MH-GIS-SC_ssMH_1402	806.3	MH-GIS-SC_ssMH_1403	801.9	85.7	0.051	8	PVC	0.01	85	29.9	-0.5	
GM-GIS-SC_ssGM_141	MH-GIS-SC_ssMH_1401	819.51	MH-GIS-SC_ssMH_1402	806.3	135.3	0.098	8	PVC	0.01	82	29.5	-0.5	
GM-GIS-SC_ssGM_142	MH-GIS-SC_ssMH_1405	844.7	MH-GIS-SC_ssMH_1400	825.38	130.2	0.148	8	PVC	0.01	22	15.1	-0.6	
GM-GIS-SC_ssGM_143	MH-GIS-SC_ssMH_1400	825.38	MH-GIS-SC_ssMH_1394	817.44	96.3	0.082	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-SC_ssGM_144	MH-GIS-SC_ssMH_1379	808.09	MH-GIS-SC_ssMH_1399	805.62	196.3	0.013	8	PVC	0.01	111	34.5	-0.4	
GM-GIS-SC_ssGM_146	MH-GIS-SC_ssMH_1399	805.62	MH-IS-147	790.4	124.5	0.122	8	PVC	0.01	350	62.6	-0.2	
GM-GIS-SC_ssGM_151	MH-GIS-SC_ssMH_1390	815.09	MH-GIS-SC_ssMH_1391	809	119	0.051	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_152	MH-GIS-SC_ssMH_1391	809	MH-IS-235	798.05	86.9	0.126	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_153	MH-GIS-SC_ssMH_1389	821.1	MH-GIS-SC_ssMH_1390	815.09	101.1	0.059	8	PVC	0.01	7	8.2	-0.6	
GM-GIS-SC_ssGM_154	MH-GIS-SC_ssMH_1388	826.75	MH-GIS-SC_ssMH_1389	821.1	106	0.053	8	PVC	0.01	4	6.7	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-SC_ssGM_155	MH-GIS-SC_ssMH_1411	824	MH-GIS-SC_ssMH_1412	821.98	149.8	0.013	8	PVC	0.01	45	21.5	-0.5	
GM-GIS-SC_ssGM_156	MH-GIS-SC_ssMH_1410	826.59	MH-GIS-SC_ssMH_1411	824	130.1	0.02	8	PVC	0.01	42	20.9	-0.5	
GM-GIS-SC_ssGM_158	MH-GIS-SC_ssMH_1386	800.02	MH-GIS-SC_ssMH_1378	800.92	127.1	-0.007	8	PVC	0.01	89	100	6.3	
GM-GIS-SC_ssGM_159	MH-GIS-SC_ssMH_1385	868.7	MH-GIS-SC_ssMH_1382	850.2	167	0.111	8	PVC	0.01	13	11.7	-0.6	
GM-GIS-SC_ssGM_160	MH-GIS-SC_ssMH_1373	860.98	MH-GIS-SC_ssMH_1404	853.62	158.8	0.046	8	PVC	0.01	2	4.7	-0.6	
GM-GIS-SC_ssGM_162	MH-GIS-SC_ssMH_1378	800.92	MH-GIS-SC_ssMH_1381	806.03	218.6	-0.023	8	PVC	0.01	91	100	6.9	
GM-GIS-SC_ssGM_163	MH-GIS-SC_ssMH_1381	806.03	MH-GIS-SC_ssMH_1380	805.45	127.1	0.005	8	PVC	0.01	94	100	1.8	
GM-GIS-SC_ssGM_164	MH-GIS-SC_ssMH_1380	805.45	MH-GIS-SC_ssMH_1379	808.09	138.7	-0.019	8	PVC	0.01	96	100	2.3	
GM-GIS-SC_ssGM_165	MH-GIS-SC_ssMH_1377	812.62	MH-GIS-SC_ssMH_1379	808.09	137.7	0.033	8	PVC	0.01	13	11.7	-0.6	
GM-GIS-SC_ssGM_166	MH-GIS-SC_ssMH_1376	817.41	MH-GIS-SC_ssMH_1377	812.62	119.1	0.04	8	PVC	0.01	11	10.6	-0.6	
GM-GIS-SC_ssGM_167	MH-GIS-SC_ssMH_1375	823.01	MH-GIS-SC_ssMH_1376	817.41	255.8	0.022	8	PVC	0.01	9	9.5	-0.6	
GM-GIS-SC_ssGM_168	MH-GIS-SC_ssMH_1374	818.18	MH-GIS-SC_ssMH_1375	823.01	220.3	-0.022	8	PVC	0.01	7	100	4.3	
GM-GIS-SC_ssGM_169	MH-GIS-SC_ssMH_1413	818.04	MH-GIS-SC_ssMH_1374	818.18	168.6	-8E-04	8	PVC	0.01	4	100	4.4	
GM-GIS-SF_ssGM_186	MH-GIS-SF_ssMH_2138	441.25	MH-GIS-SF_ssMH_1574	441.02	84.7	0.003	8	Concrete	0.013	93	39.7	-0.4	
GM-GIS-SF_ssGM_187	MH-GIS-SF_ssMH_1574	441.02	MH-GIS-SF_ssMH_1575	438.75	461.7	0.005	8	Concrete	0.013	96	34.3	-0.4	
GM-GIS-SF_ssGM_188	MH-GIS-SF_ssMH_1575	438.75	MH-GIS-SF_ssMH_1576	438.31	233.1	0.002	8	Concrete	0.013	99	44.9	-0.4	
GM-GIS-SF_ssGM_879	MH-GIS-SF_ssMH_1450	417.9	MH-GIS-SF_ssMH_1447	416.32	98.7	0.016	10	Glass	0.013	49	17	-0.7	
GM-GIS-SF_ssGM_880	MH-GIS-SF_ssMH_1449	419.28	MH-GIS-SF_ssMH_1450	417.9	179	0.008	10	Glass	0.013	23	11.6	-0.7	
GM-GIS-SF_ssGM_881	MH-GIS-SF_ssMH_1447	410.46	IPPS Wetwell	400.65	77.2	0.127	14	Glass	0.013	611	40.3	-0.7	
GM-GIS-SF_ssGM_882	MH-GIS-SF_ssMH_2088	429.06	MH-IS-27	424.37	121.1	0.039	8	PVC	0.01	549	78.5	-0.1	
GM-GIS-SF_ssGM_951	MH-GIS-MH-24	428.63	MH-GIS-SF_ssMH_1449	424.58	13.2	0.307	10	Ductile Iron	0.013	3	3.9	-0.8	
GM-GIS-SF_ssGM_952	MH-GIS-MH-202	430.39	MH-GIS-MH-190	429.57	206.8	0.004	8	PVC	0.01	3	5.5	-0.6	
GM-GIS-SF_ssGM_953	MH-GIS-MH-190	429.57	MH-GIS-MH-83	428.92	162.1	0.004	8	PVC	0.01	5	7.6	-0.6	
GM-GIS-SF_ssGM_954	MH-GIS-MH-83	428.92	MH-GIS-MH-84	428.71	51.9	0.004	8	PVC	0.01	8	9.2	-0.6	
GM-GIS-SF_ssGM_955	MH-GIS-MH-134	429.8	MH-GIS-SF_ssMH_2137	429.41	98.6	0.004	8	PVC	0.01	3	5.5	-0.6	
GM-GIS-SF_ssGM_956	MH-GIS-SF_ssMH_2137	429.41	MH-GIS-MH-84	428.71	174.2	0.004	8	PVC	0.01	5	7.6	-0.6	
GM-GIS-SF_ssGM_957	MH-GIS-MH-84	428.71	MH-GIS-SF_ssMH_2136	424.95	169	0.022	8	PVC	0.01	15	12.6	-0.6	
GM-GIS-SF_ssGM_958	MH-GIS-SF_ssMH_2136	424.95	MH-GIS-SF_ssMH_1449	424.28	139	0.005	8	PVC	0.01	18	13.6	-0.6	
GM-GIS-SF_ssGM_959	MH-GIS-SF_ssMH_2149	477.68	MH-GIS-SF_ssMH_2148	476.43	12.3	0.101	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-SF_ssGM_960	MH-GIS-SF_ssMH_2148	476.43	MH-GIS-SF_ssMH_2147	471.41	67	0.075	8	PVC	0.01	36	19.4	-0.5	
GM-GIS-SF_ssGM_961	MH-GIS-SF_ssMH_2147	471.41	MH-GIS-SF_ssMH_2146	461.32	244.6	0.041	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-SF_ssGM_962	MH-GIS-SF_ssMH_2146	461.32	MH-GIS-SF_ssMH_2145	459.29	35.8	0.057	8	PVC	0.01	42	20.8	-0.5	
GM-GIS-SF_ssGM_963	MH-GIS-SF_ssMH_2145	459.29	MH-GIS-SF_ssMH_2141	457.36	36.5	0.053	8	PVC	0.01	44	21.4	-0.5	
GM-GIS-SF_ssGM_964	MH-GIS-SF_ssMH_2141	457.36	MH-GIS-SF_ssMH_2140	451.88	23.7	0.231	8	PVC	0.01	86	30.1	-0.5	
GM-GIS-SF_ssGM_965	MH-GIS-SF_ssMH_2140	451.88	MH-GIS-SF_ssMH_2139	443.69	35.4	0.231	8	Concrete	0.013	88	30.6	-0.5	
GM-GIS-SF_ssGM_966	MH-GIS-SF_ssMH_2139	443.69	MH-GIS-SF_ssMH_2138	441.25	341.2	0.007	8	Concrete	0.013	91	31	-0.5	
GM-GIS-SF_ssGM_967	MH-GIS-SF_ssMH_2144	458.32	MH-GIS-SF_ssMH_2143	458.08	61.3	0.004	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-SF_ssGM_968	MH-GIS-SF_ssMH_2143	458.08	MH-GIS-SF_ssMH_2142	457.95	32.3	0.004	8	PVC	0.01	36	19.4	-0.5	
GM-GIS-SF_ssGM_969	MH-GIS-SF_ssMH_2142	457.95	MH-GIS-SF_ssMH_2141	457.36	108.4	0.005	8	PVC	0.01	39	20.1	-0.5	
GM-GIS-SF_ssGM_1057(1)	MH-GIS-SF_ssMH_1451	419.29	MH-GIS-MH-69	419.11	31.1	0.006	10	Glass	0.013	8	7.2	-0.8	
GM-GIS-SF_ssGM_1057(2)(1)	MH-GIS-MH-69	419.11	MH-GIS-MH-63	418.7	73.7	0.006	10	Glass	0.013	13	9.2	-0.8	
GM-GIS-SF_ssGM_1057(2)(2)(1)	MH-GIS-MH-63	418.7	MH-GIS-MH-67	418.13	99.4	0.006	10	Glass	0.013	18	10.8	-0.7	
GM-GIS-SF_ssGM_1057(2)(2)(2)	MH-GIS-MH-67	418.13	MH-GIS-SF_ssMH_1450	417.9	41.1	0.006	10	Glass	0.013	23	12.1	-0.7	
GM-GIS-SF_ssGM_1058	MH-GIS-SF_ssMH_1452	423.36	MH-GIS-SF_ssMH_1451	423.29	17	0.004	8	Glass	0.013	5	8.5	-0.6	
GM-GIS-SF_ssGM_1059	MH-GIS-MH-66	419	MH-GIS-MH-67	418.13	44.6	0.019	8	Glass	0.013	3	5.1	-0.6	
GM-GIS-SF_ssGM_1060	MH-GIS-MH-68	419.29	MH-GIS-MH-69	419.11	45.6	0.004	8	Glass	0.013	3	6.2	-0.6	
GM-GIS-SF_ssGM_1061	MH-GIS-MH-62	419	MH-GIS-MH-63	418.7	43	0.007	8	Glass	0.013	3	5.4	-0.6	
GM-GIS-SF_ssGM_1062	MH-GIS-SF_ssMH_1452	423.36	MH-GIS-SF_ssMH_2224	423.37	3	0.004	8	Glass	0.013	3	7.2	-0.6	
GM-GIS-SF_ssGM_1065	MH-GIS-MH-94	427.82	MH-IS-27	424.37	61.4	0.056	8	PVC	0.01	3	5.1	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-SF_ssGM_1067	MH-GIS-MH-72	431.47	MH-GIS-SF_ssMH_2088	429.06	47.5	0.051	8	Glass	0.013	3	5.1	-0.6	
GM-GIS-SF_ssGM_1079	MH-GIS-SF_ssMH_1576	438.31	MH-GIS-SF_ssMH_2088	429.06	123.5	0.075	8	Concrete	0.013	544	78.2	-0.1	
GM-GIS-ST_ssGM_425	MH-GIS-MH-183	855.01	MH-GIS-ST_ssMH_1545	857.37	157.3	-0.015	8	PVC	0.01	1	100	7.7	
GM-GIS-ST_ssGM_426	MH-GIS-ST_ssMH_1548	860.52	MH-GIS-ST_ssMH_1546	859	76.6	0.02	8	PVC	0.01	18	100	2.2	
GM-GIS-ST_ssGM_427	MH-GIS-ST_ssMH_1547	856.62	MH-GIS-ST_ssMH_1546	859	136.9	-0.017	8	PVC	0.01	3	100	6.1	
GM-GIS-ST_ssGM_428	MH-GIS-MH-118	855.03	MH-GIS-ST_ssMH_1547	856.62	78.3	-0.02	8	PVC	0.01	1	100	6.9	
GM-GIS-ST_ssGM_429	MH-GIS-ST_ssMH_1546	859	MH-GIS-ST_ssMH_1545	857.37	140.4	0.012	8	PVC	0.01	22	100	3.7	
GM-GIS-ST_ssGM_430	MH-GIS-MH-158	859.17	MH-GIS-ST_ssMH_1545	857.37	129.6	0.014	8	PVC	0.01	1	100	3.5	
GM-GIS-ST_ssGM_431	MH-GIS-ST_ssMH_1545	857.37	MH-GIS-ST_ssMH_1544	859	146	-0.011	8	PVC	0.01	26	100	6.7	
GM-GIS-ST_ssGM_432	MH-GIS-MH-71	857.99	MH-GIS-ST_ssMH_1543	858.72	45	-0.016	8	PVC	0.01	1	100	6.1	
GM-GIS-ST_ssGM_433	MH-GIS-MH-161	854.41	MH-GIS-ST_ssMH_1549	857.28	134.8	-0.021	8	PVC	0.01	1	100	8.2	
GM-GIS-ST_ssGM_434	MH-GIS-ST_ssMH_1549	857.28	MH-GIS-ST_ssMH_1551	859.25	122.2	-0.016	8	PVC	0.01	3	100	5.4	
GM-GIS-ST_ssGM_435	MH-GIS-ST_ssMH_1550	857.16	MH-GIS-ST_ssMH_1551	859.25	176.8	-0.012	8	PVC	0.01	1	100	5.5	
GM-GIS-ST_ssGM_436	MH-GIS-ST_ssMH_1551	859.25	MH-GIS-ST_ssMH_1548	860.52	98.6	-0.013	8	PVC	0.01	5	100	3.5	
GM-GIS-ST_ssGM_437	MH-GIS-ST_ssMH_1556	870.35	MH-GIS-ST_ssMH_1554	865.14	151.1	0.034	8	PVC	0.01	6	8.1	-0.6	
GM-GIS-ST_ssGM_438	MH-GIS-ST_ssMH_1557	873.32	MH-GIS-ST_ssMH_1556	870.35	103.9	0.029	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-ST_ssGM_439	MH-GIS-ST_ssMH_1558	875.23	MH-GIS-ST_ssMH_1557	873.32	103.4	0.018	8	PVC	0.01	4	6.3	-0.6	
GM-GIS-ST_ssGM_440	MH-GIS-ST_ssMH_1560	882.81	MH-GIS-ST_ssMH_1559	877.89	159.8	0.031	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-ST_ssGM_441	MH-GIS-ST_ssMH_1559	877.89	MH-GIS-ST_ssMH_1558	875.23	106.9	0.025	8	PVC	0.01	3	5.1	-0.6	
GM-GIS-ST_ssGM_442	MH-GIS-ST_ssMH_1555	871.37	MH-GIS-ST_ssMH_1554	865.14	264.7	0.024	8	PVC	0.01	1	3.6	-0.6	
GM-GIS-ST_ssGM_443	MH-GIS-ST_ssMH_1548	860.52	MH-GIS-ST_ssMH_1552	861.96	96.3	0.015	8	PVC	0.01	12	100	2.2	
GM-GIS-ST_ssGM_444	MH-GIS-ST_ssMH_1553	864	MH-GIS-ST_ssMH_1552	861.96	112.2	0.018	8	PVC	0.01	10	10.3	-0.6	
GM-GIS-ST_ssGM_445	MH-GIS-ST_ssMH_1554	865.14	MH-GIS-ST_ssMH_1553	864	141.7	0.008	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-ST_ssGM_446	MH-GIS-ST_ssMH_1542	864	MH-GIS-ST_ssMH_1541	863.36	251.8	0.003	8	PVC	0.01	32	100	1.7	
GM-GIS-ST_ssGM_447	MH-GIS-ST_ssMH_1543	858.72	MH-GIS-ST_ssMH_1542	864	63	-0.084	8	PVC	0.01	31	100	6.9	
GM-GIS-ST_ssGM_448	MH-GIS-MH-157	862.37	MH-GIS-ST_ssMH_1544	859	128.5	0.026	8	PVC	0.01	1	100	1.7	
GM-GIS-ST_ssGM_449	MH-GIS-ST_ssMH_1544	859	MH-GIS-ST_ssMH_1543	858.72	178.5	0.002	8	PVC	0.01	28	100	5.1	
GM-GIS-TH_ssGM_145	MH-GIS-MH-205	810.83	MH-GIS-SC_ssMH_1399	805.62	257.5	0.02	8	PVC	0.01	236	51	-0.3	
GM-GIS-TH_ssGM_1341	MH-GIS-TH_ssMH_2410	832.92	MH-GIS-TH_ssMH_2411	845.81	261.2	-0.049	8	PVC	0.01	6	100	12.5	
GM-GIS-TH_ssGM_1342	MH-GIS-TH_ssMH_2409	831.23	MH-GIS-TH_ssMH_2410	832.92	85.5	-0.02	8	PVC	0.01	3	100	7	
GM-GIS-TH_ssGM_1343	MH-GIS-TH_ssMH_2411	845.81	MH-GIS-TH_ssMH_2427	845.8	117.2	9E-05	8	PVC	0.01	49	41.7	-0.4	
GM-GIS-TH_ssGM_1344	MH-GIS-TH_ssMH_2412	847.58	MH-GIS-TH_ssMH_2411	845.81	36.7	0.048	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1345	MH-GIS-TH_ssMH_2414	827.68	MH-GIS-TH_ssMH_2406	822.5	238.3	0.022	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1346	MH-GIS-TH_ssMH_2405	814	MH-GIS-TH_ssMH_2407	814	129.2	0	8	PVC	0.01	3	100	2.8	
GM-GIS-TH_ssGM_1347	MH-GIS-TH_ssMH_2408	818.97	MH-GIS-TH_ssMH_2407	814	237.6	0.021	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1348	MH-GIS-TH_ssMH_2406	822.5	MH-GIS-TH_ssMH_2408	818.97	219.6	0.016	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1349	MH-GIS-TH_ssMH_2415	824	MH-GIS-TH_ssMH_2416	819	239.9	0.021	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1350	MH-GIS-TH_ssMH_2416	819	MH-GIS-TH_ssMH_2417	819	71.4	0	8	PVC	0.01	6	100	3	
GM-GIS-TH_ssGM_1351	MH-GIS-TH_ssMH_2417	819	MH-GIS-TH_ssMH_2418	816.63	84	0.028	8	PVC	0.01	9	100	3	
GM-GIS-TH_ssGM_1352	MH-GIS-TH_ssMH_2407	814	MH-GIS-TH_ssMH_2419	814	171.7	0	8	PVC	0.01	15	100	2.8	
GM-GIS-TH_ssGM_1353	MH-GIS-TH_ssMH_2450	887.77	MH-GIS-TH_ssMH_2449	883.57	209	0.02	8	PVC	0.01	31	17.8	-0.5	
GM-GIS-TH_ssGM_1354	MH-GIS-TH_ssMH_2423	867.07	MH-GIS-TH_ssMH_2424	862.29	356	0.013	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1355	MH-GIS-TH_ssMH_2424	862.29	MH-GIS-TH_ssMH_2444	861.48	53.6	0.015	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1356	MH-GIS-TH_ssMH_2426	851.47	MH-GIS-TH_ssMH_2509	829	339.7	0.066	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1357	MH-GIS-TH_ssMH_2419	814	MH-GIS-TH_ssMH_2420	812.28	95.3	0.018	8	PVC	0.01	18	100	2.8	
GM-GIS-TH_ssGM_1358	MH-GIS-TH_ssMH_2418	816.63	MH-GIS-TH_ssMH_2421	817.85	62.8	-0.019	8	PVC	0.01	43	100	6.5	
GM-GIS-TH_ssGM_1359	MH-GIS-TH_ssMH_2421	817.85	MH-GIS-TH_ssMH_2429	817.77	109.3	7E-04	8	PVC	0.01	46	100	5.3	
GM-GIS-TH_ssGM_1360	MH-GIS-TH_ssMH_2429	817.77	MH-GIS-MH-127	824	199.8	-0.031	8	PVC	0.01	49	100	7.8	
GM-GIS-TH_ssGM_1361	MH-GIS-TH_ssMH_2436	878.25	MH-GIS-MH-122	882.33	165.9	-0.025	8	PVC	0.01	61	100	3.7	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-TH_ssGM_1362	MH-GIS-TH_ssMH_2430	874	MH-GIS-TH_ssMH_2436	878.25	265.8	-0.016	8	PVC	0.01	58	100	8	
GM-GIS-TH_ssGM_1363	MH-GIS-TH_ssMH_2431	874	MH-GIS-TH_ssMH_2430	874	62.3	0	8	PVC	0.01	55	100	5.3	
GM-GIS-TH_ssGM_1364	MH-GIS-TH_ssMH_2448	880.86	MH-GIS-TH_ssMH_2431	874	233.9	0.029	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-TH_ssGM_1365	MH-GIS-TH_ssMH_2433	889.23	MH-GIS-TH_ssMH_2432	883.44	165.9	0.035	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-TH_ssGM_1366	MH-GIS-TH_ssMH_2434	891.21	MH-GIS-TH_ssMH_2433	889.23	60.7	0.033	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1367	MH-GIS-TH_ssMH_2447	852.59	MH-GIS-TH_ssMH_2411	845.81	181.1	0.037	8	PVC	0.01	31	17.8	-0.5	
GM-GIS-TH_ssGM_1368	MH-GIS-TH_ssMH_2451	889	MH-GIS-TH_ssMH_2434	891.21	150.2	-0.015	8	PVC	0.01	6	100	1.6	
GM-GIS-TH_ssGM_1369	MH-GIS-TH_ssMH_2413	851.14	MH-GIS-TH_ssMH_2412	847.58	101	0.035	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1370	MH-GIS-TH_ssMH_2420	812.28	MH-GIS-TH_ssMH_2428	811.46	71	0.012	8	PVC	0.01	22	100	4.5	
GM-GIS-TH_ssGM_1371	MH-GIS-TH_ssMH_2428	811.46	MH-GIS-TH_ssMH_2437	813.12	87.5	-0.019	8	PVC	0.01	25	100	7	
GM-GIS-TH_ssGM_1372	MH-GIS-TH_ssMH_2438	814	MH-GIS-TH_ssMH_2418	816.63	164.2	-0.016	8	PVC	0.01	31	100	8	
GM-GIS-TH_ssGM_1373	MH-GIS-TH_ssMH_2437	813.12	MH-GIS-TH_ssMH_2438	814	71.7	-0.012	8	PVC	0.01	28	100	6.2	
GM-GIS-TH_ssGM_1374	MH-GIS-TH_ssMH_2439	851.96	MH-GIS-TH_ssMH_2413	851.14	87.8	0.009	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1375	MH-GIS-TH_ssMH_2442	862.25	MH-GIS-TH_ssMH_2443	859.08	180.9	0.018	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1376	MH-GIS-TH_ssMH_2441	863.07	MH-GIS-TH_ssMH_2442	862.25	48	0.017	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1377	MH-GIS-TH_ssMH_2440	865.19	MH-GIS-TH_ssMH_2441	863.07	53.8	0.039	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1378	MH-GIS-TH_ssMH_2445	862.69	MH-GIS-TH_ssMH_2444	861.48	101.3	0.012	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1379	MH-GIS-TH_ssMH_2446	866.93	MH-GIS-TH_ssMH_2445	862.69	116.3	0.036	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1380	MH-GIS-TH_ssMH_2444	861.48	MH-GIS-TH_ssMH_2443	859.08	57.1	0.042	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-TH_ssGM_1381	MH-GIS-TH_ssMH_2443	859.08	MH-GIS-TH_ssMH_2447	852.59	148.8	0.044	8	PVC	0.01	28	16.9	-0.6	
GM-GIS-TH_ssGM_1382	MH-GIS-TH_ssMH_2449	883.57	MH-GIS-TH_ssMH_2448	880.86	161	0.017	8	PVC	0.01	34	18.7	-0.5	
GM-GIS-TH_ssGM_1383	MH-GIS-TH_ssMH_2432	883.44	MH-GIS-TH_ssMH_2448	880.86	77.1	0.033	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-TH_ssGM_1384	MH-GIS-MH-102	888.77	MH-GIS-TH_ssMH_2450	887.77	125.1	0.008	8	PVC	0.01	28	16.9	-0.6	
GM-GIS-TH_ssGM_1385	MH-GIS-TH_ssMH_2422	818.06	MH-GIS-MH-107	817.34	113.5	0.006	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1386	MH-GIS-TH_ssMH_2425	853.07	MH-GIS-MH-59	852.02	244.7	0.004	8	PVC	0.01	3	5.8	-0.6	
GM-GIS-TH_ssGM_1387	MH-GIS-TH_ssMH_2435	892.75	MH-GIS-TH_ssMH_2451	889	240.4	0.016	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-TH_ssGM_1388	MH-GIS-TH_ssMH_2427	845.8	MH-GIS-MH-119	845.1	150.8	0.005	8	PVC	0.01	52	23.4	-0.5	
GM-GIS-TH_ssGM_1389	MH-GIS-TH_ssMH_2454	822.12	MH-GIS-TH_ssMH_2452	816.34	144.8	0.04	8	PVC	0.01	224	49.7	-0.3	
GM-GIS-TH_ssGM_1390	MH-GIS-TH_ssMH_2457	829	MH-GIS-TH_ssMH_2453	824	231.3	0.022	8	PVC	0.01	163	42	-0.4	
GM-GIS-TH_ssGM_1391	MH-GIS-TH_ssMH_2452	816.34	MH-GIS-MH-205	810.83	158.4	0.035	8	PVC	0.01	234	50.8	-0.3	
GM-GIS-TH_ssGM_1392	MH-GIS-TH_ssMH_2458	881.69	MH-GIS-TH_ssMH_2465	867.84	238.2	0.058	8	PVC	0.01	68	26.6	-0.5	
GM-GIS-TH_ssGM_1393	MH-GIS-TH_ssMH_2456	863.88	MH-GIS-TH_ssMH_2459	854.04	157.3	0.063	8	PVC	0.01	74	27.8	-0.5	
GM-GIS-TH_ssGM_1394	MH-GIS-MH-107	817.34	MH-GIS-TH_ssMH_2452	816.34	71.8	0.014	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1395	MH-GIS-MH-59	852.02	MH-GIS-TH_ssMH_2464	851.09	39.9	0.023	8	PVC	0.01	6	7.9	-0.6	
GM-GIS-TH_ssGM_1396	MH-GIS-TH_ssMH_2509	829	MH-GIS-TH_ssMH_2457	829	43.6	0	8	PVC	0.01	6	42	-0.4	
GM-GIS-TH_ssGM_1397	MH-GIS-TH_ssMH_2464	851.09	MH-GIS-TH_ssMH_2460	842.8	136.1	0.061	8	PVC	0.01	86	30.2	-0.5	
GM-GIS-TH_ssGM_1398	MH-GIS-MH-119	845.1	MH-GIS-TH_ssMH_2460	842.8	78.7	0.029	8	PVC	0.01	55	24	-0.5	
GM-GIS-TH_ssGM_1399	MH-GIS-MH-127	824	MH-GIS-TH_ssMH_2453	824	85.7	0	8	PVC	0.01	52	100	1.6	
GM-GIS-TH_ssGM_1400	MH-GIS-TH_ssMH_2462	829.3	MH-GIS-TH_ssMH_2457	829	204.4	0.001	8	PVC	0.01	154	54	-0.3	
GM-GIS-TH_ssGM_1401	MH-GIS-TH_ssMH_2463	829	MH-GIS-TH_ssMH_2462	829.3	152	-0.002	8	PVC	0.01	151	100	0.1	
GM-GIS-TH_ssGM_1402	MH-GIS-TH_ssMH_2459	854.04	MH-GIS-TH_ssMH_2464	851.09	49.3	0.06	8	PVC	0.01	77	28.4	-0.5	
GM-GIS-TH_ssGM_1403	MH-GIS-TH_ssMH_2465	867.84	MH-GIS-TH_ssMH_2456	863.88	68.1	0.058	8	PVC	0.01	71	27.2	-0.5	
GM-GIS-TH_ssGM_1404	MH-GIS-MH-122	882.33	MH-GIS-TH_ssMH_2458	881.69	83.1	0.008	8	PVC	0.01	65	26	-0.5	
GM-GIS-TH_ssGM_1405	MH-GIS-TH_ssMH_2466	825.56	MH-GIS-TH_ssMH_2454	822.12	400.2	0.009	8	PVC	0.01	221	49.3	-0.3	
GM-GIS-TH_ssGM_1406	MH-GIS-TH_ssMH_2453	824	MH-GIS-TH_ssMH_2466	825.56	214.6	-0.007	8	PVC	0.01	218	100	1.6	
GM-GIS-TH_ssGM_1407	MH-GIS-TH_ssMH_2460	842.8	MH-GIS-TH_ssMH_2461	837.94	79.3	0.061	8	PVC	0.01	144	39.5	-0.4	
GM-GIS-TH_ssGM_1408	MH-GIS-TH_ssMH_2461	837.94	MH-GIS-TH_ssMH_2463	829	173.6	0.052	8	PVC	0.01	148	39.9	-0.4	
GM-GIS-TH_ssGM_1409	MH-GIS-MH-96	891.26	MH-GIS-TH_ssMH_2467	889.56	60.3	0.028	8	PVC	0.01	18	13.7	-0.6	
GM-GIS-TH_ssGM_1410	MH-GIS-TH_ssMH_2468	886.14	MH-GIS-TH_ssMH_2467	889.56	115.7	-0.03	8	PVC	0.01	3	100	2.9	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-GIS-TH_ssGM_1411	MH-GIS-TH_ssMH_2467	889.56	MH-GIS-MH-102	888.77	65.6	0.012	8	PVC	0.01	25	15.9	-0.6	
GM-GIS-TH_ssGM_1412	MH-GIS-MH-39	899.81	MH-GIS-MH-40	899.01	27.4	0.029	8	PVC	0.01	9	9.6	-0.6	
GM-GIS-TH_ssGM_1413	MH-GIS-TH_ssMH_2508	895.72	MH-GIS-MH-96	891.26	227.1	0.02	8	PVC	0.01	15	12.5	-0.6	
GM-GIS-TH_ssGM_1414	MH-GIS-MH-40	899.01	MH-GIS-TH_ssMH_2508	895.72	166.5	0.02	8	PVC	0.01	12	11.2	-0.6	
GM-GIS-TH_ssGM_1415	MH-GIS-TH_ssMH_2469	899.48	MH-GIS-MH-39	899.81	94.7	-0.003	8	PVC	0.01	6	63.4	-0.2	
GM-GIS-TH_ssGM_1416	MH-GIS-TH_ssMH_2470	900.98	MH-GIS-TH_ssMH_2469	899.48	61.6	0.024	8	PVC	0.01	3	5.6	-0.6	
GM-GIS-WC_ssGM_30	MH-GIS-WC_ssMH_1443	584.4	MH-GIS-WC_ssMH_1444	576.86	105.9	0.071	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-WC_ssGM_31	MH-GIS-WC_ssMH_1430	568.76	MH-GIS-WC_ssMH_1444	576.86	119.6	-0.068	8	PVC	0.01	7	100	9.8	
GM-GIS-WC_ssGM_32	MH-GIS-WC_ssMH_1438	586.92	MH-GIS-WC_ssMH_1443	584.4	113	0.022	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-WC_ssGM_33	MH-GIS-WC_ssMH_1444	576.86	MH-GIS-KR_ssMH_1445	579.09	178.7	-0.012	8	PVC	0.01	12	100	1.7	
GM-GIS-WC_ssGM_37	MH-GIS-MH-152	645.99	MH-GIS-WC_ssMH_1433	638.58	120.9	0.061	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_38	MH-GIS-WC_ssMH_1432	627.41	MH-GIS-WC_ssMH_1434	616.89	337.6	0.031	8	PVC	0.01	3	5.7	-0.6	
GM-GIS-WC_ssGM_39	MH-GIS-WC_ssMH_1433	638.58	MH-GIS-WC_ssMH_1432	627.41	257.8	0.043	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-WC_ssGM_40	MH-GIS-WC_ssMH_1437	570.16	MH-GIS-WC_ssMH_1430	568.76	272.9	0.005	8	PVC	0.01	7	100	3.9	
GM-GIS-WC_ssGM_41	MH-GIS-MH-170	634.14	MH-GIS-WC_ssMH_1446	626.21	147.1	0.054	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_42	MH-GIS-WC_ssMH_1446	626.21	MH-GIS-WC_ssMH_1440	607.87	280.7	0.065	8	PVC	0.01	2	4.1	-0.6	
GM-GIS-WC_ssGM_43	MH-GIS-WC_ssMH_1440	607.87	MH-GIS-WC_ssMH_1438	586.92	304	0.069	8	PVC	0.01	2	5	-0.6	
GM-GIS-WC_ssGM_44	MH-GIS-WC_ssMH_1436	600.59	MH-GIS-WC_ssMH_1437	570.16	340.3	0.089	8	PVC	0.01	6	7.6	-0.6	
GM-GIS-WC_ssGM_45	MH-GIS-WC_ssMH_1435	611.95	MH-GIS-WC_ssMH_1436	600.59	130.7	0.087	8	PVC	0.01	5	7.2	-0.6	
GM-GIS-WC_ssGM_46	MH-GIS-WC_ssMH_1434	616.89	MH-GIS-WC_ssMH_1435	611.95	85.2	0.058	8	PVC	0.01	4	6.5	-0.6	
GM-GIS-WC_ssGM_47	MH-GIS-MH-120	629.37	MH-GIS-WC_ssMH_1432	627.41	79.5	0.025	8	PVC	0.01	1	2.9	-0.6	
GM-GIS-WC_ssGM_108	MH-GIS-WC_ssMH_1561	651.21	MH-IS-107	644.73	77.8	0.083	8	PVC	0.01	1	2.9	-0.6	
GM-IS-2	MH-IS-276	849.3	MH-IS-205	845.9	150.7	0.023	10	PVC	0.01	71	20.6	-0.7	
GM-IS-3	MH-IS-221	840.61	MH-IS-223	839.61	174.8	0.006	10	PVC	0.01	111	25.9	-0.6	
GM-IS-4	MH-IS-201	841.44	MH-IS-221	840.61	69.9	0.012	10	PVC	0.01	110	25.8	-0.6	
GM-IS-5	MH-IS-229	834.38	MH-IS-233	831.11	247	0.013	10	PVC	0.01	115	26.2	-0.6	
GM-IS-6	MH-IS-225	838.58	MH-IS-227	835.69	254.9	0.011	10	PVC	0.01	113	26	-0.6	
GM-IS-7	MH-IS-223	839.61	MH-IS-225	838.58	237.4	0.004	10	PVC	0.01	112	25.9	-0.6	
GM-IS-8	MH-IS-234	862.31	MH-IS-243	858.19	164.3	0.025	10	PVC	0.01	45	16.2	-0.7	
GM-IS-9	MH-IS-227	835.69	MH-IS-229	834.38	95.6	0.014	10	PVC	0.01	114	26.1	-0.6	
GM-IS-10	MH-IS-251	855.2	MH-IS-261	853.85	164.5	0.008	10	PVC	0.01	47	16.5	-0.7	
GM-IS-11	MH-IS-243	858.19	MH-IS-251	855.2	188.2	0.016	10	PVC	0.01	46	16.4	-0.7	
GM-IS-12	MH-IS-269	850.48	MH-IS-276	849.3	264.6	0.004	10	PVC	0.01	48	16.9	-0.7	
GM-IS-13	MH-IS-261	853.85	MH-IS-269	850.48	285.6	0.012	10	PVC	0.01	47	16.7	-0.7	
GM-IS-14	MH-IS-203	843.68	MH-IS-201	841.44	159.9	0.014	10	PVC	0.01	89	23	-0.6	
GM-IS-15	MH-IS-211	869.29	MH-IS-234	862.31	166	0.042	10	PVC	0.01	42	15.8	-0.7	
GM-IS-16	MH-IS-185	875.33	MH-IS-211	869.29	249.3	0.024	10	PVC	0.01	42	15.6	-0.7	
GM-IS-17	MH-IS-146	876.12	MH-IS-185	875.33	147.9	0.005	10	Ductile Iron	0.013	41	16.2	-0.7	
GM-IS-18	MH-IS-18	799.57	MH-IS-235	798.05	144.3	0.011	12	PVC	0.01	70	16.1	-0.8	
GM-IS-19	MH-IS-147	790.4	PSLWW	789.9	57.6	0.009	12	PVC	0.01	439	41.5	-0.6	
GM-IS-20	MH-IS-186	794.7	MH-IS-147	790.4	84.3	0.051	12	PVC	0.01	88	18.1	-0.8	
GM-IS-21	MH-IS-212	795.56	MH-IS-186	794.7	81.7	0.011	12	PVC	0.01	86	17.9	-0.8	
GM-IS-22	MH-IS-235	798.05	MH-IS-212	795.56	92	0.027	12	PVC	0.01	83	17.7	-0.8	
GM-IS-23	MH-IS-3	797.17	MH-IS-117	796.57	128.5	0.005	12	PVC	0.01	7	4.9	-1	
GM-IS-28	MH-IS-187	422.69	MH-IS-213	420.51	310.9	0.007	12	PVC	0.01	556	47	-0.5	
GM-IS-29	MH-IS-27	424.37	MH-IS-187	422.69	270.5	0.006	12	PVC	0.01	554	46.9	-0.5	
GM-IS-30	MH-IS-39	847.91	MH-IS-290	832.16	182.5	0.086	12	PVC	0.01	702	53.1	-0.5	
GM-IS-31	MH-IS-233	831.11	MH-IS-249	830.76	39.8	0.009	10	PVC	0.01	121	27	-0.6	
GM-IS-32	MH-IS-249	830.76	MH-IS-126	830.14	295.5	0.002	10	PVC	0.01	131	32.2	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-33	MH-IS-40	811.95	MH-IS-36	792.15	132.2	0.15	12	PVC	0.01	721	53.8	-0.5	
GM-IS-34	MH-IS-290	832.16	MH-IS-31	830.87	241	0.005	12	PVC	0.01	702	53.1	-0.5	
GM-IS-35	MH-IS-31	830.87	MH-IS-32	829.81	139.4	0.008	12	PVC	0.01	703	53.1	-0.5	
GM-IS-36	MH-IS-32	829.81	MH-IS-33	827.47	336.3	0.007	12	PVC	0.01	704	53.2	-0.5	
GM-IS-37	MH-IS-33	827.47	MH-IS-35	824.02	225.5	0.015	12	PVC	0.01	705	53.2	-0.5	
GM-IS-38	MH-IS-35	824.02	MH-IS-40	811.95	301.4	0.04	12	PVC	0.01	706	53.2	-0.5	
GM-IS-39	MH-IS-36	792.15	MH-IS-37	788.58	65.5	0.054	12	PVC	0.01	722	53.8	-0.5	
GM-IS-40	MH-IS-37	788.58	MH-IS-38	767.46	126.7	0.167	12	PVC	0.01	722	53.9	-0.5	
GM-IS-42	MH-IS-MH-3	801.7	MH-GIS-DH_ssMH_1627	801.8	292	-3E-04	10	PVC	0.01	48	45.7	-0.5	
GM-IS-43	MH-IS-MH-4	873	MH-IS-46	869.81	399.4	0.008	12	PVC	0.01	543	46.4	-0.5	
GM-IS-44	MH-IS-43	861.48	MH-IS-44	849.46	145.7	0.083	12	PVC	0.01	549	46.7	-0.5	
GM-IS-45	MH-IS-44	849.46	MH-IS-39	847.91	70.6	0.022	12	PVC	0.01	550	46.7	-0.5	
GM-IS-46	MH-IS-46	869.81	MH-IS-43	861.48	366.7	0.023	12	PVC	0.01	544	46.4	-0.5	
GM-IS-47(1)	MH-IS-198	779.52	MH-IS-MH-210	778.16	18.4	0.074	10	PVC	0.01	795	71.7	-0.2	
GM-IS-47(2)	MH-IS-MH-210	778.16	MH-IS-195	775.63	34.1	0.074	10	PVC	0.01	798	71.8	-0.2	
GM-IS-48	MH-IS-MH-5	825.27	MH-IS-54	819.68	193.9	0.029	10	PVC	0.01	807	72.2	-0.2	
GM-IS-49	MH-IS-49	804.65	MH-IS-51	801.25	273	0.012	10	PVC	0.01	67	20	-0.7	
GM-IS-50	MH-IS-51	801.25	MH-IS-50	797.44	305.3	0.012	10	PVC	0.01	69	20.2	-0.7	
GM-IS-51	MH-IS-54	819.68	MH-IS-61	800.77	221.8	0.085	10	PVC	0.01	807	72.2	-0.2	
GM-IS-52	MH-IS-50	797.44	MH-IS-198	779.52	269.6	0.066	10	PVC	0.01	73	20.7	-0.7	
GM-IS-53	MH-IS-195	775.63	PSBPWW	775.63	45.7	0	10	PVC	0.01	799	100	0.1	
GM-IS-54	MH-IS-59	828.09	MH-IS-58	819.51	192.3	0.045	10	PVC	0.01	58	18.6	-0.7	
GM-IS-55	MH-IS-53	830.15	MH-IS-59	828.09	188.3	0.011	10	PVC	0.01	57	18.4	-0.7	
GM-IS-56	MH-IS-58	819.51	MH-IS-60	809.95	383.8	0.025	10	PVC	0.01	62	19.2	-0.7	
GM-IS-57	MH-IS-60	809.95	MH-IS-49	804.65	214.5	0.025	10	PVC	0.01	63	19.4	-0.7	
GM-IS-58	MH-IS-64	788.27	MH-IS-65	770.15	350.9	0.052	10	Ductile Iron	0.013	811	72.4	-0.2	
GM-IS-59	MH-IS-63	796.38	MH-IS-64	788.27	45.8	0.177	10	Ductile Iron	0.013	810	72.4	-0.2	
GM-IS-60	MH-IS-61	800.77	MH-IS-62	799.18	294.1	0.005	10	Ductile Iron	0.013	808	100	0.2	
GM-IS-61	MH-IS-65	770.15	MH-IS-116	769.83	183.2	0.002	10	Ductile Iron	0.013	812	100	0.8	
GM-IS-63	MH-IS-62	799.18	MH-IS-63	796.38	321.1	0.009	10	Ductile Iron	0.013	809	72.9	-0.2	
GM-IS-64(1)	MH-IS-152	852.91	MH-IS-BP_ssMH_2512	837.33	197.1	0.079	10	PVC	0.01	49	17	-0.7	
GM-IS-64(2)	MH-IS-BP_ssMH_2512	837.33	MH-IS-67	832.9	282.2	0.016	10	PVC	0.01	51	17.3	-0.7	
GM-IS-66	MH-IS-67	832.9	MH-IS-53	830.15	327.8	0.008	10	PVC	0.01	52	17.5	-0.7	
GM-IS-67	MH-IS-69	876.77	MH-IS-146	876.12	109.3	0.006	10	Ductile Iron	0.013	40	15.6	-0.7	
GM-IS-68	MH-IS-70	866.12	MH-IS-71	858.15	228.3	0.035	10	Ductile Iron	0.013	43	15.8	-0.7	
GM-IS-69	MH-IS-71	858.15	MH-IS-152	852.91	245.9	0.021	10	Ductile Iron	0.013	48	16.8	-0.7	
GM-IS-70	MH-IS-294	409.13	MH-IS-230	408.12	139.2	0.007	12	PVC	0.01	1	75	-0.3	
GM-IS-71	MH-IS-72	415.04	MH-IS-230	408.12	240.6	0.029	15	PVC	0.01	2,027	68.9	-0.4	
GM-IS-72	MH-IS-77	422.01	MH-IS-72	415.04	250	0.028	15	PVC	0.01	2,026	68.9	-0.4	
GM-IS-73	MH-IS-MH-2	408.8	MH-IS-232	406.2	302.4	0.009	36	Concrete	0.013	4,003	31.4	-2.1	
GM-IS-74	MH-IS-230	408.12	MH-IS-MH-2	408.8	32.2	-0.021	24	Concrete	0.013	2,028	88	-0.2	
GM-IS-75	MH-IS-81	438.64	MH-IS-78	430.27	309.1	0.027	15	PVC	0.01	2,024	68.9	-0.4	
GM-IS-76	MH-IS-82	448.73	MH-IS-81	438.64	294.7	0.034	15	PVC	0.01	2,022	68.8	-0.4	
GM-IS-77	MH-IS-76	491.15	MH-IS-75	479.82	294.7	0.038	15	PVC	0.01	2,018	68.8	-0.4	
GM-IS-78	MH-IS-74	465.04	MH-IS-82	448.73	296.4	0.055	15	PVC	0.01	2,019	68.8	-0.4	
GM-IS-79	MH-IS-75	479.82	MH-IS-74	465.04	275	0.054	15	PVC	0.01	2,018	68.8	-0.4	
GM-IS-80	MH-IS-78	430.27	MH-IS-77	422.01	303.5	0.027	15	PVC	0.01	2,025	68.9	-0.4	
GM-IS-81	MH-IS-128	510.28	MH-IS-84	509.54	45.6	0.016	12	PVC	0.01	235	30.1	-0.7	
GM-IS-82	MH-IS-154	499.58	MH-IS-121	498.94	147.4	0.004	12	PVC	0.01	5	21.9	-0.8	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-83	MH-IS-84	509.54	MH-IS-121	498.94	356.1	0.03	15	PVC	0.01	2,010	68.6	-0.4	
GM-IS-84	MH-IS-83	573.01	MH-IS-87	563.08	301	0.033	15	PVC	0.01	1,771	64.3	-0.4	
GM-IS-85	MH-IS-87	563.08	MH-IS-86	543.15	300	0.066	15	PVC	0.01	1,772	64.3	-0.4	
GM-IS-86	MH-IS-86	543.15	MH-IS-85	525.48	251.4	0.07	15	PVC	0.01	1,773	64.3	-0.4	
GM-IS-87	MH-IS-85	525.48	MH-IS-84	509.54	296.7	0.054	15	PVC	0.01	1,774	64.4	-0.4	
GM-IS-88	MH-IS-48	588.13	MH-IS-99	587.49	150.6	0.004	12	PVC	0.01	41	16.2	-0.8	
GM-IS-89	MH-IS-90	583.48	MH-IS-89	577.39	235.4	0.026	15	PVC	0.01	1,757	64	-0.4	
GM-IS-90	MH-IS-99	587.49	MH-IS-90	583.48	306.8	0.013	15	PVC	0.01	1,756	64	-0.4	
GM-IS-91	MH-IS-101	594.05	MH-IS-99	587.49	246	0.027	15	PVC	0.01	1,714	63.2	-0.5	
GM-IS-92	MH-IS-89	577.39	MH-IS-83	573.01	316.6	0.014	15	PVC	0.01	1,771	64.3	-0.4	
GM-IS-93	MH-IS-121	498.94	MH-IS-76	491.15	268.4	0.029	15	PVC	0.01	2,017	68.7	-0.4	
GM-IS-94	MH-IS-112	687.28	MH-IS-111	668.45	304.2	0.062	15	PVC	0.01	1,689	62.7	-0.5	
GM-IS-95	MH-IS-113	708.48	MH-IS-112	687.28	306.5	0.069	15	PVC	0.01	1,688	62.7	-0.5	
GM-IS-96	MH-IS-117	796.57	MH-IS-116	769.83	386.7	0.069	15	PVC	0.01	148	17.8	-1	
GM-IS-97	MH-IS-118	807.25	MH-IS-117	796.57	109.3	0.098	12	PVC	0.01	140	23	-0.8	
GM-IS-98	MH-IS-119	829.53	MH-IS-118	807.25	297.4	0.075	12	PVC	0.01	139	22.9	-0.8	
GM-IS-99	MH-IS-120	850.27	MH-IS-119	829.53	297.3	0.07	12	PVC	0.01	6	4.6	-1	
GM-IS-100	MH-IS-123	863.89	MH-IS-120	850.27	318.5	0.043	12	PVC	0.01	5	4.2	-1	
GM-IS-101	MH-IS-124	870.98	MH-IS-123	863.89	227.3	0.031	12	PVC	0.01	2	3	-1	
GM-IS-102	MH-IS-125	874.79	MH-IS-124	870.98	247.6	0.015	12	PVC	0.01	2	2.5	-1	
GM-IS-103	MH-IS-129	645.79	MH-IS-107	644.73	147.5	0.007	12	PVC	0.01	19	8.4	-0.9	
GM-IS-104	MH-IS-296	797.56	MH-IS-117	796.57	70.4	0.014	12	PVC	0.01	1	1.7	-1	
GM-IS-105	MH-IS-116	769.83	MH-IS-115	750.98	298.9	0.063	15	PVC	0.01	960	46.7	-0.7	
GM-IS-106	MH-IS-291	874.15	MH-IS-125	874.79	46.8	-0.014	12	PVC	0.01	1	67.3	-0.3	
GM-IS-107	MH-IS-111	668.45	MH-IS-108	657.51	300.5	0.036	15	PVC	0.01	1,690	62.8	-0.5	
GM-IS-108	MH-IS-108	657.51	MH-IS-107	644.73	299.4	0.043	15	PVC	0.01	1,691	62.8	-0.5	
GM-IS-109	MH-IS-107	644.73	MH-IS-106	632.04	300.6	0.042	15	PVC	0.01	1,712	63.2	-0.5	
GM-IS-110	MH-IS-106	632.04	MH-IS-105	612.67	299.9	0.065	15	PVC	0.01	1,713	63.2	-0.5	
GM-IS-111	MH-IS-115	750.98	MH-IS-114	728.11	298.5	0.077	15	PVC	0.01	1,687	62.7	-0.5	
GM-IS-112	MH-IS-114	728.11	MH-IS-113	708.48	305.3	0.064	15	PVC	0.01	1,688	62.7	-0.5	
GM-IS-113	MH-IS-126	830.14	MH-IS-119	829.53	121.4	0.005	12	PVC	0.01	132	22.3	-0.8	
GM-IS-114	MH-IS-127	755.09	MH-IS-115	750.98	63.4	0.065	12	PVC	0.01	726	54	-0.5	
GM-IS-115	MH-IS-102	756.47	MH-IS-127	755.09	85.5	0.016	12	PVC	0.01	725	54	-0.5	
GM-IS-116	MH-IS-105	612.67	MH-IS-101	594.05	299.6	0.062	15	PVC	0.01	1,713	63.2	-0.5	
GM-IS-117	MH-IS-214	408.1	MH-IS-188	407.79	51	0.006	10	Concrete	0.013	17	10.2	-0.7	SM4
GM-IS-118	MH-IS-188	407.79	MH-IS-148	404.7	143.4	0.022	10	Concrete	0.013	24	11.8	-0.7	SM4
GM-IS-119	MH-IS-238	409.5	MH-IS-214	408.1	378.8	0.004	10	Concrete	0.013	9	8.8	-0.8	
GM-IS-120	MH-IS-148	404.7	MH-IS-145	404.12	72.9	0.008	10	Concrete	0.013	66	19.8	-0.7	SM4
GM-IS-121	MH-IS-145	404.12	MH-IS-144	403.08	80.2	0.013	10	Concrete	0.013	69	20.2	-0.7	SM4
GM-IS-122	MH-IS-144	403.08	PS2WW	399.5	22.6	0.159	10	Concrete	0.013	78	21.6	-0.7	SM4
GM-IS-124	MH-IS-192	405.19	PS1WW	401	69.8	0.06	18	PVC	0.01	1,971	53.6	-0.7	SM3A
GM-IS-125	MH-IS-242	406.96	MH-IS-218	405.44	302.2	0.005	18	PVC	0.01	1,936	53.1	-0.7	SM3A
GM-IS-126	MH-IS-218	405.44	MH-IS-192	405.19	294	9E-04	18	PVC	0.01	1,945	77.8	-0.3	SM3A
GM-IS-127	MH-IS-248	408.21	MH-IS-242	406.96	304.1	0.004	18	PVC	0.01	1,927	53	-0.7	SM3A
GM-IS-128	MH-IS-245	410.33	MH-IS-238	409.5	339.2	0.002	10	Concrete	0.013	7	8.4	-0.8	
GM-IS-130	MH-IS-162	413.59	MH-IS-156	413.09	173.5	0.003	12	Concrete	0.013	449	51.5	-0.5	
GM-IS-131	MH-IS-278	412.1	MH-IS-271	410.4	374.1	0.005	12	Concrete	0.013	467	46	-0.5	
GM-IS-132	MH-IS-156	413.09	MH-IS-278	412.1	264.7	0.004	12	Concrete	0.013	458	48	-0.5	
GM-IS-134	MH-IS-140	409.52	MH-IS-256	408.25	330.5	0.004	18	PVC	0.01	1,900	52.6	-0.7	SM3A

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-135	MH-IS-256	408.25	MH-IS-248	408.21	330.4	1E-04	18	PVC	0.01	1,909	90.7	-0.1	SM3A
GM-IS-136	MH-IS-MH-6	414.56	MH-IS-267	409.97	156.9	0.029	10	Concrete	0.013	87	22.8	-0.6	
GM-IS-137	MH-IS-134	408.52	MH-IS-193	407.54	156	0.006	10	Concrete	0.013	141	29.1	-0.6	
GM-IS-139	MH-IS-193	407.54	MH-IS-155	406.97	73.7	0.008	10	Concrete	0.013	410	50.9	-0.4	
GM-IS-140	MH-IS-155	406.97	PS3WW	402.5	38.7	0.116	10	Concrete	0.013	414	51.1	-0.4	
GM-IS-141	MH-IS-136	409.7	MH-IS-134	408.52	183.2	0.006	10	Concrete	0.013	134	28.4	-0.6	
GM-IS-142	MH-IS-167	414.72	MH-IS-162	413.59	394.7	0.003	12	Concrete	0.013	440	50.9	-0.5	
GM-IS-143	MH-IS-170	415.38	MH-IS-167	414.72	402.9	0.002	12	Concrete	0.013	431	59.6	-0.4	
GM-IS-144	MH-IS-172	416.48	MH-IS-170	415.38	421.1	0.003	12	Concrete	0.013	422	51	-0.5	SM3B
GM-IS-145	MH-IS-138	409.59	MH-IS-136	409.7	170.6	-6E-04	10	Concrete	0.013	124	65	-0.3	
GM-IS-146	MH-IS-139	410.69	MH-IS-138	409.59	287.4	0.004	10	Concrete	0.013	117	29.7	-0.6	
GM-IS-147	MH-IS-30	415.33	MH-IS-168	415.07	234.8	0.001	12	PVC	0.01	815	87.4	-0.1	SM1A
GM-IS-148	MH-IS-28	415.51	MH-IS-30	415.38	32	0.004	12	PVC	0.01	798	71.8	-0.3	SM1A
GM-IS-149	MH-IS-26	415.99	MH-IS-28	415.52	243.8	0.002	12	PVC	0.01	789	71.6	-0.3	SM1A
GM-IS-150	MH-IS-24	416.67	MH-IS-26	415.99	247.7	0.003	12	PVC	0.01	780	62.6	-0.4	SM1B
GM-IS-151	MH-IS-23	417.17	MH-IS-24	416.67	121	0.004	12	PVC	0.01	753	55.1	-0.4	SM1B
GM-IS-152	MH-IS-21	417.29	MH-IS-23	417.17	10.7	0.011	12	PVC	0.01	744	54.7	-0.5	SM1B
GM-IS-153	MH-IS-19	418.18	MH-IS-21	417.29	400.3	0.002	12	PVC	0.01	735	64.6	-0.4	SM1B
GM-IS-154	MH-IS-14	419.81	MH-IS-19	418.18	399.8	0.004	12	PVC	0.01	726	54	-0.5	SM1C
GM-IS-155	MH-IS-122	420.49	MH-IS-14	419.81	271.6	0.003	12	PVC	0.01	717	61	-0.4	SM1C
GM-IS-156	MH-IS-110	420.69	MH-IS-122	420.49	37.8	0.005	10	PVC	0.01	708	67.6	-0.3	
GM-IS-157	MH-IS-98	421.68	MH-IS-110	420.69	269.9	0.004	10	PVC	0.01	699	74.4	-0.2	
GM-IS-158	MH-IS-80	422.48	MH-IS-98	421.68	122	0.007	10	PVC	0.01	690	66.7	-0.3	
GM-IS-162	MH-IS-213	410.46	MH-GIS-SF_ssMH_1447	410.46	125.9	0	48	Glass	0.013	559	14	-3.4	
GM-IS-166	MH-IS-266	415.38	MH-IS-253	412.61	351	0.008	10	Concrete	0.013	10	7.6	-0.8	
GM-IS-167	MH-IS-253	412.61	MH-IS-137	411.83	356.6	0.002	10	Concrete	0.013	67	25.8	-0.6	
GM-IS-168	MH-IS-260	419.11	MH-IS-259	418.07	388.7	0.003	10	Concrete	0.013	3	5.8	-0.8	
GM-IS-169	MH-IS-259	418.07	MH-SUR-5103	416.7	121.3	0.011	10	Concrete	0.013	7	6.2	-0.8	
GM-IS-170(1)	MH-IS-135	409.66	MH-IS-GS_ssMH_1480	408.77	316.2	0.003	10	Concrete	0.013	90	28.1	-0.6	SM4
GM-IS-171	MH-IS-237	410.7	MH-IS-135	409.66	244	0.004	10	Concrete	0.013	80	24	-0.6	
GM-IS-172	MH-IS-137	411.83	MH-IS-237	410.7	353.6	0.003	10	Concrete	0.013	77	25.1	-0.6	SM4
GM-IS-174	MH-IS-0	414.12	MH-IS-253	412.61	403.5	0.004	10	Concrete	0.013	54	20.2	-0.7	
GM-IS-175	MH-IS-257	414.64	MH-IS-0	414.12	186.8	0.003	10	Concrete	0.013	50	20.9	-0.7	
GM-IS-185	MH-IS-274	415.08	MH-IS-266	415.38	300.2	-1E-03	10	Concrete	0.013	3	46.5	-0.4	
GM-IS-187(1)	MH-SUR-5103	416.7	MH-SUR-5001	414.95	586.6	0.003	10	Concrete	0.013	10	9.5	-0.8	
GM-IS-187(2)	MH-SUR-5001	414.95	MH-IS-257	414.64	53.7	0.006	10	Concrete	0.013	13	9.3	-0.8	
GM-IS-191	MH-IS-232	406.2	KCPSWW	405.5	50.1	0.014	36	Concrete	0.013	4,004	31.4	-2.1	
GM-IS-192	MH-IS-168	414.99	MH-IS-166	414.65	213.7	0.002	12	PVC	0.01	824	78.5	-0.2	
GM-IS-193	MH-IS-166	414.65	MH-IS-161	413.96	200.6	0.003	12	PVC	0.01	833	60.7	-0.4	
GM-IS-194	MH-IS-161	413.96	MH-IS-1	413.11	256.6	0.003	12	PVC	0.01	842	61.9	-0.4	
GM-IS-198	MH-IS-132	430.98	MH-IS-57	425.87	109.1	0.047	10	PVC	0.01	321	44.7	-0.5	
GM-IS-199	MH-IS-4	435.34	MH-IS-132	430.98	200.3	0.022	10	PVC	0.01	316	44.3	-0.5	
GM-IS-200	MH-IS-5	436.69	MH-IS-4	435.34	150.2	0.009	10	PVC	0.01	307	43.7	-0.5	
GM-IS-201	MH-IS-6	446.59	MH-IS-5	436.69	299.9	0.033	10	PVC	0.01	298	43	-0.5	
GM-IS-202	MH-IS-7	454.62	MH-IS-6	446.59	271.1	0.03	10	PVC	0.01	289	42.4	-0.5	
GM-IS-203	MH-IS-8	461.15	MH-IS-7	454.62	331.7	0.02	10	PVC	0.01	281	41.7	-0.5	
GM-IS-204	MH-IS-9	462.21	MH-IS-8	461.15	263.7	0.004	10	Ductile Iron	0.013	272	46.2	-0.4	
GM-IS-205	MH-IS-10	462.79	MH-IS-9	462.21	184.3	0.003	10	Ductile Iron	0.013	263	48.6	-0.4	
GM-IS-206	MH-IS-11	463.53	MH-IS-10	462.79	260.7	0.003	10	Ductile Iron	0.013	255	49.2	-0.4	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-IS-207	MH-IS-12	464.55	MH-IS-11	463.53	301.3	0.003	10	PVC	0.01	246	39.6	-0.5	
GM-IS-208	MH-IS-13	465.69	MH-IS-12	464.55	286.9	0.004	10	PVC	0.01	237	38.2	-0.5	
GM-IS-209	MH-IS-16	465.97	MH-IS-13	465.69	190.1	0.001	10	Ductile Iron	0.013	228	56.4	-0.4	
GM-IS-302	MH-IS-205	845.9	MH-IS-203	843.68	158.3	0.014	10	PVC	0.01	79	21.7	-0.7	
GM-IS-306	MH-IS-38	767.46	MH-IS-102	756.47	256.2	0.043	12	PVC	0.01	724	53.9	-0.5	
GM-IS-500	MH-IS-1	413.11	MH-IS-96	412.74	165.9	0.002	12	PVC	0.01	869	72.9	-0.3	
GM-IS-501	MH-IS-96	412.74	MH-IS-95	411.63	253.7	0.004	12	PVC	0.01	914	60.9	-0.4	
GM-IS-502	MH-IS-95	411.63	MH-IS-94	411.22	254.7	0.002	15	PVC	0.01	923	56.4	-0.5	
GM-IS-503	MH-IS-94	411.22	MH-IS-93	410.62	358.1	0.002	15	PVC	0.01	985	57.9	-0.5	
GM-IS-504	MH-IS-93	410.62	MH-IS-92	409.88	276.6	0.003	15	PVC	0.01	1,229	57.8	-0.5	
GM-IS-505	MH-IS-92	409.88	MH-IS-140	409.52	236.8	0.002	18	PVC	0.01	1,361	54	-0.7	
GM-IS-506	MH-IS-267	409.97	MH-IS-92	409.88	18	0.005	15	PVC	0.01	123	57.8	-0.5	
GM-IS-507	MH-IS-97	412.47	MH-IS-94	411.22	158.6	0.008	10	Concrete	0.013	54	17.8	-0.7	SM4
GM-IS-508	MH-IS-275	417.67	MH-IS-97	412.47	203.5	0.026	10	Concrete	0.013	9	7.2	-0.8	
GM-IS-509(1)	MH-GIS-DT_ssMH_2513	414.27	MH-IS-277	413.81	32.9	0.014	10	Concrete	0.013	9	7.2	-0.8	
GM-RD-SSGM-CO-6	GM-RD-MH-7	902.6	MH-GIS-NJ_ssMH_2565	895.08	195.7	0.038	12		0.013	159	24.5	-0.8	
GM-RD-SSGM-CO-7	GM-RD-MH-8	909.76	GM-RD-MH-7	902.6	223	0.032	12		0.013	157	24.4	-0.8	
GM-RD-SSGM-CO-8	GM-RD-MH-9	910.89	GM-RD-MH-8	909.76	54.1	0.021	12		0.013	133	22.5	-0.8	
GM-RD-SSGM-CO-9	GM-RD-MH-10	920.14	GM-RD-MH-9	910.89	217.2	0.043	12		0.013	132	22.3	-0.8	
GM-RD-SSGM-CO-10	GM-RD-MH-11	928.71	GM-RD-MH-10	920.14	99.4	0.086	12		0.013	130	22.2	-0.8	
GM-RD-SSGM-CO-11	GM-RD-MH-11	928.71	GM-RD-MH-12	955.39	204.3	0.131	12		0.013	83	17.6	25.9	
GM-RD-SSGM-CO-12	GM-RD-MH-12	955.39	GM-RD-MH-13	973.11	125.1	0.142	12		0.013	81	17.4	16.9	
GM-RD-SSGM-CO-13	GM-RD-MH-13	973.11	GM-RD-MH-14	980.3	57.9	0.124	12		0.013	30	10.5	6.3	
GM-RD-SSGM-CO-14	GM-RD-MH-14	980.3	GM-RD-MH-15	1,011.97	230.2	0.138	12		0.013	28	10.2	30.8	
GM-RD-SSGM-CO-15	GM-RD-MH-15	1,011.97	GM-RD-MH-16	1,025.99	104.2	0.135	12		0.013	26	9.8	13.1	
GM-RD-SSGM-CO-16	GM-RD-MH-16	1,025.99	GM-RD-MH-17	1,043.99	150	0.12	12		0.013	25	9.5	17.1	
GM-RD-SSGM-CO-17	GM-RD-MH-17	1,043.99	GM-RD-MH-18	1,053.31	89.7	0.104	12		0.013	23	9.1	8.4	
GM-RD-SSGM-CO-18	GM-RD-MH-18	1,053.31	GM-RD-MH-19	1,065.28	121.3	0.099	12		0.013	21	8.8	11.1	
GM-RD-SSGM-CO-19	GM-RD-MH-19	1,065.28	GM-RD-MH-20	1,090.77	317.5	0.08	12		0.013	9	5.7	24.5	
GM-RD-SSGM-CO-20	GM-RD-MH-20	1,090.77	GM-RD-MH-21	1,092.07	86.3	0.015	8		0.013	7	8.5	0.7	
GM-RD-SSGM-CO-21	GM-RD-MH-21	1,092.07	GM-RD-MH-22	1,106.43	133.2	0.108	8		0.013	5	7.3	13.7	
GM-RD-SSGM-CO-22	GM-RD-MH-22	1,106.43	GM-RD-MH-23	1,119.30	193.9	0.066	8		0.013	4	6	12.2	
GM-RD-SSGM-CO-23	GM-RD-MH-23	1,119.30	GM-RD-MH-24	1,128.16	217.4	0.041	8		0.013	2	4.2	8.2	
GM-RD-SSGM-CO-24	GM-RD-MH-25	1,128.84	GM-RD-MH-26	1,126.66	170	0.013	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-25	GM-RD-MH-26	1,126.66	GM-RD-MH-27	1,115.27	187.2	0.061	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-26	GM-RD-MH-27	1,115.27	GM-RD-MH-28	1,044.72	264.2	0.267	8		0.013	7	8.5	-0.6	
GM-RD-SSGM-CO-27	GM-RD-MH-28	1,044.72	GM-RD-MH-29	1,026.74	124.6	0.144	8		0.013	9	9.4	-0.6	
GM-RD-SSGM-CO-28	GM-RD-MH-29	1,026.74	GM-RD-MH-30	1,018.26	68.8	0.123	8		0.013	11	10.4	-0.6	
GM-RD-SSGM-CO-29	GM-RD-MH-30	1,018.26	GM-RD-MH-31	1,006.12	259	0.047	8		0.013	14	12	-0.6	
GM-RD-SSGM-CO-30	GM-RD-MH-31	1,006.12	GM-RD-MH-32	999.84	80.1	0.078	8		0.013	39	20	-0.5	
GM-RD-SSGM-CO-31	GM-RD-MH-32	999.84	GM-RD-MH-33	994	75	0.078	8		0.013	40	20.5	-0.5	
GM-RD-SSGM-CO-32	GM-RD-MH-33	994	GM-RD-MH-34	989	71.9	0.07	8		0.013	42	20.9	-0.5	
GM-RD-SSGM-CO-33	GM-RD-MH-34	989	GM-RD-MH-35	983.13	219.9	0.027	8		0.013	44	21.4	-0.5	
GM-RD-SSGM-CO-34	GM-RD-MH-35	983.13	GM-RD-MH-36	979.25	64.8	0.06	8		0.013	46	21.8	-0.5	
GM-RD-SSGM-CO-35	GM-RD-MH-36	979.25	GM-RD-MH-37	973.65	81.8	0.068	8		0.013	47	22.2	-0.5	
GM-RD-SSGM-CO-36	GM-RD-MH-37	973.65	GM-RD-MH-13	973.11	55.4	0.01	8		0.013	49	22.6	-0.5	
GM-RD-SSGM-CO-37	GM-RD-MH-38	1,018.43	GM-RD-MH-30	1,018.26	88.7	0.002	8		0.013	2	6.1	-0.6	
GM-RD-SSGM-CO-38	GM-RD-MH-39	1,073.12	GM-RD-MH-40	1,069.72	58.7	0.058	8		0.013	2	4.2	-0.6	
GM-RD-SSGM-CO-39	GM-RD-MH-40	1,069.72	GM-RD-MH-41	1,067.73	67.4	0.03	8		0.013	4	6	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-RD-SSGM-CO-40	GM-RD-MH-41	1,067.73	GM-RD-MH-42	1,064.52	194.6	0.016	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-41	GM-RD-MH-42	1,064.52	GM-RD-MH-43	1,045.23	230.8	0.084	8		0.013	16	12.7	-0.6	
GM-RD-SSGM-CO-42	GM-RD-MH-43	1,045.23	GM-RD-MH-44	1,036.63	67.3	0.128	8		0.013	18	13.4	-0.6	
GM-RD-SSGM-CO-43	GM-RD-MH-44	1,036.63	GM-RD-MH-45	1,025.54	81.4	0.136	8		0.013	19	14.1	-0.6	
GM-RD-SSGM-CO-44	GM-RD-MH-45	1,025.54	GM-RD-MH-46	1,015.06	80.5	0.13	8		0.013	21	14.7	-0.6	
GM-RD-SSGM-CO-45	GM-RD-MH-46	1,015.06	GM-RD-MH-31	1,006.12	139.9	0.064	8		0.013	23	15.3	-0.6	
GM-RD-SSGM-CO-46	GM-RD-MH-47	1,109.18	GM-RD-MH-48	1,098.20	120	0.091	8		0.013	2	4.2	-0.6	
GM-RD-SSGM-CO-47	GM-RD-MH-48	1,098.20	GM-RD-MH-49	1,084.11	175.3	0.08	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-48	GM-RD-MH-49	1,084.11	GM-RD-MH-50	1,072.16	112.2	0.107	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-49	GM-RD-MH-50	1,072.16	GM-RD-MH-51	1,067.51	71.6	0.065	8		0.013	7	8.5	-0.6	
GM-RD-SSGM-CO-50	GM-RD-MH-51	1,067.51	GM-RD-MH-42	1,064.52	83.4	0.036	8		0.013	9	9.4	-0.6	
GM-RD-SSGM-CO-51	GM-RD-MH-11	928.71	GM-RD-MH-52	932.05	49.2	0.068	12		0.013	46	13	2.5	
GM-RD-SSGM-CO-52	GM-RD-MH-52	932.05	GM-RD-MH-53	942.75	83.4	0.128	8		0.013	44	21.4	10.2	
GM-RD-SSGM-CO-53	GM-RD-MH-53	942.75	GM-RD-MH-54	941.38	109.6	-0.013	8		0.013	42	100	-0.4	
GM-RD-SSGM-CO-54	GM-RD-MH-54	941.38	GM-RD-MH-55	945.93	125.1	0.036	8		0.013	40	20.5	4	
GM-RD-SSGM-CO-55	GM-RD-MH-55	945.93	GM-RD-MH-56	951.31	95.3	0.056	8		0.013	39	20	4.8	
GM-RD-SSGM-CO-56	GM-RD-MH-56	951.31	GM-RD-MH-57	951.46	124.2	0.001	8		0.013	37	30	-0.3	
GM-RD-SSGM-CO-57	GM-RD-MH-57	951.46	GM-RD-MH-58	954.56	111.1	0.028	8		0.013	35	19	2.6	
GM-RD-SSGM-CO-58	GM-RD-MH-58	954.56	GM-RD-MH-59	955.5	50	0.019	8		0.013	33	18.6	0.4	
GM-RD-SSGM-CO-59	GM-RD-MH-59	955.5	GM-RD-MH-60	956.79	162.2	0.008	8		0.013	32	18.1	0.7	
GM-RD-SSGM-CO-60	GM-RD-MH-60	956.79	GM-RD-MH-61	956.83	60.7	7E-04	8		0.013	30	29.3	-0.4	
GM-RD-SSGM-CO-61	GM-RD-MH-61	956.83	GM-RD-MH-62	959.5	45.9	0.058	8		0.013	28	17	2.1	
GM-RD-SSGM-CO-62	GM-RD-MH-62	959.5	GM-RD-MH-63	965.81	54	0.117	8		0.013	26	16.5	5.8	
GM-RD-SSGM-CO-63	GM-RD-MH-63	965.81	GM-RD-MH-64	974.99	51	0.18	8		0.013	25	15.9	8.6	
GM-RD-SSGM-CO-64	GM-RD-MH-64	974.99	GM-RD-MH-65	980.22	31.5	0.166	8		0.013	23	15.3	4.7	
GM-RD-SSGM-CO-65	GM-RD-MH-65	980.22	GM-RD-MH-66	984.57	48.7	0.089	8		0.013	5	7.3	3.7	
GM-RD-SSGM-CO-66	GM-RD-MH-66	984.57	GM-RD-MH-67	985.09	49	0.011	8		0.013	4	6	-0.1	
GM-RD-SSGM-CO-67	GM-RD-MH-67	985.09	GM-RD-MH-68	986.37	112.9	0.011	8		0.013	2	4.2	0.6	
GM-RD-SSGM-CO-68	GM-RD-MH-65	980.22	GM-RD-MH-69	983.64	29.6	0.116	8		0.013	16	12.7	2.8	
GM-RD-SSGM-CO-69	GM-RD-MH-69	983.64	GM-RD-MH-70	996.1	49.5	0.252	8		0.013	14	12	11.9	
GM-RD-SSGM-CO-70	GM-RD-MH-70	996.1	GM-RD-MH-71	1,022.88	97.9	0.273	8		0.013	12	11.2	26.2	
GM-RD-SSGM-CO-71	GM-RD-MH-71	1,022.88	GM-RD-MH-72	1,021.26	29.9	-0.054	8		0.013	5	100	-0.6	
GM-RD-SSGM-CO-72	GM-RD-MH-72	1,021.26	GM-RD-MH-73	1,021.56	157.3	0.002	8		0.013	4	100	1	
GM-RD-SSGM-CO-73	GM-RD-MH-73	1,021.56	GM-RD-MH-74	1,021.12	97.7	-0.005	8		0.013	2	100	0.7	
GM-RD-SSGM-CO-74	GM-RD-MH-71	1,022.88	GM-RD-MH-75	1,020.90	83.5	-0.024	8		0.013	5	100	-0.6	
GM-RD-SSGM-CO-75	GM-RD-MH-75	1,020.90	GM-RD-MH-76	1,026.26	80.9	0.066	8		0.013	4	6	4.7	
GM-RD-SSGM-CO-76	GM-RD-MH-76	1,026.26	GM-RD-MH-77	1,030.33	30.7	0.133	8		0.013	2	4.2	3.4	
GM-RD-SSGM-CO-77	GM-RD-MH-19	1,065.28	GM-RD-MH-78	1,067.51	67.3	0.033	12		0.013	11	6.2	1.3	
GM-RD-SSGM-CO-78	GM-RD-MH-78	1,067.51	GM-RD-MH-79	1,071.77	88.8	0.048	12		0.013	9	5.7	3.3	
GM-RD-SSGM-CO-79	GM-RD-MH-79	1,071.77	GM-RD-MH-80	1,088.22	247.9	0.066	12		0.013	7	5.1	15.5	
GM-RD-SSGM-CO-80	GM-RD-MH-80	1,088.22	GM-RD-MH-81	1,097.92	142	0.068	12		0.013	5	4.4	8.7	
GM-RD-SSGM-CO-81	MH-GIS-EP_ssMH_2584	1,074.61	GM-RD-MH-82	1,079.02	76.1	0.058	12		0.013	14	7.2	3.5	
GM-RD-SSGM-CO-82	GM-RD-MH-82	1,079.02	GM-RD-MH-83	1,085.84	121	0.056	12		0.013	12	6.7	5.9	
GM-RD-SSGM-CO-83	GM-RD-MH-83	1,085.84	GM-RD-MH-84	1,093.77	148	0.054	12		0.013	11	6.2	7	
GM-RD-SSGM-CO-84	GM-RD-MH-84	1,093.77	GM-RD-MH-85	1,102.24	156.9	0.054	12		0.013	9	5.7	7.5	
GM-RD-SSGM-CO-85	GM-RD-MH-85	1,102.24	GM-RD-MH-86	1,106.41	149.2	0.028	12		0.013	7	5.1	3.2	
GM-RD-SSGM-CO-86	GM-RD-MH-86	1,106.41	GM-RD-MH-87	1,108.92	95.6	0.026	8		0.013	5	7.3	1.9	
GM-RD-SSGM-CO-87	GM-RD-MH-87	1,108.92	GM-RD-MH-88	1,109.78	86.5	0.01	8		0.013	4	6	0.2	
GM-RD-SSGM-CO-88	GM-RD-MH-88	1,109.78	GM-RD-MH-89	1,109.94	125.1	0.001	8		0.013	2	6.8	-0.5	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Pipe Capacity Table

Label	Upstream Node	Upstream Invert Elevation (ft)	Downstream Node	Downstream Invert Elevation (ft)	Length (ft)	Slope (%)	Diameter (in)	Material	Manning's n	Flow (gpm)	Percent Full (%)	Upstream Flow Depth Above Crown (ft)	CIP No.
GM-RD-SSGM-CO-89	MH-GIS-MH-197	1,071.22	GM-RD-MH-90	1,081.74	199.5	0.053	8		0.013	7	8.5	9.9	
GM-RD-SSGM-CO-90	GM-RD-MH-90	1,081.74	GM-RD-MH-91	1,096.59	307.4	0.048	8		0.013	5	7.3	14.2	
GM-RD-SSGM-CO-91	GM-RD-MH-91	1,096.59	GM-RD-MH-92	1,102.46	128.9	0.046	8		0.013	4	6	5.2	
GM-RD-SSGM-CO-92	GM-RD-MH-92	1,102.46	GM-RD-MH-93	1,108.54	143.4	0.042	8		0.013	2	4.2	5.4	
GM-RD-SSGM-CO-93	GM-RD-MH-94	1,108.82	MH-GIS-MH-99	1,100.90	141.1	0.056	8		0.013	7	8.5	-0.6	
GM-RD-SSGM-CO-94	GM-RD-MH-95	1,118.63	GM-RD-MH-94	1,108.82	155.1	0.063	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-95	GM-RD-MH-96	1,123.41	GM-RD-MH-95	1,118.63	101.1	0.047	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-96	GM-RD-MH-97	1,128.94	GM-RD-MH-96	1,123.41	140.5	0.039	8		0.013	2	4.2	-0.6	
GM-RD-SSGM-CO-97	GM-RD-MH-99	978.38	GM-RD-MH-98	985.89	85.6	0.088	8		0.013	1	3.1	6.9	
GM-RD-SSGM-CO-98	GM-RD-MH-100	977.51	GM-RD-MH-99	978.38	95.9	0.009	8		0.013	2	4.4	0.2	
GM-RD-SSGM-CO-99	GM-RD-MH-101	971.18	GM-RD-MH-100	977.51	141.5	0.045	8		0.013	3	5.4	5.7	
GM-RD-SSGM-CO-100	GM-RD-MH-102	968.37	GM-RD-MH-101	971.18	122.5	0.023	8		0.013	4	6.3	2.2	
GM-RD-SSGM-CO-101	GM-RD-MH-103	965.89	GM-RD-MH-102	968.37	138.9	0.018	8		0.013	5	100	2.6	
GM-RD-SSGM-CO-102	GM-RD-MH-104	969.05	GM-RD-MH-103	965.89	103.3	-0.031	8		0.013	6	100	-0.5	
GM-RD-SSGM-CO-103	GM-RD-MH-105	962.62	GM-RD-MH-104	969.05	193.1	0.033	8		0.013	7	8.2	5.8	
GM-RD-SSGM-CO-104	GM-RD-MH-106	958.2	GM-RD-MH-105	962.62	161.8	0.027	8		0.013	8	8.8	3.8	
GM-RD-SSGM-CO-105	GM-RD-MH-107	961.88	GM-RD-MH-106	958.2	108.8	-0.034	8		0.013	9	100	-0.5	
GM-RD-SSGM-CO-106	GM-RD-MH-108	962.13	GM-RD-MH-107	961.88	36.4	0.007	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-107	GM-RD-MH-109	965.58	GM-RD-MH-108	962.13	43.9	0.079	8		0.013	4	6.3	-0.6	
GM-RD-SSGM-CO-108	GM-RD-MH-110	975.13	GM-RD-MH-109	965.58	64	0.149	8		0.013	3	5.4	-0.6	
GM-RD-SSGM-CO-109	GM-RD-MH-111	977.36	GM-RD-MH-110	975.13	149.8	0.015	8		0.013	2	4.4	-0.6	
GM-RD-SSGM-CO-110	GM-RD-MH-112	977.65	GM-RD-MH-111	977.36	81.3	0.004	8		0.013	1	4	-0.6	
GM-RD-SSGM-CO-113	GM-RD-MH-107	961.88	Hospital PS-WW	958	13.6	0.284	8		0.013	14	12.1	-0.6	
GM-RD-SSGM-CO-114	GM-RD-MH-113	884	PSS12A-WW	871.69	17.5	0.704	8		0.013	20	14.3	-0.6	
GM-RD-SSGM-CO-115	GM-RD-MH-114	884.05	GM-RD-MH-113	884	37.5	0.001	8		0.013	18	20.3	-0.5	
GM-RD-SSGM-CO-116	GM-RD-MH-115	884.22	GM-RD-MH-114	884.05	131.6	0.001	8		0.013	16	19.6	-0.5	
GM-RD-SSGM-CO-117	GM-RD-MH-116	884.37	GM-RD-MH-115	884.22	121.1	0.001	8		0.013	14	18.5	-0.5	
GM-RD-SSGM-CO-118	GM-RD-MH-117	884.76	GM-RD-MH-116	884.37	97.6	0.004	8		0.013	13	13.1	-0.6	
GM-RD-SSGM-CO-119	GM-RD-MH-118	886.88	GM-RD-MH-117	884.76	146.4	0.014	8		0.013	11	10.5	-0.6	
GM-RD-SSGM-CO-120	GM-RD-MH-119	888.51	GM-RD-MH-118	886.88	176.8	0.009	8		0.013	9	9.6	-0.6	
GM-RD-SSGM-CO-121	GM-RD-MH-120	890.76	GM-RD-MH-119	888.51	178.6	0.013	8		0.013	7	8.6	-0.6	
GM-RD-SSGM-CO-122	GM-RD-MH-121	891.95	GM-RD-MH-120	890.76	79.1	0.015	8		0.013	5	7.4	-0.6	
GM-RD-SSGM-CO-123	GM-RD-MH-122	892.48	GM-RD-MH-121	891.95	164.2	0.003	8		0.013	4	7.6	-0.6	
GM-RD-SSGM-CO-124	GM-RD-MH-123	892.86	GM-RD-MH-122	892.48	116.5	0.003	8		0.013	2	5.5	-0.6	
GM-RD-SSGM-CO-125	GM-RD-MH-8	909.76	GM-RD-MH-124	905.29	53.2	-0.084	8		0.013	22	100	-0.4	
GM-RD-SSGM-CO-127	GM-RD-MH-25	1,128.84	GM-RD-MH-125	1,134.00	185.7	0.028	8		0.013	2	4.2	4.5	
GM-RD-SSGM-CO-128	GM-RD-MH-81	1,097.92	GM-RD-MH-126	1,114.04	236.1	0.068	12		0.013	4	3.6	15.2	
GM-RD-SSGM-CO-129	GM-RD-MH-126	1,114.04	GM-RD-MH-127	1,130.57	225.3	0.073	12		0.013	2	2.5	15.6	
GM-RD-SSGM-CO-130	GM-RD-MH-128	1,124.84	MH-GIS-MH-75	1,110.99	148.4	0.093	8		0.013	5	7.3	-0.6	
GM-RD-SSGM-CO-131	GM-RD-MH-129	1,134.00	GM-RD-MH-128	1,124.84	196.7	0.047	8		0.013	4	6	-0.6	
GM-RD-SSGM-CO-132	GM-RD-MH-130	1,134.71	GM-RD-MH-129	1,134.00	177.5	0.004	8		0.013	2	5.2	-0.6	
GM-SUR-304	MH-IS-57	425.87	MH-IS-80	422.48	336.3	0.01	10	Ductile Iron	0.013	682	66.3	-0.3	
GM-SUR-5001	MH-IS-271	410.4	MH-SUR-5002	410.5	88.2	-0.001	12	Concrete	0.013	494	81.6	-0.2	
GM-SUR-5002	MH-SUR-5002	410.5	MH-IS-140	409.52	29.8	0.033	12	Concrete	0.013	502.8128	44.6	-0.6	

2040 (20-year) with Proposed Improvements - Peak Hour Flow - Wet Well Table

Label	Ground Elevation (ft)	Maximum Elevation (ft)	Initial Elevation (ft)	Minimum Elevation (ft)	Base Elevation (ft)	Flow In (gpm)	Flow Out (gpm)	Net Flow In (gpm)
Hospital PS-WW	968	3.75	1.7	0	958	14	225	-210
IPPS Wetwell	430.65	4	2.5	0	400.65	611	4,852	-4242
KCPSWW	428.11	14	0.6	0	399.5	4,004	9,079	-5075
PS1WW	419.19	7.6	5	0	394.33	1,971	2,066	-94
PS2WW	415.2	4.25	2	0	395.25	78	499	-420
PS3WW	418.23	5.15	2.85	0	401.67	414	756	-342
PS4WW	417.46	4.2	3	0	399.83	133	243	-111
PSBPWW	796.77	9.7	4.5	0	765.5	799	1,039	-240
PSEWW	762.77	6.5	3.5	0	736.5	140	280	-140
PSFWW	721.2	4	2.5	0	704	47	272	-224
PSK3-WW	818.91	7.1	3.1	0	793	101	241	-140
PSLWW	807.37	11.1	5.6	0	777.9	439	493	-54
PSS12A-WW	886.8	4.1	2.1	0	871.69	20	123	-104
Pump Station K2 (Burke St) Wetwell	698.45	6.6	3.1	0	688.45	45	89	-44
Pump Station N6 Wetwell	727.14	4.4	2.9	0	717.14	18	120	-102
Pump Station No. 6 Wetwell	425	4	2	0	415	11	0	11
Pump Station Z (Gala) Wetwell	537.95	7.1	3.5	0	527.95	34	84	-50

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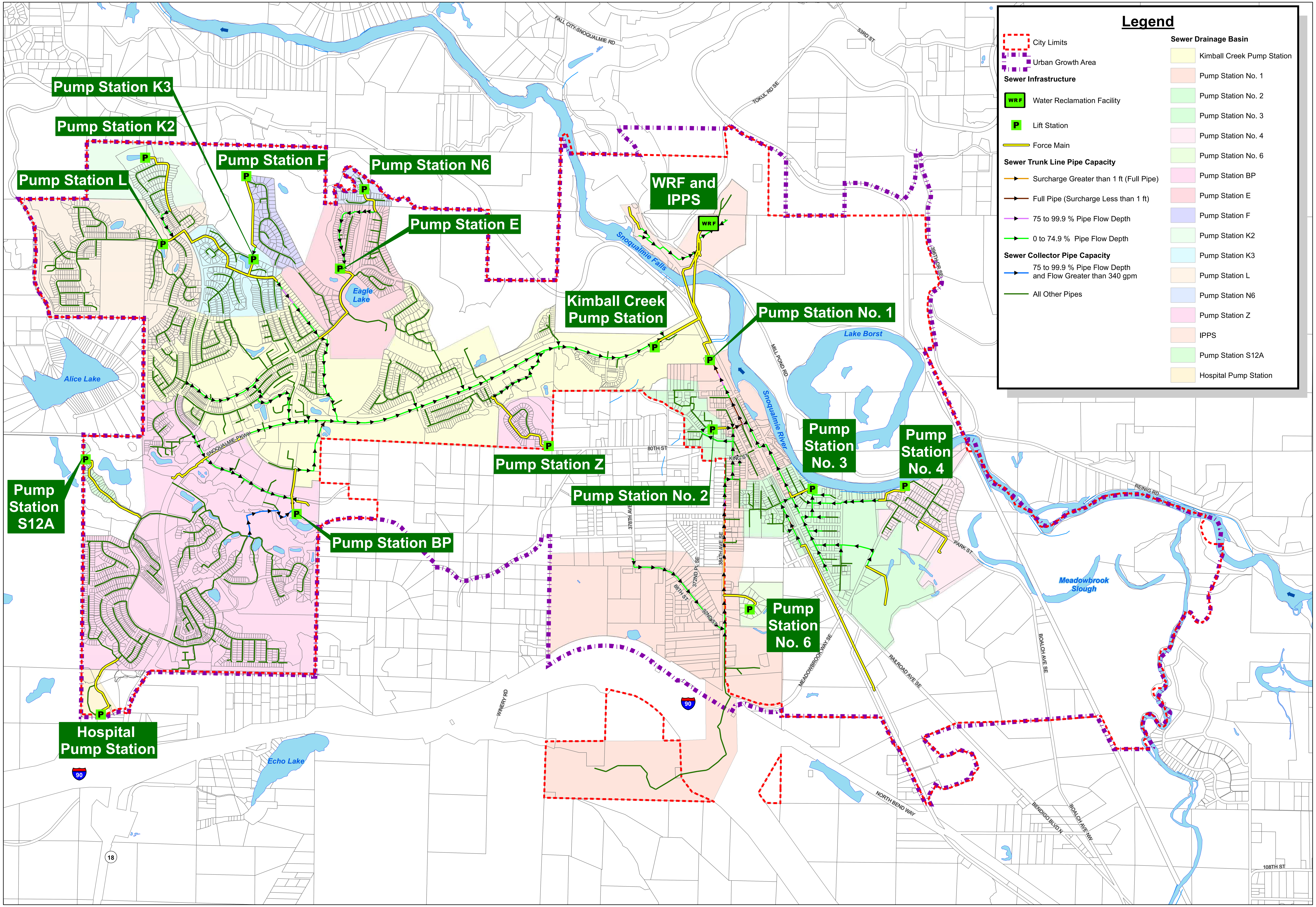

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Vicinity Map

Figure G-1
Existing SewerGEMS Results
City of Snoqualmie General Sewer Plan

1 inch = 1,000 feet

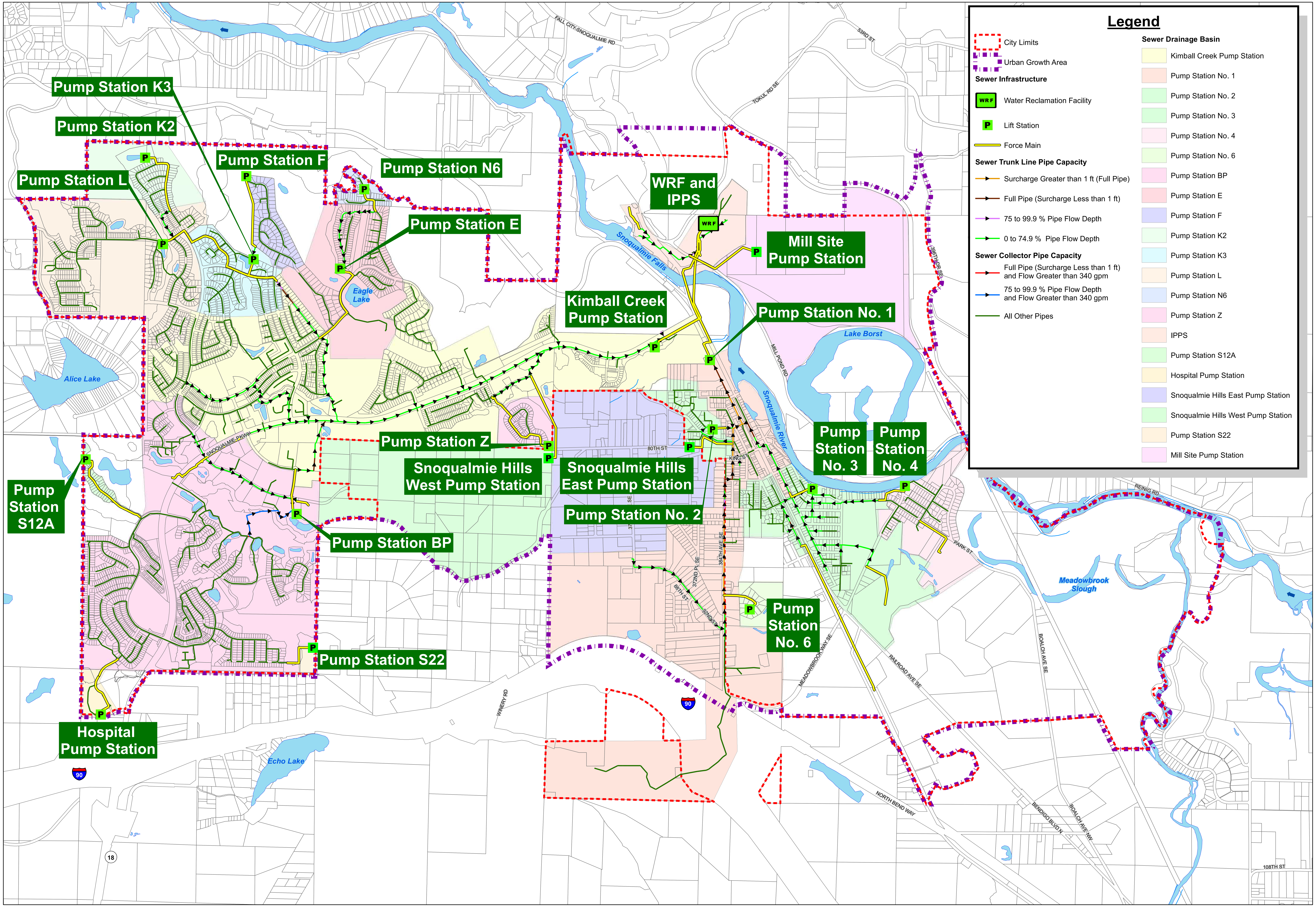
0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET PLOT DATE: JUL 1, 2021 BY: KGOMEZ \\RH2-118\PROJECT\DATA\SNQ\118-083\GIS\GSP-FIG_G-1_EX SEWER RESULTS.MXD



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Vicinity Map

Figure G-2
Projected 2040 SewerGEMS Results without Improvements

City of Snoqualmie General Sewer Plan

\\RH2-118\PROJECT\DATA\SNQ\118-083\GIS\GSP-FIG_G-2_2040 SEWER RESULTS.MXD BY: KGOMEZ PLOT DATE: JUL 1, 2021 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

CITY OF SNOQUALMIE

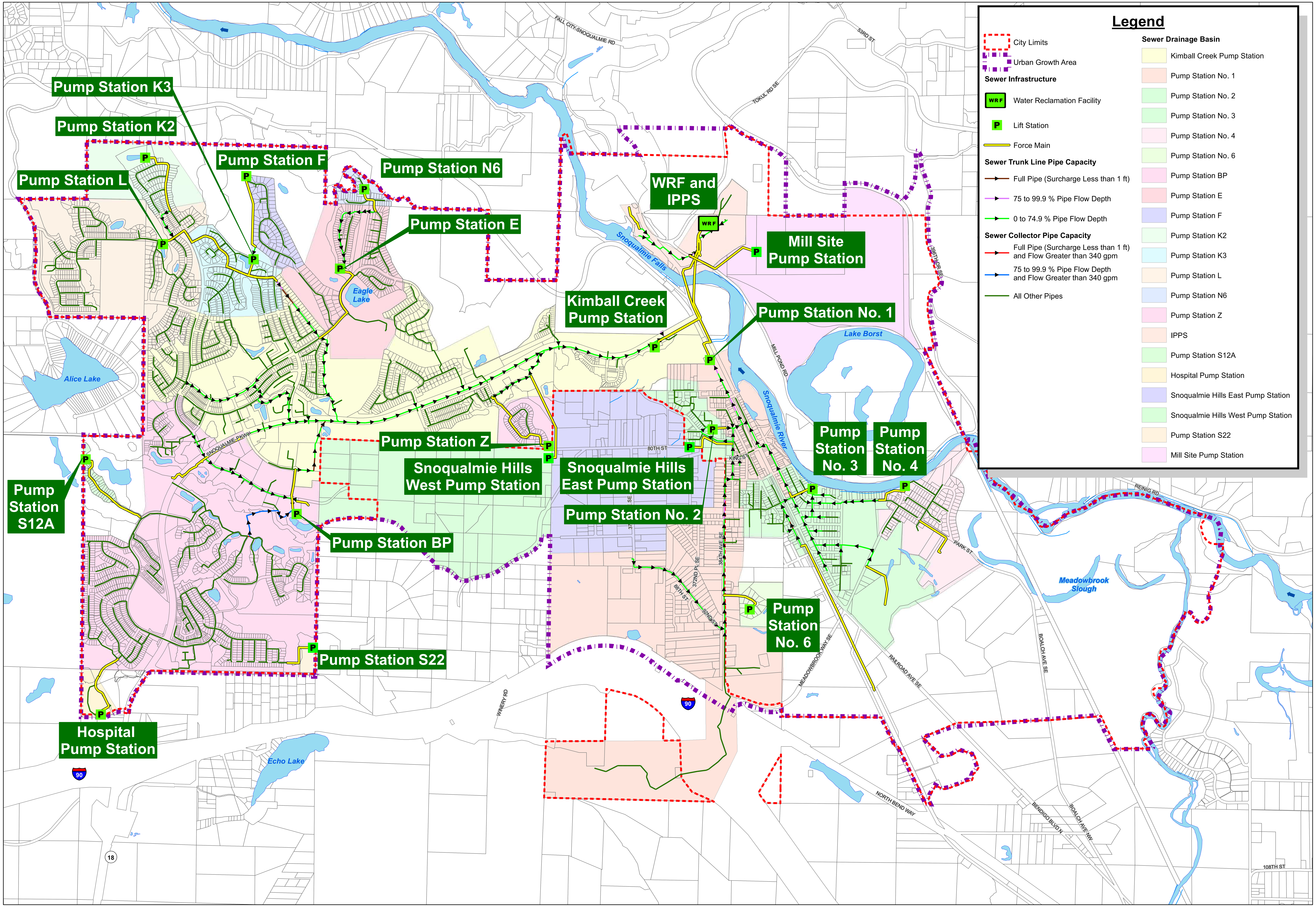
1 inch = 1,000 feet

0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH



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Vicinity Map

Figure G-3
Projected 2040 SewerGEMS Results with Improvements

City of Snoqualmie General Sewer Plan

CITY OF SNOQUALMIE

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

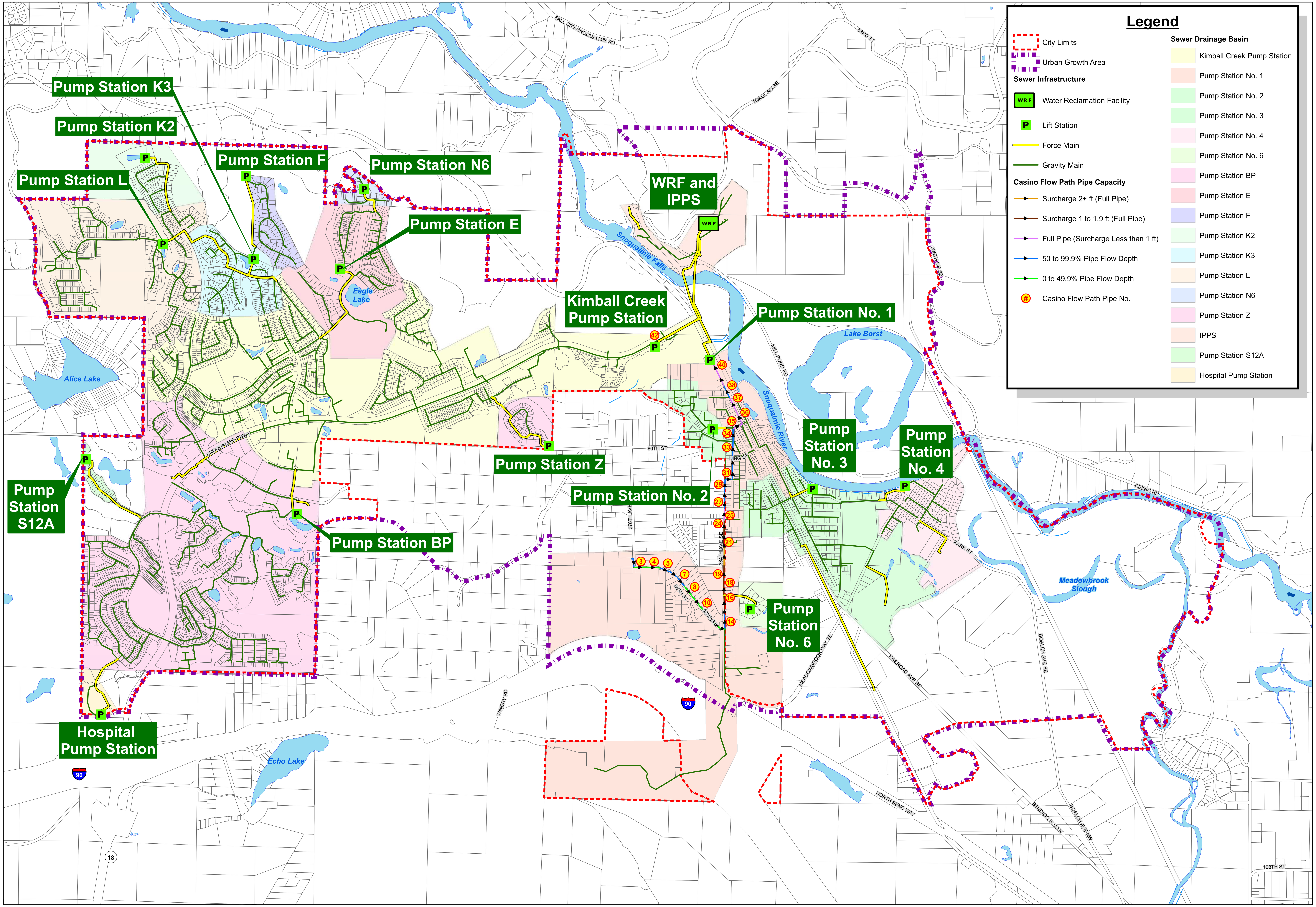
\\RH2-118\PROJECT\DATA\SNQ\118-083\GIS\GSP-FIG_G-3_2040 SEWER W IMP RESULTS.MXD BY: KGOMEZ PLOT DATE: JUL 1, 2021 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

City of Snoqualmie
General Sewer Plan
Casino Expansion Evaluation
Sewer Hydraulic Modeling Results

Pipe No.	Ex. Pipe Diameter (in.)	Surcharge at Upstream End (ft) With Casino Expansion: 2017 PHF without Improvements	2017 PHF with CIPs SM1 and SM3	2040 PHF without Improvements	2040 PHF with CIPs SM1 and SM3	Notes
1	8	-0.3	-0.3	-0.3	-0.3	
2	10	-0.3	-0.3	-0.3	-0.3	
3	10	-0.5	-0.5	-0.5	-0.5	
4	10	-0.5	-0.5	-0.5	-0.5	
5	10	-0.4	-0.4	-0.4	-0.4	
6	10	-0.4	-0.4	-0.4	-0.4	
7	10	-0.4	-0.4	-0.4	-0.4	
8	10	-0.5	-0.5	-0.5	-0.5	
9	10	-0.5	-0.5	-0.5	-0.5	
10	10	-0.4	-0.4	-0.4	-0.4	
11	10	-0.4	-0.4	-0.4	-0.4	
12	10	-0.4	-0.4	-0.4	-0.4	
13	10	-0.4	-0.4	-0.4	-0.4	
14	10	-0.3	-0.3	-0.3	-0.3	
15	10	1.2	-0.3	1.2	-0.3	
16	10	1.6	-0.2	1.6	-0.2	
17	10	1.7	-0.3	1.7	-0.3	
18	10	1.8	-0.4	1.8	-0.4	CIP SM1.
19	10	1.5	-0.4	1.5	-0.4	CIP SM1.
20	10	2	-0.3	2.6	-0.3	CIP SM1.
21	10	1.5	-0.4	2	-0.4	CIP SM1.
22	10	1.5	-0.4	2	-0.4	CIP SM1.
23	10	1.6	-0.4	2.1	-0.4	CIP SM1.
24	10	1.2	-0.3	1.7	-0.3	CIP SM1.
25	10	0.9	-0.2	1.4	-0.2	Existing adverse slope. CIP SM1.
26	10	0.7	-0.1	1.2	-0.1	CIP SM1.
27	12	-0.2	-0.2	0.3	-0.2	
28	12	-0.4	-0.4	0.3	-0.4	
29	12	-0.4	-0.4	0.6	-0.4	
30	12	-0.2	-0.2	1	-0.2	
31	12	-0.4	-0.4	1.1	-0.4	
32	15	-0.5	-0.5	1.4	-0.5	
33	15	-0.5	-0.5	1.6	-0.5	
34	15	-0.1	-0.6	2	-0.5	
35	18	0.2	-0.8	2.1	-0.7	
36	15	0.7	-0.8	2.6	-0.7	CIP SM3.
37	15	0.9	-0.2	2.4	-0.1	CIP SM3.
38	15	-0.3	-0.8	1	-0.7	CIP SM3.
39	15	0.1	-0.8	0.8	-0.7	CIP SM3.
40	15	0.5	-0.4	0.9	-0.3	CIP SM3.
41	15	-0.5	-0.7	-0.4	-0.7	Conveys to Pump Station No. 1. CIP SM3.
42	36	-2.1	-2.1	-2.1	-2.1	
43	36	-2.1	-2.1	-2.1	-2.1	Conveys to Kimball Creek Pump Station.
Maximum		2	-0.1	2.6	-0.1	

Legend

- Surcharge < -0.4 ft
- -0.4 ft ≤ Surcharge < 0 ft
- 0 ft ≤ Surcharge < 1 ft
- 1 ft ≤ Surcharge < 2 ft
- Surcharge ≥ 2 ft



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COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET PLOT DATE: DEC 5, 2021 BY: KGOMEZ

J:\DATA\SNQ\118-083\GIS\CASINO SEWER AGREEMENT 2021\CASINO 2021-FIG_2_2017 SEWER RESULTS.MXD

Figure G-4
Projected 2017 PHF with Casino Expansion SewerGEMS Results without Improvements

City of Snoqualmie
2021 Casino Sewer Agreement

CITY OF SNOQUALMIE

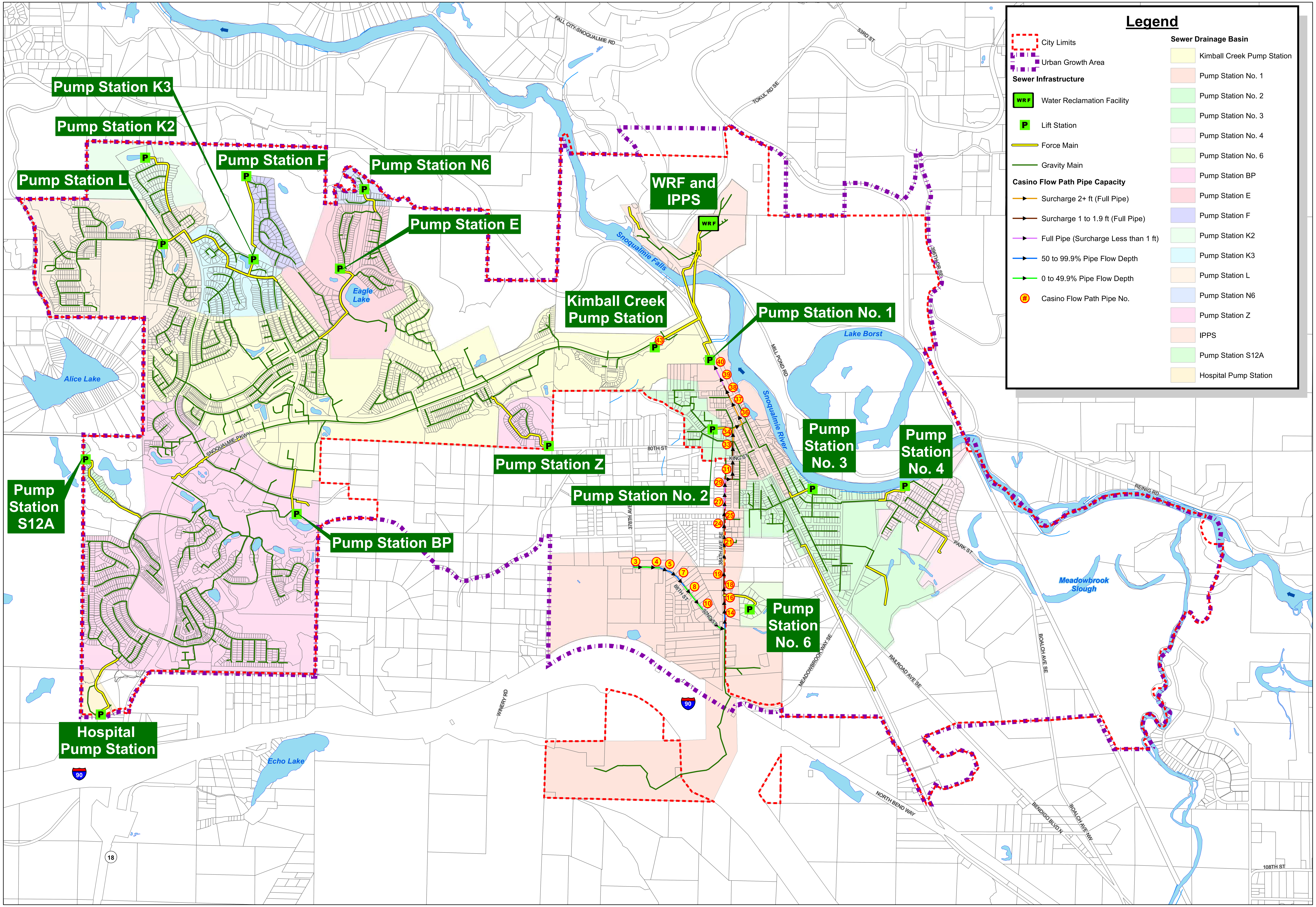
1 inch = 1,000 feet

0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH



Legend

City Limits
Urban Growth Area

Sewer Infrastructure
WRF Water Reclamation Facility
P Lift Station
Force Main
Gravity Main

Casino Flow Path Pipe Capacity
Surcharge 2+ ft (Full Pipe)
Surcharge 1 to 1.9 ft (Full Pipe)
Full Pipe (Surcharge Less than 1 ft)
50 to 99.9% Pipe Flow Depth
0 to 49.9% Pipe Flow Depth
Casino Flow Path Pipe No.

Sewer Drainage Basin
Kimball Creek Pump Station
Pump Station No. 1
Pump Station No. 2
Pump Station No. 3
Pump Station No. 4
Pump Station No. 6
Pump Station BP
Pump Station E
Pump Station F
Pump Station K2
Pump Station K3
Pump Station L
Pump Station N6
Pump Station Z
IPPS
Pump Station S12A
Hospital Pump Station

Vicinity Map

KING COUNTY

Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Figure G-5
Projected 2040 PHF with Casino Expansion SewerGEMS Results without Improvements
City of Snoqualmie
2021 Casino Sewer Agreement

J:\DATA\SNQ\118-083\GIS\CASINO SEWER AGREEMENT 2021\CASINO 2021-FIG_3_2040 SEWER RESULTS.MXD BY: KGOMEZ PLOT DATE: DEC 5, 2021 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

CITY OF SNOQUALMIE

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

Appendix H

Permits for Known Long-Term Industrial Wastewater Producers

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Issuance Date:	May 1, 2018
Effective Date:	May 1, 2018
Expiration Date:	April 30, 2023

State Waste Discharge Permit Number ST0045516

State of Washington
DEPARTMENT OF ECOLOGY
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

In compliance with the provisions of the
State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington, as amended,

Girard Resources and Recycling, LLC
38190 SE Stearns Road
Snoqualmie, WA 98065

is authorized to discharge wastewater in accordance
with the special and general conditions which follow.

Facility Location: 38190 SE Stearns RD Snoqualmie, WA 98065 POTW Receiving Discharge: City of Snoqualmie WWTP & Water Reclamation Facility	SIC Code: 4953 NAICS Code: 562219 Non-Categorical Non-Significant Industrial User Industry Type: Concrete Solids Processing

Rachel McCrea

Rachel McCrea
Water Quality Section Manager
Northwest Regional Office
Washington State Department of Ecology

Table of Contents

Summary of Permit Report Submittals

Refer to the Special and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A	Discharge Monitoring Report (DMR)	Monthly	June 28, 2018
S3.F	Reporting Permit Violations	As necessary	
S4.A	Reporting Bypasses	As necessary	
S7.C	Solid Waste Control Plan	1/permit cycle	July 1, 2018
S8	Application for Permit Renewal	1/permit cycle	March 1, 2023
S10	Spill Control Plan	1/permit cycle	July 1, 2018
G1	Notice of Change in Authorization	As necessary	
G4	Permit Application for Substantive Changes to the Discharge	As necessary	
G5	Engineering Report for Construction or Modification Activities	As necessary	
G7	Notice of Permit Transfer	As necessary	
G12	Duty to Provide Information	As necessary	

Special Conditions

S1. Discharge limits

All discharges and activities authorized by this permit must comply with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a concentration in excess of, that authorized by this permit violates the terms and conditions of this permit.

A discharge of a pollutant in excess of local limits set by the City of Snoqualmie violates the terms and conditions of this permit.

Beginning on the effective date, the Permittee is authorized to discharge wastewater to the City of Snoqualmie Water Reclamation Facility sewer system subject to the following limits:

Discharge Limits	
Parameter	Maximum Daily [a]
Flow	50000 gpd
Total Suspended Solids (TSS)	350 mg/L

Parameter	Minimum	Maximum
pH	5.5	11.0

[a] Maximum daily effluent limit means the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. For other units of measurement, the daily discharge is the average measurement of the pollutant over the day. This does not apply to pH.

S2. Monitoring requirements

S2.A. Monitoring requirements

The Permittee must monitor the wastewater and production according to the following schedule:

Parameter	Units	Sampling Frequency	Sample Type
(1) Final Wastewater Effluent			
Flow	gallons/day (gpd)	Continuous [a]	Metered
Total Suspended Solids (TSS)	mg/L	Monthly	Grab [b]
pH [c]	Standard Units	Continuous	Metered

a	Continuous means uninterrupted except for brief lengths of time for calibration, power failure, or unanticipated equipment repair or maintenance. The time interval for the associated data logger must be no greater than 30 minutes. The Permittee must sample once each two hours when continuous monitoring is not possible.
b	Grab means an individual sample collected over a 15-minute, or less, period.
c	The Permittee must report the instantaneous maximum and minimum pH monthly. Do not average pH values.

S2.B. Sampling and analytical procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions affecting effluent quality.

Sampling and analytical methods used to meet the water and wastewater monitoring requirements specified in this permit must conform to the latest revision of the following rules and documents unless otherwise specified in this permit or approved in writing by Ecology.

- Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136.
- Standard Methods for the Examination of Water and Wastewater (APHA).

S2.C. Flow measurement and continuous monitoring devices

The Permittee must:

1. Select and use appropriate flow measurement and continuous monitoring devices and methods consistent with accepted scientific practices.
2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard, the manufacturer's recommendation, and approved O&M manual procedures for the device and the wastestream.
3. Calibrate continuous monitoring instruments weekly unless it can demonstrate a longer period is sufficient based on monitoring records.

The Permittee:

a. May calibrate apparatus for continuous monitoring of dissolved oxygen by air calibration.

b. Must calibrate continuous pH measurement instruments using a grab sample analyzed in the lab with a pH meter calibrated with standard buffers and analyzed within 15 minutes of sampling.

c. Must calibrate continuous chlorine measurement instruments using a grab sample analyzed in the laboratory within 15 minutes of sampling.

4. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
5. Establish a calibration frequency for each device or instrument in the O&M manual that conforms to the frequency recommended by the manufacturer.
6. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.
7. Maintain calibration records for at least three years.

S2.D. Laboratory accreditation

The Permittee must ensure that all monitoring data required by Ecology for permit specified parameters is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement.

S3. Reporting and recording requirements

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

S3.A. Discharge monitoring reports

The first monitoring period begins on the effective date of the permit (unless otherwise specified). The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic discharge monitoring report (DMR) form provided by Ecology within the Water Quality Permitting Portal. Include data for each of the parameters tabulated in Special Condition S2 and as required by the form. Report a value for each day sampling occurred (unless specifically exempted in the permit) and for the summary values (when applicable) included on the electronic form.

   To find out more information and to sign up for the Water Quality Permitting Portal go to: http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html

2. Enter the “No Discharge” reporting code for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate, if the Permittee did not discharge wastewater or a specific pollutant during a given monitoring period.
3. Report single analytical values below detection as “less than the detection level (DL)” by entering < followed by the numeric value of the detection level (e.g. < 2.0) on the DMR. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.
4. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in Appendix A.
5. Calculate average values and calculated total values (unless otherwise specified in the permit) using:
    a. The reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.
    b. One-half the detection value (for values reported below detection) if the lab detected the parameter in another sample from the same monitoring point for the reporting period.
    c. Zero (for values reported below detection) if the lab did not detect the parameter in another sample for the reporting period.
6. Report single-sample grouped parameters (for example: priority pollutants, PAHs, pulp and paper chlorophenolics, TTOs) on the WQWebDMR form and include sample date, concentration detected, detection limit (DL) (as necessary), and laboratory quantitation level (QL) (as necessary).

    The Permittee must also submit an electronic copy of the laboratory report as an attachment using WQWebDMR. The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.
7. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.
8. Submit DMRs for parameters with the monitoring frequencies specified in S2 (monthly, quarterly, annual, etc.) at the reporting schedule identified below. The Permittee must:
    a. Submit **monthly** DMRs by the 28th day of the following month.

S3.B. Permit submittals and schedules

The Permittee must use the Water Quality Permitting Portal – Permit Submittals application (unless otherwise specified in the permit) to submit all other written permit-required reports by the date specified in the permit.

When another permit condition requires submittal of a paper (hard-copy) report, the Permittee must ensure that it is postmarked or received by Ecology no later than the dates specified by this permit. Send these paper reports to Ecology at:

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

S3.C. Records retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

S3.D. Recording of results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

S3.E. Additional monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR unless otherwise specified by Condition S2.

S3.F. Reporting permit violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.
2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

a. Immediate reporting

The Permittee must report any noncompliance that may endanger health or the environment immediately to the Department of Ecology's Regional Office 24-hour number listed below:

Northwest Regional Office	425-649-7000

If the noncompliance is a discharge to either sanitary or stormwater contact City of Snoqualmie:

Stormwater Hotline	425-831-4919
WWTP	425-888-8015

b. Twenty-four-hour reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone number listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances. The Permittee must report:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.
2. Any unanticipated bypass that causes an exceedance of an effluent limit in the permit (See Part S4.B., "Bypass Procedures").
3. Any upset that causes an exceedance of an effluent limit in the permit. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.
4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.
5. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit. This requirement does not include industrial process wastewater overflows to impermeable surfaces which are collected and routed to the treatment works.

c. Report within five days

The Permittee must also submit a written report within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The report must contain:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times.

3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
5. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

d. Waiver of written reports

Ecology may waive the written report required in subpart c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

e. All other permit violation reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in subpart c, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

S3.G. Other reporting

a. Spills of oil or hazardous materials

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and chapter 173-303-145. You can obtain further instructions at the following website: http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm .

b. Failure to submit relevant or correct facts

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to Ecology, it must submit such facts or information promptly.

S3.H. Maintaining a copy of this permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S3.I. Dangerous waste discharge notification

The Permittee must notify the publicly owned treatment works (POTW) and Ecology in writing of the intent to discharge into the POTW any substance designated as a dangerous waste in accordance with the provisions of WAC 173-303-070. It must make this notification at least 90 days prior to the date that it proposes to initiate the discharge. The Permittee must not discharge this substance until authorized by Ecology and the POTW. It must also comply with the notification requirements of Special Condition S8 and General Condition G4.

S3.J. Spill notification

The Permittee must notify the POTW immediately (as soon as discovered) of all discharges that could cause problems to the POTW, such as process spills and unauthorized discharges (including slug discharges).

S4. Operation and maintenance

The Permittee must, at all times, properly operate and maintain all facilities or systems of treatment and control (and related appurtenances) which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a Permittee only when the operation is necessary to achieve compliance with the conditions of this permit.

S4.A. Bypass procedures

This permit prohibits a bypass, which is the intentional diversion of waste streams from any portion of a treatment facility. Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit authorizes a bypass if it allows for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by Ecology prior to the bypass. The Permittee must submit prior notice, if possible, at least ten (10) days before the date of the bypass.

2. Bypass is unavoidable, unanticipated, and results in noncompliance of this permit.

   This permit authorizes such a bypass only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   b. No feasible alternatives to the bypass exist, such as:

      - The use of auxiliary treatment facilities.
      - Retention of untreated wastes.
      - Stopping production.
      - Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
      - Transport of untreated wastes to another treatment facility.

c. The Permittee has properly notified Ecology of the bypass as required in Condition S3.E of this permit.

3. If bypass is anticipated and has the potential to result in noncompliance of this permit.

   a. The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:

      - A description of the bypass and its cause.
      - An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.
      - A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
      - The minimum and maximum duration of bypass under each alternative.
      - A recommendation as to the preferred alternative for conducting the bypass.
      - The projected date of bypass initiation.
      - A statement of compliance with SEPA.
      - A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
      - Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

   b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during the project planning and design process. The project-specific engineering report or facilities plan as well as the plans and specifications must include details of probable construction bypasses to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

   c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:

      - If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.
      - If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.
      - If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

S4.B. Best management practices\pollution prevention program

1. Chemical Storage

   The Permittee must store solid chemicals, chemical solutions, paints, oils, solvents, acids, caustic solutions and waste materials, including used batteries, in a manner which will prevent the inadvertent entry of these materials into the POTW or waters of the state, including ground waters, and in a manner that will prevent spillage by overfilling, tipping, or rupture.

   In addition, the Permittee must:

   a. Store all liquid products on durable impervious surfaces and behind berms.
   b. Store and dispense chemicals only in roofed and bermed areas to eliminate potential spills to waters of the state or contamination of stormwater runoff.
   c. Locate any tank containing chemical solutions in a diked, or no-outlet area adequate to prevent chemical loss to waters of the state, or the sanitary sewer
   d. Contain all quenching, hydraulic, machining, and lubricating oils to prevent spills, or loss to waters of the state or to the sanitary sewer.
   e. Store waste liquids under cover, such as tarpaulins or roofed structures, or in a closed vessel.
   f. Segregate and securely store incompatible or reactive materials in separate containment areas that prevent the mixing of chemicals.
   g. Dispose of concentrated waste or spilled chemicals at a facility approved by Ecology or appropriate county health department in accordance with the Solid Waste Disposal Plan requirements of this permit.
   h. <u>Not</u> dispose of concentrated waste or spilled chemicals to any sewer or state water.
   i. Dispose of sludges and scale from cleaning tanks in an approved manner other than to the sewer system and other than to a state watercourse.
   j. <u>Not</u> discharge concentrated organic solvents to the sewer system.
   k. Close any spill control valves, if a spill occurs within the process area, to prevent the entry of concentrated chemicals to the sanitary sewer.
   l. Treat all industrial wastes containing pollutants by using all known, available, and reasonable methods for treatment prior to discharge to the sanitary sewer.

S5. Prohibited discharges

The Permittee must comply with these General and Specific Prohibitions.

S5.A. General prohibitions

The Permittee must not introduce into the POTW pollutant(s), which cause pass through or interference.

S5.B. Specific prohibitions

In addition, the Permittee must not introduce the following into the POTW:

1. Pollutants which create a fire or explosion hazard in the POTW, including, but not limited to, waste streams with a closed cup flashpoint of less than 60 degrees C (140 degrees F) using the test methods specified in 40 CFR 261.21.
2. Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW resulting in interference.
3. Any pollutant (including oxygen-demanding pollutants (BOD_5, etc.), released in a discharge at a flow rate and/or pollutant concentration that will cause interference with the POTW.
4. Heat in amounts which will inhibit biological activity in the POTW resulting in interference, but in no case heat in such quantities that the temperature at the POTW treatment plant exceeds 40 degrees C (104 degrees F) unless the approval authority, upon request of the POTW, approves alternative temperature limits.
5. Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass-through.
6. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems.
7. Any trucked or hauled pollutants, except at discharge points designated by the POTW.
8. Pollutants that will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0 or greater than 11.0, unless the collection and treatment system is specifically designed to accommodate such discharges.

S5.C. Prohibited unless approved

Any of the following discharges are prohibited unless approved by Ecology under extraordinary circumstances (such as a lack of direct discharge alternatives due to combined sewer service or a need to augment sewage flows due to septic conditions):

1. Noncontact cooling water in significant volumes.
2. Storm water and other direct inflow sources.

3. Wastewaters significantly affecting system hydraulic loading, which do not require treatment or would not be afforded a significant degree of treatment by the system.
4. The discharge of dangerous wastes as defined in Chapter 173-303 WAC (Unless specifically authorized in this permit).

S6. Dilution prohibited

The Permittee must not dilute the wastewater discharge with stormwater or increase the use of potable water, process water, noncontact cooling water, or, in any way, attempt to dilute an effluent as a partial or complete substitute for adequate treatment to achieve compliance with the limits contained in this permit.

S7. Solid waste disposal

S7.A. Solid waste handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

S7.B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

S7.C. Solid waste control plan

a. Submittal requirements

The Permittee must:

1. Submit a solid waste control plan to Ecology by July 1, 2018.
2. Submit to Ecology any proposed revision or modification of the solid waste control plan for review and approval at least 30 days prior to implementation.
3. Comply with the plan and any modifications.
4. Submit an update of the solid waste control plan by March 1, 2023.

b. Solid waste control plan content

The solid waste control plan must:

1. Follow Ecology's guidance for preparing a solid waste control plan and address all solid wastes generated by the permittee. (https://fortress.wa.gov/ecy/publications/documents/0710024.pdf)
2. Include at a minimum a description, source, generation rate, and disposal methods of these solid wastes.
3. Not conflict with local or state solid waste regulations.

S8. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit by March 1, 2023.

The Permittee must also submit a new application or addendum at least sixty (60) days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

S9. Nonroutine and unanticipated discharges

1. Beginning on the effective date of this permit, the Permittee is authorized to discharge nonroutine wastewater on a case-by-case basis to the sanitary sewer if approved by Ecology and the POTW. Prior to any such discharge, the Permittee must contact Ecology and **at a minimum** provide the following information:
   a. The proposed discharge location.
   b. The nature of the activity that will generate the discharge.
   c. Any alternatives to the discharge, such as reuse, storage, or recycling of the water.
   d. The total volume of water it expects to discharge.
   e. The results of the chemical analysis of the water.
   f. The date of proposed discharge.
   g. The expected rate of discharge discharged, in gallons per day.
2. The expected rate of discharge in gallons per minute for discharges greater than 20,000 gallons.
3. The Permittee must analyze the water for all constituents limited for the discharge and report them as required by subpart 1.e above. The analysis must also include any parameter deemed necessary by Ecology. All discharges must comply with the effluent limits as established in Condition S1 of this permit and any other limits imposed by Ecology.
4. The discharge cannot proceed until Ecology has reviewed the information provided and has authorized the discharge by letter to the Permittee or by an Administrative Order.

S10. Spill control plan

S10.A. Spill control plan submittals and requirements

The Permittee must:

1. Submit to Ecology a spill control plan for the prevention, containment, and control of spills or unplanned releases of pollutants by July 1, 2018.
2. Review the plan at least annually and update the spill plan as needed.
3. Send changes to the plan to Ecology.
4. Follow the plan and any supplements throughout the term of the permit.

S10.B. Spill control plan components

The spill control plan must include the following:

1. A list of all oil and petroleum products and other materials used and/or stored on-site, which when spilled, or otherwise released into the environment, designate as dangerous waste (DW) or extremely hazardous waste (EHW) by the procedures set forth in WAC 173-303-070. Include other materials used and/or stored on-site, which may become pollutants or cause pollution upon reaching state's waters.
2. A description of preventive measures and facilities (including an overall facility plot showing drainage patterns) which prevent, contain, or treat spills of these materials.
3. A description of the reporting system the Permittee will use to alert responsible managers and legal authorities in the event of a spill.
4. A description of operator training to implement the plan.

The Permittee may submit plans and manuals required by 40 CFR Part 112, contingency plans required by Chapter 173-303 WAC, or other plans required by other agencies, which meet the intent of this section.

General Conditions

G1. Signatory requirements

All applications, reports, or information submitted to Ecology must be signed as follows:

1. All permit applications must be signed by either a principal executive officer or ranking elected official.
2. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
   a. The authorization is made in writing by the person described above and is submitted to Ecology at the time of authorization, and
   b. The authorization specifies either a named individual or any individual occupying a named position.
3. Changes to authorization. If an authorization under paragraph G1.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section must make the following certification:

   "I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. Right of entry

Representatives of Ecology have the right to enter at all reasonable times in or upon any property, public or private, for the purpose of inspecting and investigating conditions relating to the pollution or the possible pollution of any waters of the state. Reasonable times include normal business hours; hours during which production, treatment, or discharge occurs; or times when Ecology suspects a violation requiring immediate inspection. Representatives of Ecology must be allowed to have access to, and copy at reasonable cost, any records required to be kept under terms and conditions of the permit; to inspect any monitoring equipment or method required in the permit; and to sample the discharge, waste treatment processes, or internal waste streams.

G3. Permit actions

This permit is subject to modification, suspension, or termination, in whole or in part by Ecology for any of the following causes:

1. Violation of any permit term or condition;
2. Obtaining a permit by misrepresentation or failure to disclose all relevant facts;
3. A material change in quantity or type of waste disposal;
4. A material change in the condition of the waters of the state; or
5. Nonpayment of fees assessed pursuant to RCW 90.48.465.

Ecology may also modify this permit, including the schedule of compliance or other conditions, if it determines good and valid cause exists, including promulgation or revisions of regulations or new information.

G4. Reporting a cause for modification

The Permittee must submit a new application, or a supplement to the previous application, along with required engineering plans and reports, whenever a new or increased discharge or change in the nature of the discharge is anticipated which is not specifically authorized by this permit. This application must be submitted at least one hundred eighty (180) days prior to any proposed changes. Submission of this application does not relieve the Permittee of the duty to comply with the existing permit until it is modified or reissued.

G5. Plan review required

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with Chapter 173-240 WAC. Engineering reports, plans, and specifications should be submitted at least 180 days prior to the planned start of construction. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in the permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

This permit is automatically transferred to a new owner or operator if:

1. A written agreement between the old and new owner or operator containing a specific date for transfer of permit responsibility, coverage, and liability is submitted to Ecology;
2. A copy of the permit is provided to the new owner; and
3. Ecology does not notify the Permittee of the need to modify the permit.

Unless this permit is automatically transferred according to Section 1, above, this permit may be transferred only if it is modified to identify the new Permittee and to incorporate such other requirements as determined necessary by Ecology.

G8. Reduced production for compliance

The Permittee must control production or discharge to the extent necessary to maintain compliance with the terms and conditions of this permit upon reduction of efficiency, loss, or failure of its treatment facility until the treatment capacity is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power for the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the effluent stream for discharge.

G10. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology. Ecology may revoke this permit if the permit fees established under Chapter 173-224 WAC are not paid.

G11. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs is a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit incurs, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is a separate and distinct violation.

G12. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G13. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of chapter 90.48 RCW and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

Appendix A

LIST OF POLLUTANTS WITH ANALYTICAL METHODS, DETECTION LIMITS, AND QUANTITATION LEVELS

The Permittee must use the specified analytical methods, detection limits (DLs), and quantitation levels (QLs) in the following table for permit and application required monitoring unless:

- Another permit condition specifies other methods, detection levels, or quantitation levels.
- The method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136.

If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

When the permit requires the Permittee to measure the base neutral compounds in the list of priority pollutants, it must measure all of the base neutral pollutants listed in the table below. The list includes EPA-required base neutral priority pollutants and several additional polynuclear aromatic hydrocarbons (PAHs). The Water Quality Program added several PAHs to the list of base neutrals below from Ecology's Persistent Bioaccumulative Toxics (PBT) List. It only added those PBT parameters of interest to Appendix A that did not increase the overall cost of analysis unreasonably.

Ecology added this appendix to the permit in order to reduce the number of analytical "non-detects" in permit-required monitoring and to measure effluent concentrations near or below criteria values where possible at a reasonable cost.

The lists below include conventional pollutants (as defined in CWA section 502(6) and 40 CFR Part 122.), toxic or priority pollutants as defined in CWA section 307(a)(1) and listed in 40 CFR Part 122 Appendix D, 40 CFR Part 401.15 and 40 CFR Part 423 Appendix A), and nonconventionals. 40 CFR Part 122 Appendix D (Table V) also identifies toxic pollutants and hazardous substances which are required to be reported by dischargers if expected to be present. This permit Appendix A list does not include those parameters.

Conventional Pollutants	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
Oil and Grease (HEM) (Hexane Extractable Material)		1664 A or B	1,400	5,000
pH		SM4500-H^+ B	N/A	N/A
Total Suspended Solids		SM2540-D		5 mg/L

PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL) [2] *µg/L unless specified***
METALS, CYANIDE & TOTAL PHENOLS					
Antimony, Total	114	7440-36-0	200.8	0.3	1.0
Arsenic, Total	115	7440-38-2	200.8	0.1	0.5
Beryllium, Total	117	7440-41-7	200.8	0.1	0.5
Cadmium, Total	118	7440-43-9	200.8	0.05	0.25
Chromium (hex) dissolved	119	18540-29-9	SM3500-Cr C	0.3	1.2
Chromium, Total	119	7440-47-3	200.8	0.2	1.0
Copper, Total	120	7440-50-8	200.8	0.4	2.0
Lead, Total	122	7439-92-1	200.8	0.1	0.5
Mercury, Total	123	7439-97-6	1631E	0.0002	0.0005
Nickel, Total	124	7440-02-0	200.8	0.1	0.5
Selenium, Total	125	7782-49-2	200.8	1.0	1.0
Silver, Total	126	7440-22-4	200.8	0.04	0.2
Thallium, Total	127	7440-28-0	200.8	0.09	0.36
Zinc, Total	128	7440-66-6	200.8	0.5	2.5
Cyanide, Total	121	57-12-5	335.4	5	10
Cyanide, Weak Acid Dissociable	121		SM4500-CN I	5	10
Cyanide, Free Amenable to Chlorination (Available Cyanide)	121		SM4500-CN G	5	10
Phenols, Total	65		EPA 420.1		50
PRIORITY POLLUTANTS	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)1 µg/L unless specified**	**Quantitation Level (QL) 2 µg/L unless specified**
VOLATILE COMPOUNDS					
Acrolein	2	107-02-8	624	5	10
Acrylonitrile	3	107-13-1	624	1.0	2.0
Benzene	4	71-43-2	624	1.0	2.0
Bromoform	47	75-25-2	624	1.0	2.0
Carbon tetrachloride	6	56-23-5	624/601 or SM6230B	1.0	2.0
Chlorobenzene	7	108-90-7	624	1.0	2.0
Chloroethane	16	75-00-3	624/601	1.0	2.0
2-Chloroethylvinyl Ether	19	110-75-8	624	1.0	2.0
Chloroform	23	67-66-3	624 or SM6210B	1.0	2.0
Dibromochloromethane (chlordibromomethane)	51	124-48-1	624	1.0	2.0
1,2-Dichlorobenzene	25	95-50-1	624	1.9	7.6
1,3-Dichlorobenzene	26	541-73-1	624	1.9	7.6
1,4-Dichlorobenzene	27	106-46-7	624	4.4	17.6
Dichlorobromomethane	48	75-27-4	624	1.0	2.0

PRIORITY POLLUTANTS	PP #	CAS Number (if available)	Recommended Analytical Protocol	Detection (DL)[1] *µg/L unless specified*	Quantitation Level (QL) [2] *µg/L unless specified*
METALS, CYANIDE & TOTAL PHENOLS					
1,1-Dichloroethane	13	75-34-3	624	1.0	2.0
1,2-Dichloroethane	10	107-06-2	624	1.0	2.0
1,1-Dichloroethylene	29	75-35-4	624	1.0	2.0
1,2-Dichloropropane	32	78-87-5	624	1.0	2.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) [6]	33	542-75-6	624	1.0	2.0
Ethylbenzene	38	100-41-4	624	1.0	2.0
Methyl bromide (Bromomethane)	46	74-83-9	624/601	5.0	10.0
Methyl chloride (Chloromethane)	45	74-87-3	624	1.0	2.0
Methylene chloride	44	75-09-2	624	5.0	10.0
1,1,2,2-Tetrachloroethane	15	79-34-5	624	1.9	2.0
Tetrachloroethylene	85	127-18-4	624	1.0	2.0
Toluene	86	108-88-3	624	1.0	2.0
1,2-Trans-Dichloroethylene (Ethylene dichloride)	30	156-60-5	624	1.0	2.0
1,1,1-Trichloroethane	11	71-55-6	624	1.0	2.0
1,1,2-Trichloroethane	14	79-00-5	624	1.0	2.0
Trichloroethylene	87	79-01-6	624	1.0	2.0
Vinyl chloride	88	75-01-4	624/SM6200B	1.0	2.0

1. Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.

2. Quantitation Level (QL) also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer (64 FR 30417).
   ALSO GIVEN AS:
   The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency, December 2007).

Issuance Date:	November 21, 2019
Effective Date:	December 1, 2019
Expiration Date:	November 30, 2024

State Waste Discharge Permit Number ST0045534

State of Washington
DEPARTMENT OF ECOLOGY
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008-5452

In compliance with the provisions of the
State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington, as amended,

Technical Glass Products
8107 Bracken Place SE
Snoqualmie, WA 98065

is authorized to discharge wastewater in accordance
with the special and general conditions which follow.

Facility Location: 8107 Bracken Place SE Snoqualmie, WA 98065 **Industry Type:** Metal Finishing **POTW Receiving Discharge:** City of Snoqualmie – NPDES Permit Number WA0022403	**SIC Code:** 3479 **NAICS Code:** 332812 **Categorical Significant Industrial User:** Subject to standards set forth in 40 CFR Part 433.17

Rachel McCrea
Water Quality Section Manager
Northwest Regional Office
Washington State Department of Ecology

Table of Contents

Summary of Permit Report Submittals

Refer to the Special and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A.	Monthly Discharge Monitoring Report	Monthly	January 28, 2020
S3.A.	Semi-Annual Discharge Monitoring Report	Once per each 6 months	July 28, 2020
S3.	TTO Certification Statement	Monthly	Submit with monthly DMRs (if Permittee chooses waiver of TTO monitoring requirements)
S3.F.a.	Reporting Permit Violations	As necessary	Immediately for violations which may endanger health or environment
S3.F.b.	Reporting Permit Violations	As necessary	Within 24 hours of becoming aware of overflows, violations of permit standards, overflows prior to treatment works
S3.F.c.	Reporting Permit Violations	As necessary	Within five days of becoming aware of violations reportable under S3.E.a. and S3.E.b.
S3.F.e.	Other Reporting - Spills of Hazardous Waste and Oil	As necessary	In accordance with deadlines established under WAC 173-303
S3.G.	Other Reporting - Submittals to Remedy Failure to Submit Material Information	As necessary	Promptly
S4.A.	Reporting Bypasses	As necessary	See provisions of S4.A.3
S8.	Application for Permit Renewal	1/permit cycle	September 30, 2024
S9.	Information Related to Non- Routine and Unanticipated Discharges	As needed	Prior to discharge
G1.3.	Signatory Requirements (Notification of Change of Signatory Authority)	As necessary	No later than simultaneous with submittal of first document submittal under new signatory authority
G4.	Permit Application for Substantive Changes to the Discharge	As necessary	No later than 60 days prior to adoption of substantive change
G5.	Engineering Report for Construction or Modification Activities	As necessary	60 days prior to the planned start of construction
G7.	Notice of Permit Transfer	As necessary	No later than date of transfer
G12.	Duty to Provide Information	As necessary	Within a reasonable time

Special Conditions

S1. Discharge limits

All discharges and activities authorized by this permit must comply with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a concentration in excess of, that authorized by this permit violates the terms and conditions of this permit.

A discharge of a pollutant in excess of local limits established by the City of Snoqualmie violates the terms and conditions of this permit.

In addition to the authorization to discharge from Outfall 003, as set forth below, the Permittee is authorized to discharge industrial wastewater from two minor sources (described in greater detail in the fact sheet for this permit) for which no monitoring is required. The two minor sources authorized consist of:

- Outfall 001: The discharge from the Glass Film Laminating process in the amount of approximately 1200 gallons per day.
- Outfall 002: The discharge from the Glass Edging process in the amount of approximately 1800 gallons per day.

Beginning on the effective date of this permit, the Permittee is authorized to discharge wastewater to the City of Snoqualmie sanitary sewer system subject to the following limits:

Effluent Limits: Outfall # 003 [a] **Latitude: 47.526548 º North Longitude: 121.870005 º West**		
Parameter	**Monthly Average [b]**	**Maximum Daily [c]**
Flow (gpd)	N/A	5,000
Cadmium, T (mg/L) [d]	0.07	0.11
Chromium, T (mg/L) [d]	1.71	2.77
Copper, T (mg/L) [d]	2.07	3.38
Lead, T (mg/L) [d]	0.43	0.69
Nickel, T (mg/L) [d]	2.38	3.98
Silver, T (mg/L) [d]	0.24	0.43
Zinc, T (mg/L) [d]	1.48	2.61
Zirconium, T (mg/L) [d]	N/A	18.3
Cyanide,T (mg/L) [e]	0.65	1.20
Total Toxic Organic Compounds (TTO) 40 CFR Part 433 (mg/L) [f]	N/A	2.13

Parameter	**Minimum**	**Maximum**
pH (standard pH units)	6.0	11.0

[a] The monitoring point for outfall number 003 is the discharge of the powder coat rinse water line at a point following the discharge of the pretreatment system prior to mixture with sanitary, storm, or non-contact cooling water wastewaters.

[b] The term "*monthly average*" effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, the Permittee must add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured.

c	The term "*maximum daily effluent limit*" means the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass or flow, the daily discharge is the total mass or flow of the pollutant discharged over the day. For limits with concentration-based units of measurement (such as mg/L), the daily discharge is the average measurement of the pollutant over the day. This does not apply to pH.
d	The term "*T*" following the name of a metal indicates the total form of the metal as opposed to the dissolved form of the metal.
e	The term "*T*" following cyanide indicates total cyanide (as opposed to cyanide amenable to chlorination).
f	The term "*TTO*" indicates those organic chemicals listed in 40 CFR Part 433.11(e). The results of analysis for TTO's shall be reported as the sum of all TTO compounds measured at concentrations greater than 0.01 mg/L. The Permittee is authorized to analyze and submit the results for the purgeable (volatile) subset of the TTO compounds in lieu of the results for all TTO compounds. The Permittee must employ Method 624.1 for analysis of the purgeable TTO compounds. The following is a list of those compounds which comprise the purgeable TTO compounds: Benzene Dichlorobromomethane Bromoform Tribromomethane) Methyl bromide (Bromomethane) Carbon tetrachloride (Tetrachloromethane) Chlorobenzene Chloroethane 2-Chloroethyl vinyl ether (mixed) Chloroform (Trichloromethane) Methylene chloride (Chloromethane) 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,1-Dichlorethane 1,2-Dichloroethane 1,1- Dichloroethene 1,2-trans-Dichloroethylene 1,2-Dichloropropane cis-1,3-Dichloropropylene (cis-1,3-Dichloropropene) trans-1,3-Dichloropropylene (trans-1,3-Dichloropropene) Ethylbenzene Methylene chloride (Dichloromethane) 1,1,2,2-Tetrachloroethane Tetrachloroethylene (Tetrachloroethene) Toluene 1,1,1-Trichloroethane 1,1,2-Trichloroethane Trichloroethene (Trichloroethylene) 1,2-Dichloropropane Vinyl chloride (Chloroethylene) Provided that the Permittee has prepared and submitted a Toxic Organic Management Plan as required in S12 of this permit, the Permittee is authorized to submit the following TTO certification statement monthly in lieu of performing TTO monitoring: **TTO Certification Statement:** *"Based on my inquiry of the person or persons directly responsible for managing compliance with the permit limitation for total toxic organics (TTO), I certify that, to the best of my knowledge and belief, no dumping of concentrated toxic organics into wastewaters has occurred since the filing of the last discharge monitoring report. I further certify that this facility is implementing the toxic organic management plan submitted to the Washington State Department of Ecology."* Responsible Official ________________________________ Date ____________

S2. Monitoring requirements

S2.A. Monitoring requirements

The Permittee must monitor the wastewater according to the following schedule:

Sampling Requirements Outfall # 003 [a] Latitude: 47.526548 º North Longitude: 121.870005 º West **(NOTE: Table Contains Sampling Requirements Associated with Special Condition S2.)**		
Pollutant Parameter	**Sampling Frequency**	**Sample Type**
Flow (gpd)	Daily	Metered
Cadmium, T (mg/L) [b]	Monthly	Grab [d]
Chromium, T (mg/L) [b]	Monthly	Grab [d]
Copper, T (mg/L) [b]	Monthly	Grab [d]
Lead, T (mg/L) [b]	Monthly	Grab [d]
Nickel, T (mg/L) [b]	Monthly	Grab [d]
Silver, T (mg/L) [b]	Monthly	Grab [d]
Zinc, T (mg/L) [b]	Monthly	Grab [d]
Zirconium, T (mg/L) [b]	Monthly	Grab [d]
Cyanide,T (mg/L) [c]	Semiannual [g]	Grab [d]
Total Toxic Organic Compounds (TTO) 40 CFR Part 433 (mg/L) [e]	Semiannual [g]	Grab [d]
pH (standard pH units) [f]	Daily	Metered

[a] The monitoring point for outfall number 003 is the discharge of the powder coat rinse water line at a point following the discharge of the pretreatment system prior to mixture with sanitary, storm, or non-contact cooling water wastewaters.

[b] The term "*T*" following the name of a metal indicates the total form of the metal as opposed to the dissolved form of the metal.

[c] The term "*T*" following cyanide indicates total cyanide (as opposed to cyanide amenable to chlorination). The cyanide sample must be properly preserved with ascorbic acid and the addition of sodium hydroxide to raise the pH of the sample to a minimum of 12.0 (see handling and preservation under USEPA Method 335.2.).

[d] The term "*Grab*" means an individual sample collected over a fifteen (15)-minute, or less, period.

[e] The term "*TTO*" indicates those organic chemical compounds listed in 40 CFR Part 433.11(e). The results of analysis for TTOs shall be reported as the sum of the concentrations of all TTO compounds quantified at concentrations greater than 0.01 mg/L. The Permittee is authorized to analyze and submit the results for the purgeable-only (volatile-only) subset of the TTOs in lieu of results for all TTOs. For each TTO compliance sample, the Permittee shall collect composite samples consisting of a minimum of four time- or flow-proportional aliquots. The sample vials shall be sealed immediately after collection.

The Permittee is authorized to analyze and submit the results for the purgeable (volatile) subset of the TTOs in lieu of results for all TTOs. The following is a list of those compounds which comprise the purgeable TTO compounds:

- Benzene
- Dichlorobromomethane
- Bromoform Tribromomethane)
- Methyl bromide (Bromomethane)
- Carbon tetrachloride (Tetrachloromethane)
- Chlorobenzene
- Chloroethane
- 2-Chloroethyl vinyl ether (mixed)
- Chloroform (Trichloromethane)
- Methylene chloride (Chloromethane)
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene

- 1,1-Dichlorethane
- 1,2-Dichloroethane
- 1,1- Dichloroethene
- 1,2-trans-Dichloroethylene
- 1,2-Dichloropropane
- cis-1,3-Dichloropropylene (cis-1,3-Dichloropropene)
- trans-1,3-Dichloropropylene (trans-1,3-Dichloropropene)
- Ethylbenzene
- Methylene chloride (Dichloromethane)
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene (Tetrachloroethene)
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethene (Trichloroethylene)
- 1,2-Dichloropropane
- Vinyl chloride (Chloroethylene)

Provided that the Permittee has prepared and submitted a Toxic Organic Management Plan as required in S12 of this permit, the Permittee is authorized to submit the following TTO certification statement monthly in lieu of performing TTO monitoring:

TTO Certification Statement:

"Based on my inquiry of the person or persons directly responsible for managing compliance with the permit limitation for total toxic organics (TTO), I certify that, to the best of my knowledge and belief, no dumping of concentrated toxic organics into wastewaters has occurred since the filing of the last discharge monitoring report. I further certify that this facility is implementing the toxic organic management plan submitted to the Washington State Department of Ecology."

Responsible Official ________________________________ Date ____________

[f] The Permittee must monitor the final effluent for pH by means of a pH probe/recorder. The Permittee must calibrate and maintain the meter and probe in such a manner as to ensure its reliability and accuracy. Calibration and maintenance activities must be recorded in an operator's log.

[g] Semiannual sampling periods are January through June, and July through December.

S2.B. Sampling and analytical procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets and maintenance-related conditions affecting effluent quality.

Sampling and analytical methods used to meet the water and wastewater monitoring requirements specified in this permit must conform to the latest revision of the following rules and documents unless otherwise specified in this permit or approved in writing by Ecology.

- Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136.
- Standard Methods for the Examination of Water and Wastewater (APHA).

S2.C. Flow measurement, and continuous monitoring devices

The Permittee must:

1. Select and use appropriate flow measurement, and continuous monitoring devices and methods consistent with accepted scientific practices.

2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard and the manufacturer's recommendation for that type of device.
3. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
4. Calibrate these devices at the frequency recommended by the manufacturer.
5. Maintain calibration records for at least three years.

S2.D. Laboratory accreditation

The Permittee must ensure that all monitoring data required by Ecology for permit specified parameters is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. Flow, pH, and internal process control parameters are exempt from this requirement.

S3. Reporting and recording requirements

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

S3.A. Reporting

The first monitoring period begins on the effective date of the permit. The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic Discharge Monitoring Report (DMR) form provided by Ecology within WAWebDMR. Include data for each of the parameters tabulated in Special Condition S2 and as required by the form. Report a value for each day sampling occurred (unless specifically exempted in the permit) and for the summary values (when applicable) included on the electronic form.

   To find out more information and to sign up for WAWebDMR go to: http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html .

   If the Permittee is unable to submit electronically (for example, if the Permittee does not have an internet connection), the Permittee must contact Ecology to request a waiver and obtain instructions on how to obtain a paper copy DMR.
2. Enter the "no discharge" reporting code for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate, if the Permittee did not discharge wastewater or a specific pollutant during a given monitoring period.
3. Report single analytical values below the detection level as "less than the detection level (DL)" by entering "<" followed by the numeric value of the detection level (e.g. "< 2.0") on the DMR. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.

4. Calculate average values (unless otherwise specified in the permit) using:
   a. The reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.
   b. One-half the detection value (for values reported below the detection level) if the laboratory detected the parameter in another sample for the reporting period.
   c. Zero (for values reported below the detection limit) if the lab did not detect the parameter in another sample for the reporting period.
5. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in Appendix A of this permit.
6. If the Permittee has obtained a waiver from electronic reporting or if submitting prior to the compliance date, the Permittee must submit a paper copy of the laboratory report providing the following information: date sampled, sample location, date of analysis, parameter name, CAS number, analytical method/number, detection level (DL), laboratory quantitation level (QL), reporting units, and concentration detected.

   The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.
7. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.
8. Submit DMRs for parameters with the monitoring frequencies specified in S2 (monthly, quarterly, annual, etc.) at the reporting schedule identified below. The Permittee must:
   a. Submit **monthly** DMRs by the 28th day of the following month.
   b. Submit **semi-annual DMRs**, unless otherwise specified in the permit, by July 28 and January 28 of each year. Semi-annual sampling periods are January through June, and July through December.

S3.B. Permit submittals and schedules

The Permittee must use the Water Quality Permitting Portal – Permit Submittals application (unless otherwise specified in the permit) to submit all other written permit-required reports by the date specified in the permit.

When another permit condition requires submittal of a paper (hard-copy) report, the Permittee must ensure that it is postmarked or received by Ecology no later than the dates specified by this permit. Send these paper reports to Ecology at:

Water Quality Permit Coordinator
WA State Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

S3.C. Records retention

The Permittee must retain records of all monitoring information for a minimum of three years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

S3.D. Recording of results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

S3.E. Additional monitoring by the Permittee

If the Permittee monitors the effluent for any pollutant more frequently than required by Condition S2 of this permit utilizing monitoring and analytical protocols specified in this permit, the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR unless otherwise specified by Condition S2.

S3.F. Reporting permit violations

The Permittee must take the following actions upon becoming aware that it has violated or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and clean up unauthorized discharges or otherwise stop the noncompliance and correct the problem.
2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

a. Immediate reporting

The Permittee must report any noncompliance that may endanger health or the environment immediately to the Department of Ecology's Regional Office 24-hour number listed below:

Northwest Regional Office	425-649-7000

If the noncompliance is a discharge to either sanitary or stormwater, Technical Glass Products must also contact the City of Snoqualmie:

Stormwater Hotline	425-831-4919
WWTP	425-888-8015

b. Twenty-four-hour reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone number listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances. The Permittee must report:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.
2. Any unanticipated bypass that causes an exceedance of an effluent limit in the permit (See Part S4.A., "Bypass Procedures").
3. Any upset that causes an exceedance of an effluent limit in the permit. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.
4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.
5. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit.

c. Report within five days

The Permittee must also submit a written report within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The report must contain:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times.
3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
5. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

d. Waiver of written reports

Ecology may waive the written report required in subpart c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

e. All other permit violation reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in subpart c, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

f. Report submittal

The Permittee must submit reports to:

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 - 160th Avenue SE
Bellevue, WA 98008-5452

S3.G. Other reporting

a. Spills of oil or hazardous materials

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and chapter 173-303-145. You can obtain further instructions at the following website: https://ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue/Report-a-spill

b. Failure to submit relevant or correct facts

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to Ecology, it must submit such facts or information promptly.

S3.H. Maintaining a copy of this permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S3.I. Dangerous waste discharge notification

The Permittee must notify the publicly owned treatment works (POTW) and Ecology in writing of the intent to discharge into the POTW any substance designated as a dangerous waste in accordance with the provisions of WAC 173-303-070. It must make this notification at least 90 days prior to the date that it proposes to initiate the discharge. The Permittee must not discharge this substance until authorized by Ecology and the POTW. It must also comply with the notification requirements of Special Condition S8 and General Condition G4.

S3.J. Spill notification

The Permittee must notify the POTW immediately (as soon as discovered) of all discharges that could cause problems to the POTW, such as process spills and unauthorized discharges (including slug discharges).

S4. Operation and maintenance

The Permittee must, at all times, properly operate and maintain all facilities or systems of treatment and control (and related appurtenances) which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a Permittee only when the operation is necessary to achieve compliance with the conditions of this permit.

S4.A. Bypass procedures

This permit prohibits a bypass, which is the intentional diversion of waste streams from any portion of a treatment facility. Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit authorizes a bypass if it allows for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by Ecology prior to the bypass. The Permittee must submit prior notice, if possible, at least ten (10) days before the date of the bypass.

2. Bypass is unavoidable, unanticipated, and results in noncompliance of this permit.

   This permit authorizes such a bypass only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. “Severe property damage” means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   b. No feasible alternatives to the bypass exist, such as:

      - The use of auxiliary treatment facilities.
      - Retention of untreated wastes.
      - Stopping production.

- Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
- Transport of untreated wastes to another treatment facility.

c. The Permittee has properly notified Ecology of the bypass as required in Condition S3.E of this permit.

3. If bypass is anticipated and has the potential to result in noncompliance of this permit.

a. The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:

- A description of the bypass and its cause.
- An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.
- A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
- The minimum and maximum duration of bypass under each alternative.
- A recommendation as to the preferred alternative for conducting the bypass.
- The projected date of bypass initiation.
- A statement of compliance with SEPA.
- A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
- Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during preparation of the engineering report or facilities plan and plans and specifications and must include these to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:

- If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.

- If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.
- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

S4.B. Best management practices

The Permittee must:

1. Dispose of sludge and scale from dip tanks, spray tanks, settling tanks, sumps and solids from grease traps in an approved manner other than to the sanitary sewer or storm sewer system, and other than to waters of the state.
2. Store all barrels or similar containers containing toxic or deleterious materials, including but not limited to petroleum products, chlorinated organic compounds, cyanide and heavy metals in a bermed and covered area, to prevent discharge into the sanitary or storm sewer system or into ground or surface waters in the event of leakage or rupture.
3. Store empty barrels with all openings plugged, in an upright position, and at least ten feet from a storm drain.
4. **Not** discharge concentrated organic compounds to the sanitary sewer system.
5. Store waste chemicals awaiting disposal in such a manner as to not enter waters of the state.
6. Close the spill control valve (when so-equipped) if a spill occurs within the process area, to prevent the entry of concentrated wastes or chemicals into the sanitary sewer system.
7. Exclude stormwater from the sanitary sewer system except as specifically authorized in this permit.
8. Maintain a pH log for all batch discharges of wastewater.
9. Segregate and store non-compatible chemicals securely in separate containment areas that prevent mixing of incompatible or reactive materials.
10. Locate process tanks in a bermed, roofed, secured area, capable of containing a minimum of 110% of the volume capacity of the largest tank within the bermed enclosure.
11. Maintain a sealed floor within the bermed area of all wet metal finishing areas, as well as areas which serve as storage areas for wet process chemicals and baths.

12. Maintain the pretreatment system in good operating order.
13. Discharge fluids contained in machinery parts (for example, hydraulic fluid, jet fuel, antifreeze, motor oil, gear oil, gasoline, machine tool coolants and kerosene) to collection vessels prior to washing the part, in any instances in which the wash/rinse water is to be discharged to the sanitary sewer. The collected fluids must not be discharged to the sanitary sewer.
14. **Not** discharge motor oil, brake fluid, gear oil, and automatic transmission fluid drained from vehicles in motor vehicle or equipment maintenance areas to the sanitary sewer or storm sewer.
15. Maintain all grease traps and oil/water separators which discharge to the Industrial Wastewater Treatment Plant (IWTP), or to the POTW, in good working order. Inspect such traps on at least a monthly basis and clean as necessary. Maintain a log of each such inspection and cleaning performed and make the log available, upon request, to Ecology during any inspection of the facility it conducts.
16. **Not** discharge particles, grit and paint chips resulting from grinding, sanding, shotpeining, abrasive blasting, cutting, and any other abrasive operations to the sanitary sewer.
17. **Not** discharge fire retardant foaming agents such as AFFF to the sanitary sewer system in quantities sufficient to cause excessive foaming in the POTW effluent or to otherwise cause interference at the POTW.
18. **Not** discharge surfactant materials such as soaps and detergents to the sanitary sewer in quantities sufficient to cause excessive foaming in the POTW effluent or to otherwise cause interference in the POTW. Excessive foaming is foaming resulting in interference, pass-through, or upset at the POTW, or which otherwise impedes the normal and efficient operation of the POTW.
19. **Not** discharge colored materials or other low-transmittance material to the sanitary sewer in such quantities or concentrations as to interfere with the disinfection process at the POTW, or in such amounts as to cause pass-through resulting in impairment of the aesthetic character or designated uses of the receiving water.

S5. Prohibited discharges

The Permittee must comply with these General and Specific Prohibitions.

S5.A. General prohibitions

The Permittee must not introduce into the POTW pollutant(s), which cause pass through or interference.

S5.B. Specific prohibitions

In addition, the Permittee must not introduce the following into the POTW:

1. Pollutants which create a fire or explosion hazard in the POTW, including, but not limited to, waste streams with a closed cup flashpoint of less than 60 degrees C (140 degrees F) using the test methods specified in 40 CFR 261.21.
2. Solid or viscous pollutants in amounts, which will cause obstruction to the flow in the POTW resulting in interference.
3. Any pollutant (including oxygen-demanding pollutants (BOD_5, etc.), released in a discharge at a flow rate and/or pollutant concentration that will cause interference with the POTW.
4. Heat in amounts which will inhibit biological activity in the POTW resulting in interference, but in no case heat in such quantities that the temperature at the POTW treatment plant exceeds 40 degrees C (104 degrees F) unless the approval authority, upon request of the POTW, approves alternative temperature limits.
5. Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through.
6. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems.
7. Any trucked or hauled pollutants, except at discharge points designated by the POTW.
8. Pollutants that will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0 or greater than 11.0, unless specified in this permit.

S5.C. Prohibited unless approved

Any of the following discharges are prohibited unless approved by Ecology under extraordinary circumstances (such as a lack of direct discharge alternatives due to combined sewer service or a need to augment sewage flows due to septic conditions):

1. Noncontact cooling water in significant volumes.
2. Storm water and other direct inflow sources.
3. Wastewaters significantly affecting system hydraulic loading, which do not require treatment or would not be afforded a significant degree of treatment by the system.
4. The discharge of dangerous wastes as defined in Chapter 173-303 WAC (unless specifically authorized in this permit).

S6. Dilution prohibited

The Permittee must not dilute the wastewater discharge with stormwater or increase the use of potable water, process water, noncontact cooling water, or, in any way, attempt to dilute an effluent as a partial or complete substitute for adequate treatment to achieve compliance with the limits contained in this permit.

S7. Solid waste disposal

S7.A. Solid waste handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

S7.B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

S8. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit no later than September 30, 2024. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF).

The Permittee must also submit a new application or supplement at least 60 days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

S9. Non-routine and unanticipated discharges

1. Beginning on the effective date of this permit, the Permittee is authorized to discharge non-routine wastewater on a case-by-case basis to the sanitary sewer if approved by Ecology and the POTW. Prior to any such discharge, the Permittee must contact Ecology and, **at a minimum,** provide the following information:
   a. The proposed discharge location.
   b. The nature of the activity that will generate the discharge.
   c. Any alternatives to the discharge, such as reuse, storage, or recycling of the water.
   d. The total volume of water it expects to discharge.
   e. The results of the chemical analysis of the water.
   f. The date of proposed discharge.
   g. The expected rate of discharge discharged, in gallons per day.
2. The expected rate of discharge in gallons per minute for discharges greater than 20,000 gallons per day.
3. The Permittee must analyze the water for all constituents limited for the discharge and report them as required by subpart 1.e above. The analysis must also include any parameter deemed necessary by Ecology. All discharges must comply with the effluent limits as established in Condition S1 of this permit and any other limits imposed by Ecology.
4. The discharge cannot proceed until Ecology has reviewed the information provided and has authorized the discharge by letter to the Permittee or by an Administrative Order.

S10. Spill control plan

S10.A. Spill control plan requirements

The Permittee must:

1. Prepare and maintain a spill control plan for the prevention, containment, and control of spills or unplanned releases of pollutants. Follow the plan and any supplements throughout the term of the permit.
2. Maintain the spill control plan on-site and make it available to Ecology inspectors on request.
3. Periodically review, the spill control plan, and update it as necessary to maintain its effectiveness with respect to maintaining compliance with the provisions of this permit.

S10.B. Spill control plan components

The spill control plan must include the following:

1. A list of all oil and petroleum products and other materials used and/or stored on-site, which when spilled, or otherwise released into the environment, designate as dangerous waste (DW) or extremely hazardous waste (EHW) by the procedures set forth in WAC 173-303-070. Include other materials used and/or stored on-site, which may become pollutants or cause pollution upon reaching state's waters.
2. A description of preventive measures and facilities (including an overall facility plot showing drainage patterns) which prevent, contain, or treat spills of these materials.
3. A description of the reporting system the Permittee will use to alert responsible managers and legal authorities in the event of a spill.
4. A description of operator training to implement the plan.

S11. Slug discharge control plan

S11.A. Slug discharge control plan requirements

The Permittee must:

1. Prepare and maintain a plan to minimize the potential of slug discharges from the facility covered by this permit.
2. Keep the current slug discharge control plan on the plant site and make it readily available to facility personnel, and Ecology inspectors upon request.
3. Follow the plan and any approved supplements throughout the term of the permit.
4. Periodically review, the slug discharge control plan, and update it as necessary to maintain its effectiveness with respect to maintaining compliance with the provisions of this permit.

S11.B. Slug discharge control plan components

The slug discharge control plan must include the following information and procedures relating to the prevention of unauthorized slug discharges; it must include:

1. A description of a reporting system the Permittee will use to immediately notify facility management, the POTW operator, and appropriate state, federal, and local authorities of any slug discharges, and provisions to provide a written follow-up report within five days.
2. A description of operator training, equipment, and facilities (including overall facility plan) for preventing, containing, or treating slug discharges.
3. Procedures to prevent adverse impact from accidental spills including:
    a. Inspection and maintenance of storage areas.
    b. Handling and transfer of materials.
    c. Loading and unloading operations.
    d. Control of plant site run-off.
    e. Worker training.
    f. Building of containment structures or equipment.
    g. Measures for containing toxic organic pollutants (including solvents).
    h. Measures and equipment for emergency response.
4. A list of all raw materials, products, chemicals, and hazardous materials used, processed, or stored at the facility; the normal quantity maintained on the premises for each listed material; and a map showing where they are located.
5. A description of discharge practices for batch and continuous processes under normal and non-routine circumstances.
6. A brief description of any unauthorized discharges which occurred during the 36-month period preceding the effective date of this permit and subsequent measures taken by Permittee to prevent or to reduce the possibility of further unauthorized discharges.
7. An implementation schedule including additional operator training and procurement and installation of equipment or facilities required to properly implement the plan.

S12. Toxic Organic Management Plan

The Permittee is required to prepare and maintain a toxic organic management plan. The plan must include a description of the procedures used by the Permittee, to minimize the discharge of Total Toxic Organic Compounds (TTO) to the sanitary sewer. The term “TTO” includes those organic compounds listed in 40 CFR Part 433.11(e). The Permittee must review the toxic organic management plan at least annually and modify the plan, as necessary, to meet the provisions of this permit with respect to discharge of Toxic Organic Compounds to the POTW and to groundwater.

General Conditions

G1. Signatory requirements

All applications, reports, or information submitted to Ecology must be signed as follows:

1. All permit applications must be signed by either a principal executive officer or ranking elected official.
2. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
   a. The authorization is made in writing by the person described above and is submitted to Ecology at the time of authorization, and
   b. The authorization specifies either a named individual or any individual occupying a named position.
3. Changes to authorization. If an authorization under paragraph G1.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.
4. Certification. Any person signing a document under this section must make the following certification:

   "I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. Right of entry

Representatives of Ecology have the right to enter at all reasonable times in or upon any property, public or private, for the purpose of inspecting and investigating conditions relating to the pollution or the possible pollution of any waters of the state. Reasonable times include normal business hours; hours during which production, treatment, or discharge occurs; or times when Ecology suspects a violation requiring immediate inspection. Representatives of Ecology must be allowed to have access to, and copy at reasonable cost, any records required to be kept under terms and conditions of the permit; to inspect any monitoring equipment or method required in the permit; and to sample the discharge, waste treatment processes, or internal waste streams.

G3. Permit actions

This permit is subject to modification, suspension, or termination, in whole or in part by Ecology for any of the following causes:

1. Violation of any permit term or condition;
2. Obtaining a permit by misrepresentation or failure to disclose all relevant facts;
3. A material change in quantity or type of waste disposal;
4. A material change in the condition of the waters of the state; or
5. Nonpayment of fees assessed pursuant to RCW 90.48.465.

Ecology may also modify this permit, including the schedule of compliance or other conditions, if it determines good and valid cause exists, including promulgation or revisions of regulations or new information.

G4. Reporting a cause for modification

The Permittee must submit a new application, or a supplement to the previous application, along with required engineering plans and reports, whenever a new or increased discharge or change in the nature of the discharge is anticipated which is not specifically authorized by this permit. This application must be submitted at least 60 days prior to any proposed changes. Submission of this application does not relieve the Permittee of the duty to comply with the existing permit until it is modified or reissued.

G5. Plan review required

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with Chapter 173-240 WAC. Engineering reports, plans, and specifications should be submitted at least 60 days prior to the planned start of construction. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in the permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

This permit is automatically transferred to a new owner or operator if:

1. A written agreement between the old and new owner or operator containing a specific date for transfer of permit responsibility, coverage, and liability is submitted to Ecology;
2. A copy of the permit is provided to the new owner; and
3. Ecology does not notify the Permittee of the need to modify the permit.

Unless this permit is automatically transferred according to Section 1, above, this permit may be transferred only if it is modified to identify the new Permittee and to incorporate such other requirements as determined necessary by Ecology.

G8. Reduced production for compliance

The Permittee must control production or discharge to the extent necessary to maintain compliance with the terms and conditions of this permit upon reduction of efficiency, loss, or failure of its treatment facility until the treatment capacity is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power for the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the effluent stream for discharge.

G10. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology. Ecology may revoke this permit if the permit fees established under Chapter 173-224 WAC are not paid.

G11. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs is a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit incurs, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is a separate and distinct violation.

G12. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G13. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of chapter 90.48 RCW and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

APPENDIX A

LIST OF POLLUTANTS WITH ANALYTICAL METHODS, DETECTION LIMITS AND QUANTITATION LEVELS

The Permittee must use the specified analytical methods, detection limits (DLs) and quantitation levels (QLs) in the following table for permit and application required monitoring unless:

- Another permit condition specifies other methods, detection levels, or quantitation levels.
- The method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136.

If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

When the permit requires the Permittee to measure the base neutral compounds in the list of priority pollutants, it must measure all of the base neutral pollutants listed in the table below. The list includes EPA required base neutral priority pollutants and several additional polynuclear aromatic hydrocarbons (PAHs). The Water Quality Program added several PAHs to the list of base neutrals below from Ecology's Persistent Bioaccumulative Toxics (PBT) List. It only added those PBT parameters of interest to Appendix A that did not increase the overall cost of analysis unreasonably.

Ecology added this appendix to the permit in order to reduce the number of analytical "non-detects" in permit-required monitoring and to measure effluent concentrations near or below criteria values where possible at a reasonable cost.

CONVENTIONAL PARAMETERS

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL) [1] *µg/L unless specified***	**Quantitation Level (QL) [2] *µg/L unless specified***
Flow	Calibrated device		
pH	Calibrated Device	N/A	N/A

PRIORITY POLLUTANTS

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL) [1] *µg/L unless specified***	**Quantitation Level (QL) [2] *µg/L unless specified***
METALS, CYANIDE & TOTAL PHENOLS			
Cadmium, Total (7440-43-9)	200.8	0.05	0.25
Chromium (hex) dissolved (18540-29-9)	SM3500-Cr EC	0.3	1.2
Chromium, Total (7440-47-3)	200.8	0.2	1.0
Copper, Total (7440-50-8)	200.8	0.4	2.0
Lead, Total (7439-92-1)	200.8	0.1	0.5
Nickel, Total (7440-02-0)	200.8	0.1	0.5
Silver, Total (7440-22-4)	200.8	0.04	0.2
Zinc, Total (7440-66-6)	200.8	0.5	2.5
Zirconium, total (Permittee authorized to submit sum of zirconium and hafnium if analytical protocol has difficulty distinguishing as separate quanitifiable entities)	ICP or AA	100	200
Cyanide, Total (57-12-5)	335.4	5	10

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)** [1] *µg/L unless specified*	**Quantitation Level (QL)** [2] *µg/L unless specified*
VOLATILE COMPOUNDS			
Acrolein (107-02-8)	624	5	10
Acrylonitrile (107-13-1)	624	1.0	2.0
Benzene (71-43-2)	624.1	4.4	13.2
Bromoform (75-25-2)	624.1	4.7	14.1
Carbon tetrachloride (56-23-5)	624.1/601 or SM6230B	2.8	8.4
Chlorobenzene (108-90-7)	624.1	6.0	18.0
Chloroethane (75-00-3)	624/601	1.0	2.0
2-Chloroethylvinyl Ether (110-75-8)	624	1.0	2.0
Chloroform (67-66-3)	624.1 or SM6210B	1.6	4.8
Dibromochloromethane (124-48-1)	624.1	3.1	9.3
1,2-Dichlorobenzene (95-50-1)	624	1.9	7.6
1,3-Dichlorobenzene (541-73-1)	624	1.9	7.6
1,4-Dichlorobenzene (106-46-7)	624	4.4	17.6
Dichlorobromomethane (75-27-4)	624.1	2.2	6.6
1,1-Dichloroethane (75-34-3)	624.1	4.7	14.1
1,2-Dichloroethane (107-06-2)	624.1	2.8	8.4
1,1-Dichloroethylene (75-35-4)	624.1	2.8	8.4
1,2-Dichloropropane (78-87-5)	624.1	6.0	18.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) (542-75-6) **6**	624.1	5.0	15.0
Ethylbenzene (100-41-4)	624.1	7.2	21.6
Methyl bromide (74-83-9) (Bromomethane)	624/601	5.0	10.0
Methyl chloride (74-87-3) (Chloromethane)	624	1.0	2.0
Methylene chloride (75-09-2)	624.1	2.8	8.4
1,1,2,2-Tetrachloroethane (79-34-5)	624.1	6.9	20.7
Tetrachloroethylene (127-18-4)	624.1	4.1	12.3
Toluene (108-88-3)	624.1	6.0	18.0
1,2-Trans-Dichloroethylene (156-60-5) (Ethylene dichloride)	624.1	1.6	4.8
1,1,1-Trichloroethane (71-55-6)	624.1	3.8	11.4
1,1,2-Trichloroethane (79-00-5)	624.1	5.0	15.0
Trichloroethylene (79-01-6)	624.1	1.9	5.7
Vinyl chloride (75-01-4)	624/SM6200B	1.0	2.0

1. Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.
2. Quantitation Level (QL) also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10n, where n is an integer (64 FR 30417).
   ALSO GIVEN AS:
   The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency, December 2007).

Issuance Date: June 5, 2018
Effective Date: July 1, 2018
Expiration Date: June 30, 2023

State Waste Discharge Permit Number ST0501298

State of Washington
DEPARTMENT OF ECOLOGY
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

In compliance with the provisions of the
State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington, as amended,

MicroConnex Corporation
34935 SE Douglas Street Suite 110
Snoqualmie, WA 98065

is authorized to discharge wastewater in accordance with the special and general conditions which follow.

Facility Location: 34935 SE Douglas St. Suite 110 Snoqualmie, WA 98065 Industry Type: Manufacturing of Bare Printed Circuit Boards POTW Receiving Discharge: City of Snoqualmie Water Reclamation Facility	SIC Code: 3672 NAICS Code: 334412 Significant Industrial User Categorical Industry

Rachel McCrea
Water Quality Section Manager
Northwest Regional Office
Washington State Department of Ecology

Table of Contents

Summary of Permit Report Submittals

Refer to the Special and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A	Discharge Monitoring Report (DMR)	Monthly	August 28, 2018
S3.A	Discharge Monitoring Report (DMR)	Quarterly	October 28, 2018
S3.F	Reporting Permit Violations	As necessary	
S4.A	Operation and Maintenance Manual	1/permit cycle	September 1, 2018
S4.A	O&M Manual Update	As necessary	Within 30 days of adoption of modified element
S4.B	Reporting Bypasses	As necessary	
S7.C	Solid Waste Control Plan	1/permit cycle	September 1, 2018
S8	Application for Permit Renewal	1/permit cycle	May 1, 2023
S10	Slug Discharge Control Plan	1/permit cycle	September 1, 2018
G1	Notice of Change in Authorization	As necessary	
G4	Permit Application for Substantive Changes to the Discharge	As necessary	
G5	Engineering Report for Construction or Modification Activities	As necessary	
G7	Notice of Permit Transfer	As necessary	
G12	Duty to Provide Information	As necessary	

Special Conditions

S1. Discharge limits

All discharges and activities authorized by this permit must comply with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a concentration in excess of, that authorized by this permit violates the terms and conditions of this permit.

A discharge of a pollutant in excess of local limits set by the City of Snoqualmie violates the terms and conditions of this permit.

Beginning on the effective date, the Permittee is authorized to discharge wastewater to the City of Snoqualmie's sanitary sewer system subject to the following limits at outfall # 001. The monitoring point for outfall # 001 is the discharge of the metal finishing rinse water line and non-metal bearing categorical wastewater line at a point at or downstream of the discharge of the pretreatment system, and downstream of any addition of any batch process wastewater discharges, and prior to mixture with sanitary, storm, or noncontact cooling water wastewaters.

MicroConnex Corporation - Discharge Limits: Outfall # 001		
Parameter	**Average Monthly [a]**	**Maximum Daily [b]**
Flow (gallons per day, gpd)	N/A	9200
Cadmium (T) (mg/L) [c]	0.07	0.11
Chromium (T) (mg/L) [c]	1.71	2.77
Copper (T) (mg/L) [c]	2.07	3.38
Lead (T) (mg/L) [c]	0.43	0.69
Nickel (T) (mg/L) [c]	2.38	3.98
Silver (T) (mg/L) [d]	0.24	0.43
Zinc (T) (mg/L) [c]	1.48	2.61
Cyanide (T) (mg/L) [d]	0.65	1.20
TTO (mg/L) [e]	N/A	2.13

Parameter	Minimum	Maximum
pH, standard units	5.5	9.0

a	Average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured.
b	Maximum daily effluent limit means the highest allowable daily discharge. The daily discharge means the maximum discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. For other units of measurement, the daily discharge is the average measurement of the pollutant over the day. This does not apply to pH.
c	The "T" following the names of metals indicates total, as opposed to dissolved metals.
d	The "T" following cyanide indicates total cyanide, as opposed to cyanide amenable to chlorination.
e	Total toxic organics (TTO) means the sum of the concentrations for each of the toxic organic compounds as listed in 40 CFR 433.11 (e) which is found in the discharge at a concentration greater than ten (10) micrograms per liter. The Permittee is authorized to analyze and submit the results for the purgeable (volatile) subset of the TTO compounds in lieu of the results for all TTO compounds listed in 40 CFR 433.11 (e). The Permittee must employ Method 624, or USEPA Method 8270 and/or USEPA Method 8260B or equivalent method approved by Washington State Department of Ecology, for analysis of the purgeable TTO compounds. The following is a list of those compounds which comprise the purgeable TTO compounds:

- Benzene
- Dichlorobromomethane
- Bromoform (Tribromomethane)
- Methyl bromide (Bromomethane)
- Carbon tetrachloride (Tetrachloromethane)
- Chlorobenzene
- Chloroethane
- 2-Chloroethyl vinyl ether (mixed)
- Chloroform (Trichloromethane)
- Methylene chloride (Chloromethane)
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- 1,1-Dichlorethane
- 1,2-Dichloroethane
- 1,1- Dichloroethene
- 1,2-trans-Dichloroethylene
- 1,2-Dichloropropane
- cis-1,3-Dichloropropylene (cis-1,3-Dichloropropene)
- trans-1,3-Dichloropropylene (trans-1,3-Dichloropropene)
- Ethylbenzene
- Methylene chloride (Dichloromethane)
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene (Tetrachloroethene)
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethene (Trichloroethylene)
- 1,2-Dichloropropane
- Vinyl chloride (Chloroethylene)

The Permittee is authorized to discharge up to 2,000 gallons per day of noncontact cooling water if the facility's recirculating chiller systems fail during a production run. Consistent with the permit condition listed under S5.C.1, MicroConnex Corporation (MicroConnex) must contact the Department of Ecology (Ecology) if MicroConnex must discharge more than 2,000 gallons of noncontact cooling water in one day.

S2. Monitoring requirements

S2.A. Monitoring requirements

The Permittee must monitor the wastewater in accordance with the following schedule and the requirements specified in Appendix A.

Parameter	Units	Sampling Frequency	Sample Type
(1) Final Wastewater Effluent			
Flow	gallons/day (gpd)	Daily	Recording meter
Cadmium (T) [c]	mg/L	Quarterly [e]	Composite [b]
Chromium (T) [c]	mg/L	Quarterly [e]	Composite [b]
Copper (T) [c]	mg/L	Monthly	Composite [b]
Lead (T) [c]	mg/L	Quarterly [e]	Composite [b]
Nickel (T) [c]	mg/L	Monthly	Composite [b]
Silver (T) [d]	mg/L	Quarterly [e]	Composite [b]
Zinc (T) [c]	mg/L	Quarterly [e]	Composite [b]
Cyanide (T) [d]	mg/L	Quarterly [e]	Composite [b]
pH [f]	Standard Units	Continuous [a]	Recording meter
Total Toxic Organics (TTO) [g]	mg/L	Quarterly [e]	Composite [b]

a	Continuous means uninterrupted except for brief lengths of time for calibration, power failure, or unanticipated equipment repair or maintenance. The time interval for the associated data logger must be no greater than 30 minutes. The Permittee must sample at least once an hour when continuous monitoring is not possible.
b	Daily composite samples shall be composited using time- or flow-proportional compositing techniques.
c	The "T" following the names of metals indicates total, as opposed to dissolved metals.
d	The "T" following cyanide indicates total cyanide, as opposed to cyanide amenable to chlorination.
e	Quarterly sampling periods are January through March, April through June, July through September, and October through December. The Permittee must begin quarterly monitoring for the quarter beginning on July 1, 2018.
f	The Permittee must monitor the final effluent for pH by means of a continuous pH probe/recorder. The Permittee must calibrate and maintain the meter and probe in such a manner as to ensure its reliability and accuracy. Calibration and maintenance activities must be recorded in an operator's log. If the continuous pH monitoring system is inoperable, the Permittee is authorized to monitor for pH manually using a calibrated pH meter. When pH is monitored manually, a pH reading must be taken at least one time each hour, and the measured pH values must be entered in the operator's log. When pH is continuously monitored, individual pH excursions not exceeding five minutes in duration, within the pH range of 5.0 through 5.49, and individual pH excursions not exceeding five minutes in duration, within the pH range of 9.01 through 9.5, will not be considered violations (and need not be reported in the discharge monitoring reports), provided that the total time which pH values are less than 5.5 or greater than 9.0 does not exceed two hours during the applicable calendar month. This exemption is only applicable to individual pH excursions which do not exceed five minutes in length. The Permittee must report the instantaneous maximum and minimum pH monthly. Do not average pH values.
g	Total toxic organics (TTO) means the sum of the concentrations for each of the toxic organic compounds as listed in 40 CFR 433.11 (e) which is found in the discharge at a concentration greater than ten (10) micrograms per liter. The Permittee is authorized to analyze and submit the results for the purgeable (volatile) subset of the TTO compounds in lieu of the results for all TTO compounds listed in 40 CFR 433.11 (e). The Permittee must employ Method 624, or USEPA Method 8270 and/or USEPA Method 8260B or equivalent method approved by Washington State Department of Ecology, for analysis of the purgeable TTO compounds. The following is a list of those compounds which comprise the purgeable TTO compounds: • Benzene • Dichlorobromomethane • Bromoform (Tribromomethane) • Methyl bromide (Bromomethane) • Carbon tetrachloride (Tetrachloromethane) • Chlorobenzene • Chloroethane • 2-Chloroethyl vinyl ether (mixed) • Chloroform (Trichloromethane) • Methylene chloride (Chloromethane) • 1,2-Dichlorobenzene • 1,3-Dichlorobenzene • 1,4-Dichlorobenzene • 1,1-Dichlorethane • 1,2-Dichloroethane • 1,1- Dichloroethene • 1,2-trans-Dichloroethylene • 1,2-Dichloropropane • cis-1,3-Dichloropropylene (cis-1,3-Dichloropropene) • trans-1,3-Dichloropropylene (trans-1,3-Dichloropropene) • Ethylbenzene • Methylene chloride (Dichloromethane) • 1,1,2,2-Tetrachloroethane • Tetrachloroethylene (Tetrachloroethene) • Toluene • 1,1,1-Trichloroethane • 1,1,2-Trichloroethane • Trichloroethene (Trichloroethylene) • 1,2-Dichloropropane • Vinyl chloride (Chloroethylene) In lieu of the monitoring and reporting requirements for TTO compounds, as described immediately above, the Permittee is authorized to elect to prepare a Toxic Organics Management Plan (TOMP), and submit the plan to the Department of Ecology, and comply with the provisions of that Plan. In addition, should the Permittee

	elect to employ this monitoring/ reporting exemption, the Permittee must submit a TTO Certification Statement with each Discharge Monitoring Report. The TTO Certification Statement text must be the following: ***"TTO Certification Statement*** *Based on my inquiry of the person or persons directly responsible for managing compliance with the permit limitation for total toxic organics (TTO), I certify, that to the best of my knowledge and belief, no dumping of concentrated organics into wastewaters has occurred since the filing of the last discharge monitoring report. I further certify that this facility is implementing the Toxic Organic Management Plan submitted to the Washington State Department of Ecology"* *Responsible Official ____________________________ Date ____________________"*

S2.B. Sampling and analytical procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets and maintenance-related conditions affecting effluent quality.

Sampling and analytical methods used to meet the water and wastewater monitoring requirements specified in this permit must conform to the latest revision of the following rules and documents unless otherwise specified in this permit or approved in writing by Ecology.

- Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136.
- Standard Methods for the Examination of Water and Wastewater (APHA).

S2.C. Flow measurement and continuous monitoring devices

The Permittee must:

1. Select and use appropriate flow measurement and methods consistent with accepted scientific practices.
2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard, the manufacturer's recommendation, and approved O&M manual procedures for the device and the wastestream.
3. Calibrate continuous monitoring instruments weekly unless it can demonstrate a longer period is sufficient based on monitoring records. The Permittee:
   a. Must calibrate continuous pH measurement instruments using a grab sample analyzed in the lab with a pH meter calibrated with standard buffers and analyzed within 15 minutes of sampling.
4. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
5. Establish a calibration frequency for each device or instrument in the O&M manual that conforms to the frequency recommended by the manufacturer.
6. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.
7. Maintain calibration records for at least three years.

S2.D. Laboratory accreditation

The Permittee must ensure that all monitoring data required by Ecology for permit specified parameters is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement.

S3. Reporting and recording requirements

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

S3.A. Discharge monitoring reports

The first monitoring period begins on the effective date of the permit (unless otherwise specified). The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic discharge monitoring report (DMR) form provided by Ecology within the Water Quality Permitting Portal. Include data for each of the parameters tabulated in Special Condition S2 and as required by the form. Report a value for each day sampling occurred (unless specifically exempted in the permit) and for the summary values (when applicable) included on the electronic form.

   To find out more information and to sign up for the Water Quality Permitting Portal go to: http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html

2. Enter the "No Discharge" reporting code for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate, if the Permittee did not discharge wastewater or a specific pollutant during a given monitoring period.

3. Report single analytical values below detection as "less than the detection level (DL)" by entering < followed by the numeric value of the detection level (e.g. < 2.0) on the DMR. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.

4. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in Appendix A OR S2.

5. Calculate average values and calculated total values (unless otherwise specified in the permit) using:

   a. The reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.

   b. One-half the detection value (for values reported below detection) if the lab detected the parameter in another sample from the same monitoring point for the reporting period.

c. Zero (for values reported below detection) if the lab did not detect the parameter in another sample for the reporting period.

6. Report single-sample grouped parameters (for example: priority pollutants, PAHs, pulp and paper chlorophenolics, TTOs) on the WQWebDMR form and include: sample date, concentration detected, detection limit (DL) (as necessary), and laboratory quantitation level (QL) (as necessary).

   The Permittee must also submit an electronic copy of the laboratory report as an attachment using WQWebDMR. The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.

7. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.

8. Submit DMRs for parameters with the monitoring frequencies specified in S2 (monthly, quarterly, annual, etc.) at the reporting schedule identified below. The Permittee must:

   a. Submit **monthly** DMRs by the 28th day of the following month.

   b. Submit **quarterly DMRs**, unless otherwise specified in the permit, by the 28th day of the month following the monitoring period. Quarterly sampling periods are January through March, April through June, July through September, and October through December. The Permittee must submit the first quarterly DMR on October 28, 2018, for the quarter beginning on July 1, 2018.

S3.B. Permit submittals and schedules

The Permittee must use the Water Quality Permitting Portal – Permit Submittals application (unless otherwise specified in the permit) to submit all other written permit-required reports by the date specified in the permit.

When another permit condition requires submittal of a paper (hard-copy) report, the Permittee must ensure that it is postmarked or received by Ecology no later than the dates specified by this permit. Send these paper reports to Ecology at:

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

S3.C. Records retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

S3.D. Recording of results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

S3.E. Additional monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR unless otherwise specified by Condition S2.

S3.F. Reporting permit violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.
2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

a. Immediate reporting

The Permittee must report any noncompliance that may endanger health or the environment immediately to the Department of Ecology's Regional Office 24-hour number listed below:

Northwest Regional Office	425-649-7000

If the noncompliance is a discharge to either sanitary or stormwater, MicroConnex must also contact the City of Snoqualmie:

Stormwater Hotline	425-831-4919
WWTP	425-888-8015

b. Twenty-four-hour reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone numbers listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances. The Permittee must report:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.

2. Any unanticipated bypass that causes an exceedance of an effluent limit in the permit (See Part S4.B., "Bypass Procedures").
3. Any upset that causes an exceedance of an effluent limit in the permit. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.
4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.
5. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit. This requirement does not include industrial process wastewater overflows to impermeable surfaces which are collected and routed to the treatment works.

c. Report within five days

The Permittee must also submit a written report within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The report must contain:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times.
3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
5. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

d. Waiver of written reports

Ecology may waive the written report required in subpart c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

e. All other permit violation reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in subpart c, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

S3.G. Other reporting

a. Spills of oil or hazardous materials

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and chapter WAC 173-303-145. You can obtain further instructions at the following website: http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm .

b. Failure to submit relevant or correct facts

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to Ecology, it must submit such facts or information promptly.

S3.H. Maintaining a copy of this permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S3.I. Dangerous waste discharge notification

The Permittee must notify the publicly owned treatment works (POTW) and Ecology in writing of the intent to discharge into the POTW any substance designated as a dangerous waste in accordance with the provisions of WAC 173-303-070. It must make this notification at least 90 days prior to the date that it proposes to initiate the discharge. The Permittee must not discharge this substance until authorized by Ecology and the POTW. It must also comply with the notification requirements of Special Condition S8 and General Condition G4.

S3.J. Spill notification

The Permittee must notify the POTW immediately (as soon as discovered) of all discharges that could cause problems to the POTW, such as process spills and unauthorized discharges (including slug discharges).

S4. Operation and maintenance

The Permittee must, at all times, properly operate and maintain all facilities or systems of treatment and control (and related appurtenances) which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a Permittee only when the operation is necessary to achieve compliance with the conditions of this permit.

S4.A. Operations and maintenance manual

a. O&M manual submittal and requirements

The Permittee must:

1. Prepare an Operations and Maintenance (O&M) Manual that meets the requirements of WAC 173-240-150 and submit it to Ecology for approval by September 1, 2018.

2. Review the O&M Manual at least annually.
3. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual.
4. Keep the approved O&M Manual at the permitted facility.
5. Follow the instructions and procedures of this manual.

b. O&M manual components

In addition to the requirements of WAC 173-240-150, the O&M manual must include:

1. Emergency procedures for plant shutdown and cleanup in event of wastewater system upset, spill, failure, or demand by the publicly owned treatment works (POTW) treating the discharge.
2. Wastewater system maintenance procedures that contribute to the generation of process wastewater.
3. Any directions to maintenance staff when cleaning, or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine.)
4. Wastewater sampling locations, protocols, and procedures for compliance with the sampling and reporting requirements in the wastewater discharge permit.
5. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.
6. Treatment plant process control monitoring schedule.

S4.B. Bypass procedures

This permit prohibits a bypass, which is the intentional diversion of waste streams from any portion of a treatment facility. Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit authorizes a bypass if it allows for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by Ecology prior to the bypass. The Permittee must submit prior notice, if possible, at least ten (10) days before the date of the bypass.

2. Bypass is unavoidable, unanticipated, and results in noncompliance of this permit.

   This permit authorizes such a bypass only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

b. No feasible alternatives to the bypass exist, such as:

- The use of auxiliary treatment facilities.
- Retention of untreated wastes.
- Stopping production.
- Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
- Transport of untreated wastes to another treatment facility.

c. The Permittee has properly notified Ecology of the bypass as required in Condition S3.E of this permit.

3. If bypass is anticipated and has the potential to result in noncompliance of this permit.

a. The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:

- A description of the bypass and its cause.
- An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.
- A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
- The minimum and maximum duration of bypass under each alternative.
- A recommendation as to the preferred alternative for conducting the bypass.
- The projected date of bypass initiation.
- A statement of compliance with SEPA.
- A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
- Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during the project planning and design process. The project-specific engineering report or facilities plan as well as the plans and specifications must include details of probable construction bypasses to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:

- If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.
- If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.
- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

S4.C. Best management practices\pollution prevention program

1. Chemical Storage

The Permittee must store solid chemicals, chemical solutions, paints, oils, solvents, acids, caustic solutions and waste materials, including used batteries, in a manner which will prevent the inadvertent entry of these materials into the POTW or waters of the state, including ground waters, and in a manner that will prevent spillage by overfilling, tipping, or rupture.

In addition, the Permittee must:

a. Store all liquid hazardous raw materials and waste products on durable impervious surfaces (commercial secondary containment pallets or flammable storage cabinets) or behind berms.

b. Store and dispense chemicals only in roofed areas to eliminate potential spills to waters of the state or contamination of stormwater runoff.

c. Locate any tank containing chemical solutions in a diked, or no-outlet area adequate to prevent chemical loss to waters of the state, or the sanitary sewer

d. Contain all quenching, hydraulic, machining, and lubricating oils to prevent spills, or loss to waters of the state or to the sanitary sewer.

e. Store waste liquids under cover, such as tarpaulins or roofed structures, or in a closed vessel.

f. Segregate and securely store incompatible or reactive materials in separate containment areas that prevent the mixing of chemicals.

g. Dispose of concentrated waste or spilled chemicals at a facility approved by Ecology or appropriate county health department in accordance with the Solid Waste Disposal Plan requirements of this permit.

h. Not dispose of concentrated waste or spilled chemicals to any sewer or state water.

i. Dispose of sludges and scale from cleaning tanks in an approved manner other than to the sewer system and other than to a state watercourse.

j. Not discharge concentrated organic solvents to the sewer system.

k. Close any spill control valves, if a spill occurs within the process area, to prevent the entry of concentrated chemicals to the sanitary sewer.

l. Treat all industrial wastes containing pollutants by using all known, available, and reasonable methods for treatment prior to discharge to the sanitary sewer.

m. Not discharge colored materials or other low-transmittance material to the sanitary sewer in such quantities or concentrations as to interfere with the disinfection process at the POTW, or in such amounts as to cause pass-through resulting in impairment of the aesthetic character or designated uses of the receiving water.

S5. Prohibited discharges

The Permittee must comply with these General and Specific Prohibitions.

S5.A. General prohibitions

The Permittee must not introduce into the POTW pollutant(s), which cause pass-through or interference.

S5.B. Specific prohibitions

In addition, the Permittee must not introduce the following into the POTW:

1. Pollutants which create a fire or explosion hazard in the POTW, including, but not limited to, waste streams with a closed cup flashpoint of less than 60 degrees C (140 degrees F) using the test methods specified in 40 CFR 261.21.
2. Solid or viscous pollutants in amounts, which will cause obstruction to the flow in the POTW resulting in interference.
3. Any pollutant (including oxygen-demanding pollutants (BOD_5, etc.), released in a discharge at a flow rate and/or pollutant concentration that will cause interference with the POTW.
4. Heat in amounts which will inhibit biological activity in the POTW resulting in interference, but in no case heat in such quantities that the temperature at the POTW treatment plant exceeds 40 degrees C (104 degrees F) unless the approval authority, upon request of the POTW, approves alternative temperature limits.
5. Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through.
6. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems.

7. Any trucked or hauled pollutants, except at discharge points designated by the POTW.
8. Pollutants that will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0 or greater than 11.0, unless the collection and treatment system is specifically designed to accommodate such discharges.

S5.C. Prohibited unless approved

Any of the following discharges are prohibited unless approved by Ecology under extraordinary circumstances (such as a lack of direct discharge alternatives due to combined sewer service or a need to augment sewage flows due to septic conditions):

1. Noncontact cooling water in significant volumes.
2. Storm water and other direct inflow sources.
3. Wastewaters significantly affecting system hydraulic loading, which do not require treatment or would not be afforded a significant degree of treatment by the system.
4. The discharge of dangerous wastes as defined in Chapter 173-303 WAC (unless specifically authorized by Ecology).

S6. Dilution prohibited

The Permittee must not dilute the wastewater discharge with stormwater or increase the use of potable water, process water, noncontact cooling water, or, in any way, attempt to dilute an effluent as a partial or complete substitute for adequate treatment to achieve compliance with the limits contained in this permit.

S7. Solid waste disposal

S7.A. Solid waste handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

S7.B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

S7.C. Solid waste control plan

a. Submittal requirements

The Permittee must:

1. Submit a solid waste control plan to Ecology by September 1, 2018.
2. Submit to Ecology any revision or modification of the solid waste control plan prior to implementation.
3. Comply with the plan and any modifications.
4. Submit an update of the solid waste control plan with permit renewal application.

b. Solid waste control plan content

The solid waste control plan must:

1. Follow Ecology's guidance for preparing a solid waste control plan and address all solid wastes generated by the permittee. https://fortress.wa.gov/ecy/publications/documents/0710024.pdf
2. Include at a minimum a description, source, generation rate, and disposal methods of these solid wastes.
3. Not conflict with local or state solid waste regulations.

S8. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit by May 1, 2023.

The Permittee must also submit a new application or addendum at least 60 days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications in the permitted facility which may result in a material change in quantity or type of waste disposal which is not specifically authorized in this permit.

S9. Non-routine and unanticipated discharges

1. Beginning on the effective date of this permit, the Permittee is authorized to discharge non-routine wastewater on a case-by-case basis to the sanitary sewer if approved by Ecology and the POTW. Prior to any such discharge, the Permittee must contact Ecology and **at a minimum** provide the following information:
   a. The proposed discharge location.
   b. The nature of the activity that will generate the discharge.
   c. Any alternatives to the discharge, such as reuse, storage, or recycling of the water.
   d. The total volume of water it expects to discharge.
   e. The results of the chemical analysis of the water.
   f. The date of proposed discharge.
   g. The expected rate of discharge discharged, in gallons per day.

h. The expected rate of discharge in gallons per minute for discharges greater than 20,000 gallons.

2. The Permittee must analyze the water for all constituents limited for the discharge and report them as required by subpart 1.e, above. The analysis must also include any parameter deemed necessary by Ecology. All discharges must comply with the effluent limits as established in Condition S1 of this permit and any other limits imposed by Ecology.

3. The discharge cannot proceed until Ecology has reviewed the information provided and has authorized the discharge by letter to the Permittee or by an Administrative Order.

S10. Slug discharge control plan

a. Slug discharge control plan submittal and requirements

The Permittee must:

1. Prepare and submit to Ecology, by September 1, 2018, a plan to minimize the potential of slug discharges from the facility covered by this permit. The plan and any subsequent revisions become effective 30 days following submission.
2. Review its slug discharge plan and update it as needed.
3. Submit all revisions or updates of this plan to Ecology for review.
4. Keep the current approved plan on the plant site and make it readily available to facility personnel.
5. Follow the approved plan and any approved supplements throughout the term of the permit.
6. Submit an update of the slug discharge control plan, or a certification that it is current by May 1, 2023.

b. Slug discharge control plan components

The slug discharge control plan must include the following information and procedures relating to the prevention of unauthorized slug discharges; it must include:

1. A description of a reporting system the Permittee will use to immediately notify facility management, the POTW operator, and appropriate state, federal, and local authorities of any slug discharges, and provisions to provide a written follow-up report within five days.
2. A description of operator training, equipment, and facilities (including overall facility plan) for preventing, containing, or treating slug discharges.
3. Procedures to prevent adverse impact from accidental spills including:
   a. Inspection and maintenance of storage areas.
   b. Handling and transfer of materials.
   c. Loading and unloading operations.
   d. Control of plant site run-off.

e. Worker training.

f. Building of containment structures or equipment.

g. Measures for containing toxic organic pollutants (including solvents).

h. Measures and equipment for emergency response.

4. A list of all raw materials, products, chemicals, and hazardous materials used, processed, or stored at the facility; the normal quantity maintained on the premises for each listed material; and a map showing where they are located.
5. A description of discharge practices for batch and continuous processes under normal and non-routine circumstances.
6. A brief description of any unauthorized discharges which occurred during the 36-month period preceding the effective date of this permit and subsequent measures taken by Permittee to prevent or to reduce the possibility of further unauthorized discharges.
7. An implementation schedule including additional operator training and procurement and installation of equipment or facilities required to properly implement the plan.

General Conditions

G1. Signatory requirements

All applications, reports, or information submitted to Ecology must be signed as follows:

1. All permit applications must be signed by either a principal executive officer or ranking elected official.
2. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
   a. The authorization is made in writing by the person described above and is submitted to Ecology at the time of authorization, and
   b. The authorization specifies either a named individual or any individual occupying a named position.
3. Changes to authorization. If an authorization under paragraph G1.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section must make the following certification:

   "I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. Right of entry

Representatives of Ecology have the right to enter at all reasonable times in or upon any property, public or private, for the purpose of inspecting and investigating conditions relating to the pollution or the possible pollution of any waters of the state. Reasonable times include normal business hours; hours during which production, treatment, or discharge occurs; or times when Ecology suspects a violation requiring immediate inspection. Representatives of Ecology must be allowed to have access to, and copy at reasonable cost, any records required to be kept under terms and conditions of the permit; to inspect any monitoring equipment or method required in the permit; and to sample the discharge, waste treatment processes, or internal waste streams.

G3. Permit actions

This permit is subject to modification, suspension, or termination, in whole or in part by Ecology for any of the following causes:

1. Violation of any permit term or condition;
2. Obtaining a permit by misrepresentation or failure to disclose all relevant facts;
3. A material change in quantity or type of waste disposal;
4. A material change in the condition of the waters of the state; or
5. Nonpayment of fees assessed pursuant to RCW 90.48.465.

Ecology may also modify this permit, including the schedule of compliance or other conditions, if it determines good and valid cause exists, including promulgation or revisions of regulations or new information.

G4. Reporting a cause for modification

The Permittee must submit a new application, or a supplement to the previous application, along with required engineering plans and reports, whenever a material change in quantity or type of waste disposal is anticipated which is not specifically authorized by this permit. This application must be submitted at least sixty (60) days prior to any proposed changes. Submission of this application does not relieve the Permittee of the duty to comply with the existing permit until it is modified or reissued.

G5. Plan review required

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with Chapter 173-240 WAC. Engineering reports, plans, and specifications should be submitted at least 180 days prior to the planned start of construction. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in the permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

This permit is automatically transferred to a new owner or operator if:

1. A written agreement between the old and new owner or operator containing a specific date for transfer of permit responsibility, coverage, and liability is submitted to Ecology;
2. A copy of the permit is provided to the new owner; and
3. Ecology does not notify the Permittee of the need to modify the permit.

Unless this permit is automatically transferred according to Section 1, above, this permit may be transferred only if it is modified to identify the new Permittee and to incorporate such other requirements as determined necessary by Ecology.

G8. Reduced production for compliance

The Permittee must control production or discharge to the extent necessary to maintain compliance with the terms and conditions of this permit upon reduction of efficiency, loss, or failure of its treatment facility until the treatment capacity is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power for the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the effluent stream for discharge.

G10. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology. Ecology may revoke this permit if the permit fees established under Chapter 173-224 WAC are not paid.

G11. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs is a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit incurs, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is a separate and distinct violation.

G12. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G13. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of chapter 90.48 RCW and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

Appendix A

LIST OF POLLUTANTS WITH ANALYTICAL METHODS, DETECTION LIMITS AND QUANTITATION LEVELS

The Permittee must use the specified analytical methods, detection limits (DLs), and quantitation levels (QLs) in the following table for permit and application required monitoring unless:

- Another permit condition specifies other methods, detection levels, or quantitation levels.
- The method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136.

If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

Ecology added this appendix to the permit in order to reduce the number of analytical “non-detects” in permit-required monitoring and to measure effluent concentrations near or below criteria values where possible at a reasonable cost.

The lists below include conventional pollutants (as defined in CWA section 502(6) and 40 CFR Part 122.) and toxic or priority pollutants as defined in CWA section 307(a)(1) and listed in 40 CFR Part 122 Appendix D, 40 CFR Part 401.15 and 40 CFR Part 423 Appendix A). 40 CFR Part 122 Appendix D (Table V) also identifies toxic pollutants and hazardous substances which are required to be reported by dischargers if expected to be present. This permit Appendix A list does not include those parameters.

CONVENTIONAL POLLUTANTS

Pollutant	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
pH		SM4500-H^+ B	N/A	N/A
Total Suspended Solids		SM2540-D		5 mg/L

Priority Pollutants	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
METALS, CYANIDE & TOTAL PHENOLS					
Antimony, Total	114	7440-36-0	200.8	0.3	1.0
Arsenic, Total	115	7440-38-2	200.8	0.1	0.5
Beryllium, Total	117	7440-41-7	200.8	0.1	0.5
Cadmium, Total	118	7440-43-9	200.8	0.05	0.25
Chromium (hex) dissolved	119	18540-29-9	SM3500-Cr C	0.3	1.2
Chromium, Total	119	7440-47-3	200.8	0.2	1.0
Copper, Total	120	7440-50-8	200.8	0.4	2.0
Lead, Total	122	7439-92-1	200.8	0.1	0.5
Mercury, Total	123	7439-97-6	1631E	0.0002	0.0005
Nickel, Total	124	7440-02-0	200.8	0.1	0.5
Selenium, Total	125	7782-49-2	200.8	1.0	1.0
Silver, Total	126	7440-22-4	200.8	0.04	0.2
Thallium, Total	127	7440-28-0	200.8	0.09	0.36
Zinc, Total	128	7440-66-6	200.8	0.5	2.5
Cyanide, Total	121	57-12-5	335.4	5	10
Cyanide, Weak Acid Dissociable	121		SM4500-CN I	5	10
Cyanide, Free Amenable to Chlorination (Available Cyanide)	121		SM4500-CN G	5	10
Phenols, Total	65		EPA 420.1		50

Priority Pollutants	**PP #**	**CAS Number (if available)**	**Recommended Analytical Protocol**	**Detection (DL)1 µg/L unless specified**	**Quantitation Level (QL) 2 µg/L unless specified**
VOLATILE COMPOUNDS					
Acrolein	2	107-02-8	624	5	10
Acrylonitrile	3	107-13-1	624	1.0	2.0
Benzene	4	71-43-2	624	1.0	2.0
Bromoform	47	75-25-2	624	1.0	2.0
Carbon tetrachloride	6	56-23-5	624/601 or SM6230B	1.0	2.0
Chlorobenzene	7	108-90-7	624	1.0	2.0
Chloroethane	16	75-00-3	624/601	1.0	2.0
2-Chloroethylvinyl Ether	19	110-75-8	624	1.0	2.0
Chloroform	23	67-66-3	624 or SM6210B	1.0	2.0
Dibromochloromethane (chlordibromomethane)	51	124-48-1	624	1.0	2.0
1,2-Dichlorobenzene	25	95-50-1	624	1.9	7.6
1,3-Dichlorobenzene	26	541-73-1	624	1.9	7.6
1,4-Dichlorobenzene	27	106-46-7	624	4.4	17.6
Dichlorobromomethane	48	75-27-4	624	1.0	2.0
1,1-Dichloroethane	13	75-34-3	624	1.0	2.0
1,2-Dichloroethane	10	107-06-2	624	1.0	2.0
1,1-Dichloroethylene	29	75-35-4	624	1.0	2.0
1,2-Dichloropropane	32	78-87-5	624	1.0	2.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) [6]	33	542-75-6	624	1.0	2.0
Ethylbenzene	38	100-41-4	624	1.0	2.0
Methyl bromide (Bromomethane)	46	74-83-9	624/601	5.0	10.0
Methyl chloride (Chloromethane)	45	74-87-3	624	1.0	2.0
Methylene chloride	44	75-09-2	624	5.0	10.0
1,1,2,2-Tetrachloroethane	15	79-34-5	624	1.9	2.0
Tetrachloroethylene	85	127-18-4	624	1.0	2.0
Toluene	86	108-88-3	624	1.0	2.0
1,2-Trans-Dichloroethylene (Ethylene dichloride)	30	156-60-5	624	1.0	2.0
1,1,1-Trichloroethane	11	71-55-6	624	1.0	2.0
1,1,2-Trichloroethane	14	79-00-5	624	1.0	2.0
Trichloroethylene	87	79-01-6	624	1.0	2.0
Vinyl chloride	88	75-01-4	624/SM6200B	1.0	2.0

1. Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.
2. Quantitation Level (QL) also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer (64 FR 30417).
   ALSO GIVEN AS:
   The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency, December 2007).

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Appendix I

Aqua-Aerobic Systems Aqua MiniDisk Process Design Report

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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Process Design Report

SNOQUALMIE WRF WA

Design# 157666
Option: Preliminary Aqua MiniDisk Design

Aqua MiniDisk®

Cloth Media Filter

September 06, 2019
Designed By: Sara Altimimi

6306 N. Alpine Rd Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

Design Notes

Anticipated

- Treatability study is required in order to assure that the required effluent quality is achievable.

Filtration

- The cloth media filter recommendation and anticipated effluent quality are based upon influent water quality conditions as shown under "Design Parameters" of this Process Design Report.

- The filter influent should be free of algae and other solids that are not filterable through a nominal 5 micron pore size media. Provisions to treat algae and condition the solids to be filterable are the responsibility of others.

- For this application, pile filter cloth is recommended.

- The cloth media filter has been designed to handle the maximum design flow while maintaining one unit out of service.

Equipment

- Equipment selection is based upon Aqua Aerobic Systems' standard materials of construction and electrical components.

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

AquaDISK Tertiary Filtration - Design Summary

DESIGN INFLUENT CONDITIONS

Pre-Filter Treatment:	Secondary		
Avg. Design Flow	= 1.56 MGD	= 1083.33 gpm	= 5905.24 m³/day
Max Design Flow	= 3.13 MGD	= 2173.61 gpm	= 11848.34 m³/day

DESIGN PARAMETERS

	Influent	mg/l
Avg. Total Suspended Solids:	TSSa	5
Max. Total Suspended Solids:	TSSm	15
***Turbidity:**	NTU	5

*Note: Tubidity represented in Nephelometric Turbidity Units (NTU's) in lieu of mg/l.

AquaDISK FILTER RECOMMENDATION

Qty Of Filter Units Recommended	= 3
Number Of Disks Per Unit	= 20
Total Number Of Disks Recommended	= 60
Total Filter Area Provided	= 648.0 ft² = (60.20 m²)
Filter Model Recommended	= AquaDisk Concrete: Model ADFSC-11 x 10E-X2
Filter Media Cloth Type	= OptiFiber PES-14

AquaDISK FILTER CALCULATIONS

Filter Type:

Vertically Mounted Cloth Media Disks featuring automatically operated vacuum backwash.

Average Flow Conditions:

Average Hydraulic Loading
= Avg. Design Flow (gpm) / Recommended Filter Area (ft²)
= 1083.3 / 648 ft²
= 1.67 gpm/ft² (4.09 m/hr) at Avg. Flow

Maximum Flow Conditions:

Maximum Hydraulic Loading
= Max. Design Flow (gpm) / Recommended Filter Area (ft²)
= 2173.6 / 648 ft²
= 3.35 gpm/ft² (8.20 m/hr) at Max. Flow

Solids Loading:

Solids Loading Rate
= (lbs TSS/day at max flow and max TSS loading) / Recommended Filter Area (ft²)
= 391.6 lbs/day / 648 ft²
= 0.60 lbs. TSS /day/ft² (2.95 kg. TSS/day/m²)

The above recommendation is based upon the provision to maintain a satisfactory hydraulic surface loading with (1) unit out of service. The resultant hydraulic loading rate at the Maximum Design Flow is: 5 gpm / ft² = (12.3 m/hr)

Cloth Media Filters

AquaDisk Tanks/Basins

3 AquaDisk Model # ADFSC-11x10E-X2 Concrete Filter Basin Accessories consisting of:

- Concrete basin(s) (by others).
- 304 stainless steel support brackets.
- Effluent seal plate weldment.
- Stainless steel anchors.

3 Effluent Weir Installation(s) consisting of:

- Effluent weir(s).
- Stainless steel anchors.

AquaDisk Centertube Assemblies

3 Cloth set(s) will have the following feature:

- Cloth will be OptiFiber PES-14.

6 Centertube Installation(s) consisting of:

- 304 stainless steel centertube weldment(s).
- Centertube driven sprocket(s).
- Dual wheel assembly(ies).
- Rider wheel assembly(ies).
- 304 stainless steel centertube support weldment(s).
- Centertube bearing kit(s).
- Effluent centertube lip seal.
- Pile cloth media and non-corrosive support frame assemblies.
- 304 Stainless steel frame top plate(s),
- Media sealing gaskets.
- Disk segment 304 stainless steel support rods.

AquaDisk Drive Assemblies

6 Drive System(s) consisting of:

- Gearbox with motor.
- Drive sprocket(s).
- Drive chain(s) with pins.
- Stationary drive bracket weldment(s).
- Adjustable drive bracket weldment(s).
- Stainless steel anchors.
- Chain guard weldment(s).
- Warning label(s).

AquaDisk Backwash/Sludge Assemblies

3 Backwash System(s) consisting of:

- Backwash shoe assemblies.
- Backwash shoe support weldment(s).
- Flexible hose.
- Stainless steel backwash shoe springs.
- Hose clamps.
- Nylon electrical cable tie wrap(s).
- 304 stainless steel backwash collection manifold(s).
- PVC solids manifold installation(s).

3 Backwash/Solids Waste Pump Installation(s) consisting of:

- 2HP Pump assembly(ies).
- Stainless steel anchors.
- 0 to 15 psi pressure gauge(s).
- 0 to 30 inches mercury vacuum gauge(s).
- Throttling gate valve(s).
- 3" ball valve(s).

AquaDisk Instrumentation

3 Vacuum Gauge(s) with Transmitter(s) consisting of:

- Vacuum transmitter(s).
- 1/4" Threaded bronze ball valve.

3 Float Switch(es) consisting of:

- Float switch mounting bracket(s).
- Float switch(es).
- Stainless steel anchor(s).

3 Pressure Transducer Installation(s) each consisting of:

- Mounting bracket weldment(s).
- Transducer pipe weldment(s).
- Pressure transducer(s).
- 304 stainless steel union(s).
- Stainless steel anchor(s).
- Nylon electrical cable tie wrap(s).

AquaDisk Valves

3 Set(s) of Backwash Valves consisting of:

- 2" full port, two piece, stainless steel body ball valve(s), flanged end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork), Nibco, or equal.

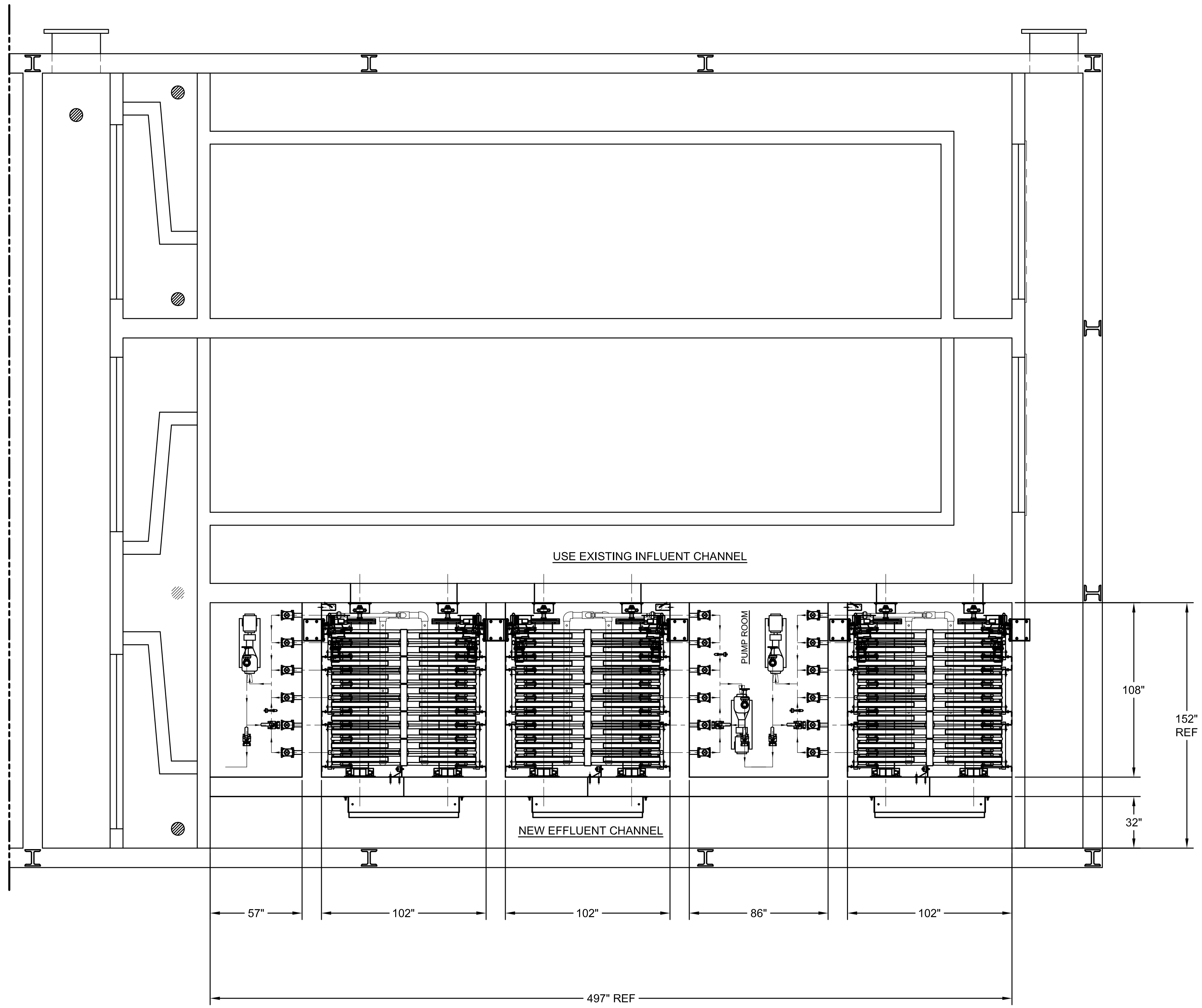
3 Solids Waste Valve(s) consisting of:

- 2" full port, two piece, stainless steel body ball valve(s), flanged end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork), Nibco, or equal.

AquaDisk Controls w/Starters

3 Control Panel(s) consisting of:

- NEMA 4X fiberglass enclosure(s).
- Circuit breaker with handle.
- Transformer(s).
- Fuses and fuse blocks.
- Line filter(s).
- GFI convenience outlet(s).
- Control relay(s).
- Selector switch(es).
- Indicating pilot light(s).
- MicroLogix 1400 PLC(s).
- Ethernet switch(es).
- Power supply(ies).
- Operator interface(s).
- Motor starter(s).
- Terminal blocks.
- UL label(s).



ITEM WEIGHTS
EFFLUENT SEAL PLATE = 66 LBS.
CENTERTUBE = 240 LBS.
EFFLUENT WEIR WELDMENT = 201 LBS.
DRIVE MOTOR ASSEMBLY = 249 LBS.
DISK SEGMENT ASSEMBLY = 6.5 LBS.
PUMP WITH MOTOR MOUNTED ON BASE = 200 LBS.
SOLIDS MANIFOLD = 54 LBS.

1. DRAWING FOR REFERENCE ONLY. ALL WALLS ARE SHOWN AT 1'. ALL DIMENSIONS TO BE VERIFIED BY CUSTOMER.

2. AQUA-AEROBIC SYSTEMS PROVIDES PUMPS AND VALVES LOOSE FOR INSTALLATION BY THE INSTALLING CONTRACTOR. ALL INTERCONNECTING PIPING, WIRING, AND WALL SPOOL PIPES AND PIPE SUPPORTS ARE PROVIDED BY THE INSTALLING CONTRACTOR.

3. IF FREEZING IS A CONCERN, AQUA-AEROBIC SYSTEMS RECOMMENDS THE FILTERS BE PLACED IN A HEATED BUILDING. IF A BUILDING IS NOT PROVIDED, ANY NECESSARY PROTECTION, INCLUDING BUT NOT LIMITED TO, HEAT TRACING AND INSULATION OF PUMPS AND PIPING, AS WELL AS PROTECTION AGAINST INTERNAL TANK FREEZING, SHALL BE PROVIDED BY THE INSTALLING CONTRACTOR.

4. THE GRAPHIC ELEMENTS OF THIS COMPUTER GENERATED DRAWING ARE DRAWN FULL SIZE. THE DIMENSIONS ARE ASSOCIATIVE. IF THE SIZE OF THE GRAPHIC ELEMENTS IS CHANGED THE DIMENSIONS WILL NOT BE CORRECT.

5. TBD THE INFLUENT AND EFFLUENT CHANNELS TO BE SIZED BY THE INSTALLING CONTRACTOR BASED ON THE PLANT FLOW.

6. AN INFLUENT VALVE IS REQUIRED FOR ISOLATION / MAINTENANCE OF EACH FILTER UNIT. INFLUENT VALVES SHALL BE PROVIDED BY OTHERS AND INSTALLED BY OTHERS.

7. WALL SPOOL PIPING AND SUPPORTS SHALL BE STAINLESS STEEL. PROVIDED BY OTHERS AND INSTALLED BY OTHERS.

NOT FOR CONSTRUCTION

JOB NAME: SNOQUALMIE WRF
JOB LOCATION: WA

REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION

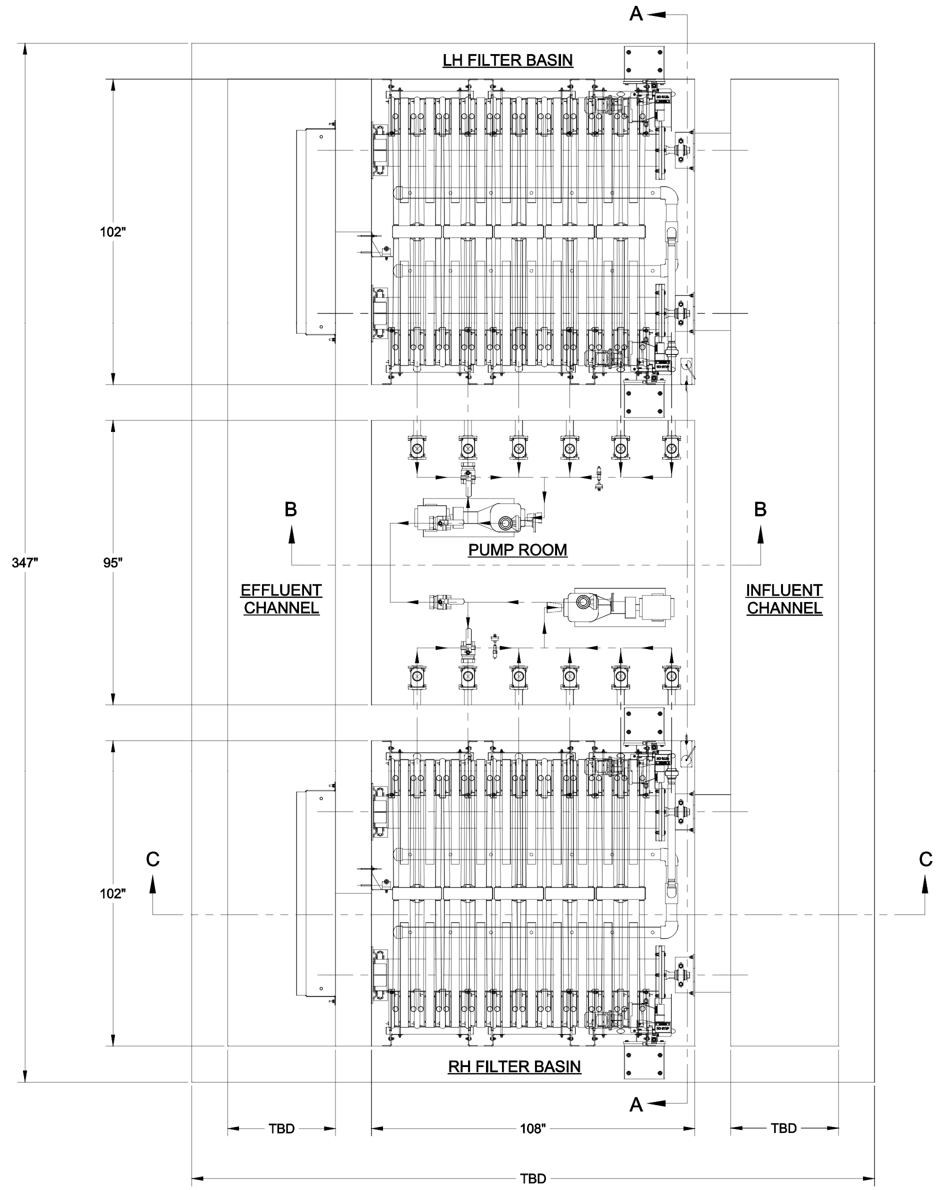
DRAWING NAME: MINIDISK LAYOUT

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES
FRACTIONAL DIMENSIONS +/- 1/16
ALL TWO PLACE DECIMALS +/- 0.010
ALL THREE PLACE DECIMALS +/- 0.005
ALL ANGLES +/- 1/2°
ANSI

MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: AMG | DATE: 2019-09-20
WEIGHT: | SHEET: 1 OF 1
DRAWING NUMBER: 8111309A6100 | SCALE: | SIZE: D



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ALL WALLS ARE SHOWN AT 1'.
ALL DIMENSIONS TO BE VERIFIED BY CUSTOMER.

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3. IF FREEZING IS A CONCERN, AQUA-AEROBIC SYSTEMS RECOMMENDS THE FILTERS BE PLACED IN A HEATED BUILDING. IF A BUILDING IS NOT PROVIDED, ANY NECESSARY PROTECTION, INCLUDING BUT NOT LIMITED TO, HEAT TRACING AND INSULATION OF PUMPS AND PIPING, AS WELL AS PROTECTION AGAINST INTERNAL TANK FREEZING, SHALL BE PROVIDED BY THE INSTALLING CONTRACTOR.

4. THE GRAPHIC ELEMENTS OF THIS COMPUTER GENERATED DRAWING ARE DRAWN FULL SIZE. THE DIMENSIONS ARE ASSOCIATIVE. IF THE SIZE OF THE GRAPHIC ELEMENTS IS CHANGED THE DIMENSIONS WILL NOT BE CORRECT.

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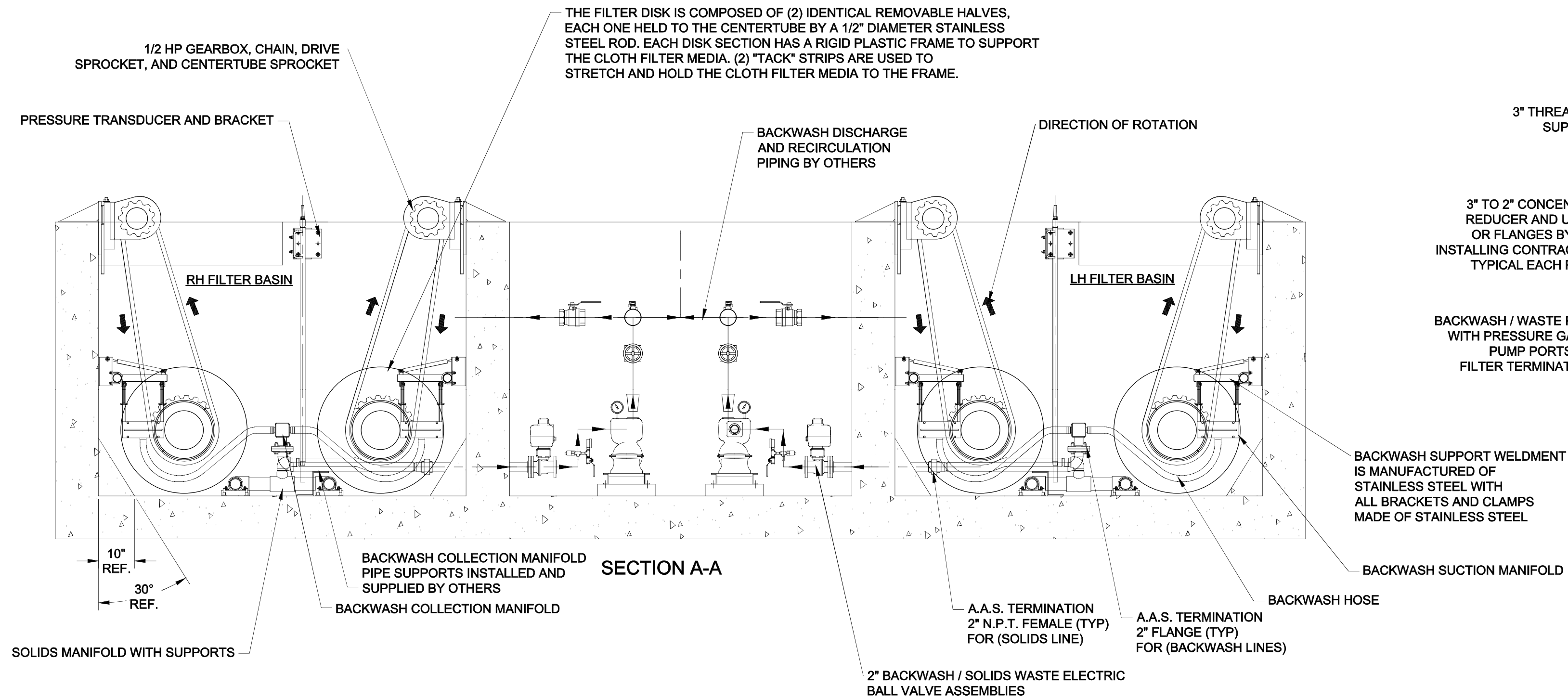
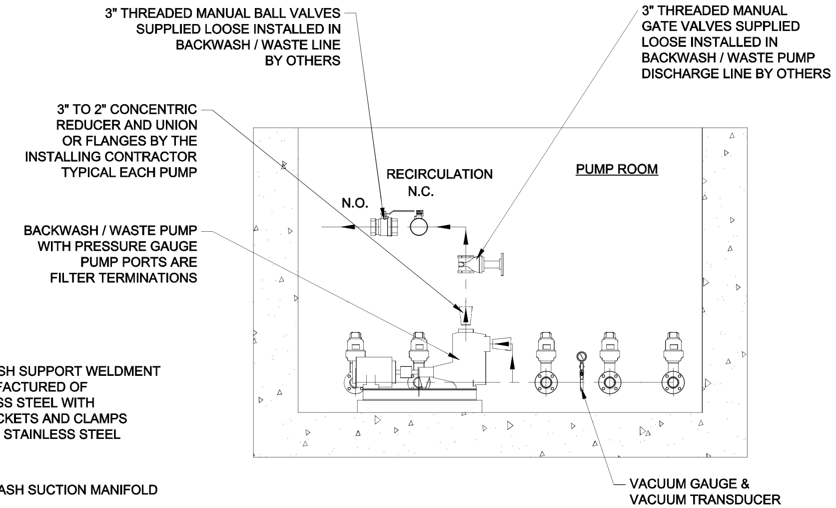
7. WALL SPOOL PIPING AND SUPPORTS SHALL BE STAINLESS STEEL.
PROVIDED BY OTHERS AND INSTALLED BY OTHERS.

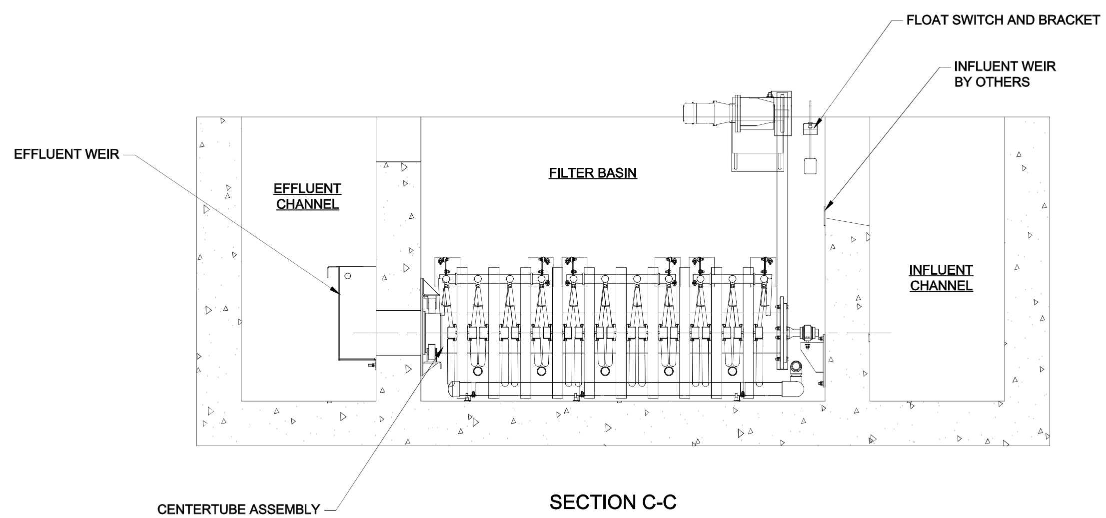
JOB NAME:	AQUA-AEROBIC SYSTEMS, INC.
JOB LOCATION:	
	DO NOT SCALE DRAWING — UNLESS OTHERWISE SPECIFIED: FRACTIONAL DIMENSIONS +/- 1/16; ALL TWO PLACE DECIMALS +/- 0.010; ALL THREE PLACE DECIMALS +/- 0.005; ALL ANGLES +/- 1/2°; ANSI
	MATERIAL:
	SIMILAR TO:
	TYPE:
	DRAWN BY: SLT — DATE: 2012-03-28
	CHECKED BY: — DATE:
REV / ERN / ECO / DATE / BY / REVISION DESCRIPTION	WEIGHT: — SHEET: 1 OF 4
DRAWING NAME: AQUADISK FILTER MODEL ADFSC-11 X 10E-X2	DRAWING NUMBER: 2801993 — SCALE: — SIZE: D



SECTION A-A



SECTION B-B



SECTION C-C

1. ALL PIPING AND FITTINGS SHALL BE PROVIDED BY OTHERS
ACTUAL PIPING LAYOUT AND PUMP LOCATION TO BE DETERMINED BY OTHERS
WHEN THREADED OR WELDED PIPE IS USED IN LIEU OF FLANGED PIPE, UNIONS SHALL BE USED AT EACH PUMP AND VALVE CONNECTION TO FACILITATE SERVICE.

2. BACKWASH / WASTE PUMP CONNECTIONS ARE 2" N.P.T. BACKWASH / WASTE PIPING IS 3" DIAMETER. 3" TO 2" CONCENTRIC REDUCER FITTINGS SHALL BE PROVIDED AND INSTALLED BY OTHERS AT EACH PUMP PORT.

3. THE BACKWASH / WASTE PUMP CAPABILITIES ARE AS FOLLOWS:

- HORSEPOWER: 2 HP
- FLOW: 130 GPM
- TOTAL DYNAMIC HEAD: 23.2 FT
- ALLOWABLE DISCHARGE HEAD, AFTER FILTER LOSSES: 12 FT

FOR INSTALLATIONS THAT REQUIRE MORE DISCHARGE HEAD, ALTERNATIVE PUMPS ARE AVAILABLE. PLEASE CONSULT ENGINEERING TO VERIFY THE SUITABILITY OF THE DISCHARGE PIPING OR FOR SPECIAL PUMP REQUIREMENTS.

JOB NAME:				
JOB LOCATION:				
REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION

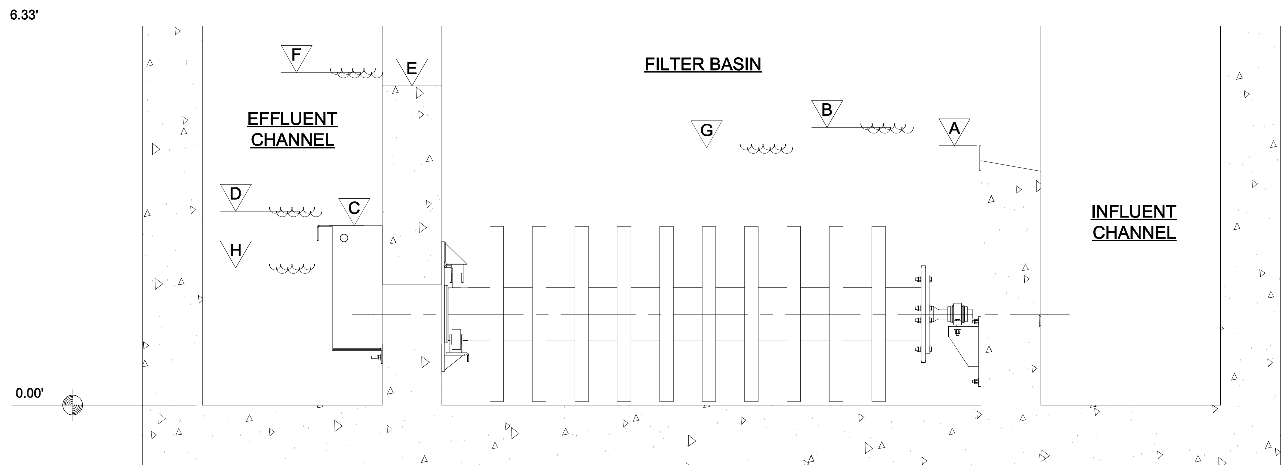
AQUA-AEROBIC SYSTEMS, INC.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
FRACTIONAL DIMENSIONS +/- 1/16
ALL TWO PLACE DECIMALS +/- 0.010
ALL THREE PLACE DECIMALS +/- 0.005
ALL ANGLES +/- 1/2°
ANSI

MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: SLT — DATE: 2012-03-28
CHECKED BY: — DATE:
WEIGHT: — SHEET: 2 OF 4

DRAWING NAME: AQUADISK FILTER MODEL ADFSC-11 X 10E-X2
DRAWING NUMBER: 2801993 — SCALE: — SIZE: D



ELEVATION

A	4.33'	INFLUENT WEIR ELEVATION
B	4.52'	NAPPE OVER INFLUENT WEIR AVERAGE FLOW
	4.64'	NAPPE OVER INFLUENT WEIR MAXIMUM FLOW
C	3.00'	EFFLUENT WEIR ELEVATION
D	3.19'	NAPPE OVER EFFLUENT WEIR AVERAGE FLOW
	3.30'	NAPPE OVER EFFLUENT WEIR MAXIMUM FLOW
E	5.33'	OVERFLOW WEIR ELEVATION
F	5.56'	NAPPE OVER OVERFLOW WEIR AVERAGE FLOW
	5.70'	NAPPE OVER OVERFLOW WEIR MAXIMUM FLOW
G	4.29'	BACKWASH START LEVEL
H	2.50'	MAXIMUM AVAILABLE LIQUID LEVEL FOR EFFLUENT CONVEYANCE

HYDRAULIC PROFILE PER FILTER BASIN
BASED UPON AVERAGE FLOW RATE OF 3.25 GPM PER SQUARE FOOT (1.0 MGD)
BASED UPON MAXIMUM FLOW RATE OF 6.5 GPM PER SQUARE FOOT (2.0 MGD)

WEIR LENGTHS
INFLUENT = 5.50'
EFFLUENT = 5.71'
OVERFLOW = 4.25'

JOB NAME:
JOB LOCATION:

REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION

AQUA-AEROBIC SYSTEMS, INC.

DO NOT SCALE DRAWING

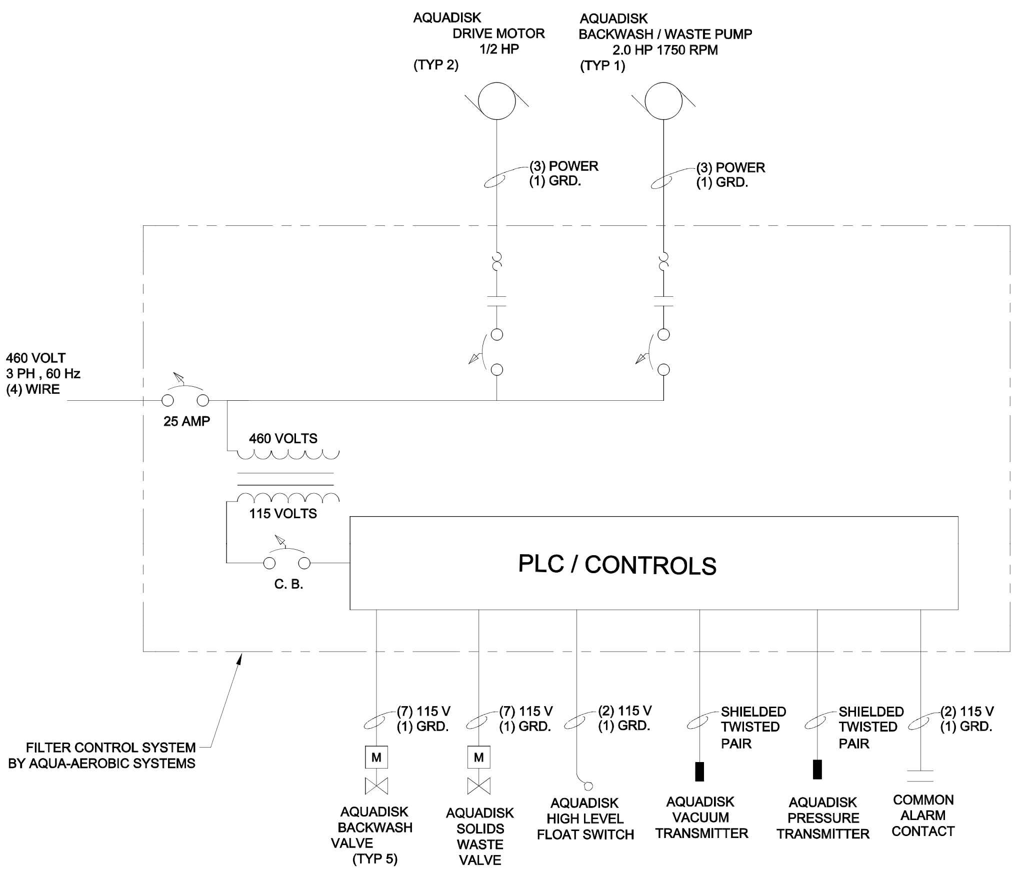
UNLESS OTHERWISE SPECIFIED
FRACTIONAL DIMENSIONS +/- 1/16
ALL TWO PLACE DECIMALS +/- 0.010
ALL THREE PLACE DECIMALS +/- 0.005
ALL ANGLES +/- 1/2°
ANSI

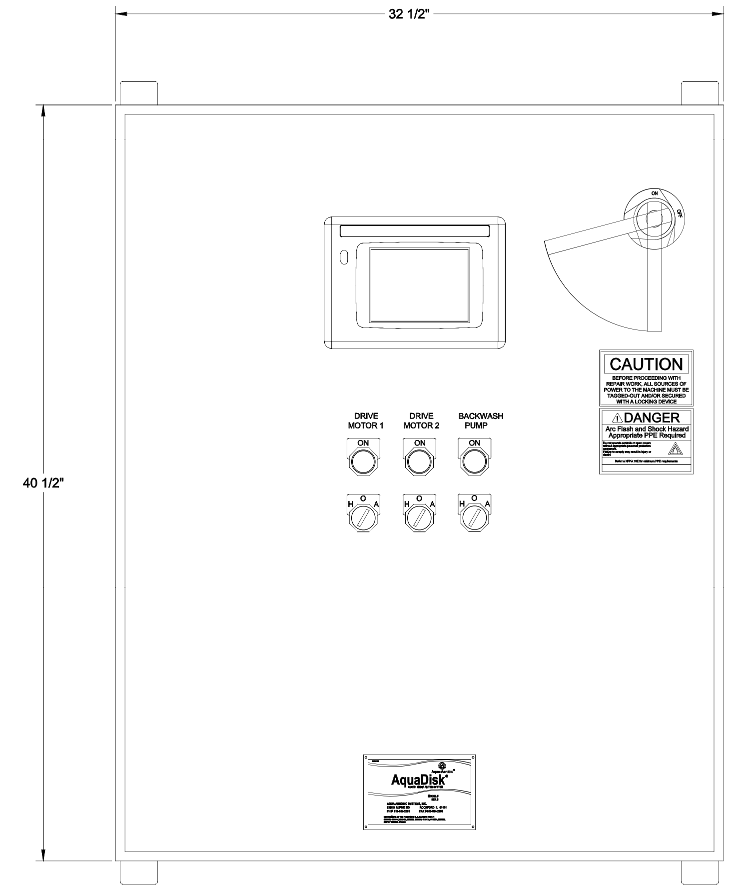
MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: SLT DATE: 2012-03-28
CHECKED BY: DATE:
WEIGHT: SHEET: 3 OF 4
DRAWING NAME: AQUADISK FILTER MODEL ADFSC-11 X 10E-X2
DRAWING NUMBER: 2801993 SCALE: SIZE: D

SYMBOL KEY

	MOTOR		CIRCUIT BREAKER		ELECTRICAL DISCONNECT	VFD	VARIABLE FREQUENCY DRIVE		TRANSDUCER		STARTER CONTACTOR
M	MOTOR OPERATED VALVE		TRANSFORMER		MOTOR OVERLOAD	P	PNEUMATIC OPERATED VALVE		FUSE		FLOAT SWITCH

NOTE: SOME SYMBOLS MAY NOT BE APPLICABLE





1 CONTROL PANEL
ENCLOSURE NEMA 4X WALL MOUNTED TYPE FIBERGLASS
FACTORY ASSEMBLED AND SHIPPED LOOSE. INSTALLED BY OTHERS.
MUST BE LOCATED WITHIN 50 FEET OF THE PRESSURE TRANSMITTER.
FACING NORTH TO LIMIT THE H.M.I. EXPOSURE TO DIRECT SUNLIGHT.
FLOOR MOUNTING IS AVAILABLE WITH STEEL OR STAINLESS STEEL ENCLOSURES.

2 STANDARD CONTROL PANEL SIZE
40" HEIGHT X 32" WIDE X 12" DEEP

JOB NAME:
JOB LOCATION:

REV	ERN / ECO	DATE	BY	REVISION DESCRIPTION

AQUA-AEROBIC SYSTEMS, INC.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
FRACTIONAL DIMENSIONS +/- 1/16
ALL TWO PLACE DECIMALS +/- 0.010
ALL THREE PLACE DECIMALS +/- 0.005
ALL ANGLES +/- 1/2°
ANSI

MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: SLT DATE: 2012-03-28
CHECKED BY: DATE:
WEIGHT: SHEET: 4 OF 4

DRAWING NAME: AQUADISK FILTER MODEL ADFSC-11 X 10E-X2
DRAWING NUMBER: 2801993 SCALE: SIZE: D

Appendix J

Common Operations and Maintenance Forms

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Dryer Batch Performance Record

Temperature Tracker

________ DAY_________MONTH____________YEAR

FIRST BATCH

GOAL

Dry Product Temperature ≥360 °F ◯ Yes

Elapsed Dry Timer ≥160 minutes ◯ Yes

If Yes on both then discharge can be initiated by temporarily altering the discharge temperature set point

TEMPERATURE

MINUNTES	TEMPERATURE
0	
40	
80	
120	
160	
170	
180	
200	

Notes:

SECOND BATCH

GOAL

Dry Product Temperature ≥360 °F ◯ Yes

Elapsed Dry Timer ≥160 minutes ◯ Yes

If Yes on both then discharge can be initiated by temporarily altering the discharge temperature set point

TEMPERATURE

MINUTES	TEMPERATURE
0	
40	
80	
120	
160	
170	
180	
200	

Notes:

THIRD BATCH

GOAL

Dry Product Temperature ≥360 °F ◯ Yes

Elapsed Dry Timer ≥160 minutes ◯ Yes

If Yes on both then discharge can be initiated by temporarily altering the discharge temperature set point

TEMPERATURE

MINUTES	TEMPERATURE
0	
40	
80	
120	
160	
170	
180	
200	

Notes:

FOURTH BATCH

GOAL

Dry Product Temperature ≥360 °F ◯ Yes

Elapsed Dry Timer ≥160 minutes ◯ Yes

If Yes on both then discharge can be initiated by temporarily altering the discharge temperature set point

TEMPERATURE

MINUTES	TEMPERATURE
0	
40	
80	
120	
160	
170	
180	
200	

Notes:

BOD BENCHSHEET

Date Samples Collected & Collector:	Time: Influent Effluent	Procedure: Standards Methods for the Examination of Water and Wastewater, 21st Edition 5210B modified via laboratory SOP manual to use LDO method 10360 Rev 1.1
Samples Analysis Initiated By:		

Sample Analysis Finalized By:	Date and Time of Initial DO	Date and Time of Final DO	COD EFF	COD SEED	COD DSHS	COD INF	COD CASINO	Page ___of ___ pages

A	B	C	D	E	F	G	H	I	J	K	L	M	N
			In 300mL BOD bottle		All DOs below in mg/L read by method 10360 LDO for DO							BOD & CBOD below in mg/L	
					DO								
Sample	Temp Deg C	Rack Slot	mLs Sample	mLs Seed	Initial	5-Day	DO Drop	Seed Ratio Factor Average f[3]	Seed Correction $E_{(vol.\ seed)} \times f$	Corrected DO	Dil. Factor	BOD or CBOD	Reported BOD or CBOD
Blank[1] Nit. Inh		3											
Blank[1] Nit. Inh		4											
Seed Control[2] Nit. Inh		5											
Seed Control[2] Nit. Inh		6											
Seed Control[2] Nit. Inh		7											
Standard GGA Nit. Inh		8	6										
Effluent Dil 1 Nit. Inh		9						Averager From Above					
Effluent Dil 2 Nit. Inh		10											
Effluent Dil 3 Nit. Inh		11						______					______
Effluent Dil 4 Nit. Inh		12											
Influent Dil 1 Nit. Inh		13						→					
Influent Dil 2 Nit. Inh		14						→					______
Influent Dil 3		15						→					
DSHS Dil1		19						→					
DSHS Dil2		20						→					
DSHS Dil3		21						→					______
Casino Dil1		22						→					
Casino Dil2		23						→					
Casino Dil3		24						→					______

[1] QC Test- Blank DO drop should be <0.2 mg/L

[2] Check Strength of Seed (should be between .6 and 1.0 mg/L per mL seed)

Comments

Bulb Tracking

Bank	Date	Hours	Intensity	Bank	Date	Hours	Intensity
ME11				ME11			
ME12				ME12			
ME13				ME13			
ME21				ME21			
ME22				ME22			
ME23				ME23			
ME11				ME11			
ME12				ME12			
ME13				ME13			
ME21				ME21			
ME22				ME22			
ME23				ME23			
ME11				ME11			
ME12				ME12			
ME13				ME13			
ME21				ME21			
ME22				ME22			
ME23				ME23			
ME11				ME11			
ME12				ME12			
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ME11				ME11			
ME12				ME12			
ME13				ME13			
ME21				ME21			
ME22				ME22			
ME23				ME23			
ME11				ME11			
ME12				ME12			
ME13				ME13			
ME21				ME21			
ME22				ME22			
ME23				ME23			

* Operator Name completing rounds x ________________________________

	HOURS	3MX25	3MX24	3MX15	3MX14
1	Today				
	Totalized				
2	Today				
	Totalized				
3	Today				
	Totalized				
4	Today				
	Totalized				
5	Today				
	Totalized				
6	Today				
	Totalized				
7	Today				
	Totalized				
8	Today				
	Totalized				
9	Today				
	Totalized				
10	Today				
	Totalized				
11	Today				
	Totalized				
12	Today				
	Totalized				
13	Today				
	Totalized				
14	Today				
	Totalized				
15	Today				
	Totalized				

	HOURS	3MX25	3MX24	3MX15	3MX14
16	Today				
	Totalized				
17	Today				
	Totalized				
18	Today				
	Totalized				
19	Today				
	Totalized				
20	Today				
	Totalized				
21	Today				
	Totalized				
22	Today				
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24	Today				
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25	Today				
	Totalized				
26	Today				
	Totalized				
27	Today				
	Totalized				
28	Today				
	Totalized				
29	Today				
	Totalized				
30	Today				
	Totalized				
31	Today				
	Totalized				

MONTH ____ YEAR ____

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____
Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____
Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____
Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____
Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____	Foam%___ Floc Sz.____ Foam Color ____

Carrousel Rounds

North End of Aeration Basin 3MX25 & 3MX15

- ☐ Check date on Desiccant replace if older than 1year or spent.
- ☐ Check for abnormal vibration and report on CAF if needed
- ☐ Check oil level and auto-lube report on CAF if needed
- ☐ Percent of Foam on Carrousel Surface 0-25 25-50 50-75 75-100
- ☐ Foam Description: Note the color and texture of foam.

South End of Aeration Basin 3MX24 & 3MX14

- ☐ Check date on Desiccant replace if older than 1year or spent.
- ☐ Check for abnormal vibration and report on CAF in needed
- ☐ Check oil level and auto-lube report on CAF in needed
- ☐ Shades of Brown Floc- Lit. Med. Drk. Floc Size- Sm. Med. Lrg.

Anaerobic & Anoxic Zone Basin 1 & 2

- ☐ Check oil level & auto –lube 3mx13 report any deficiency on CAF
- ☐ Check 3mx11 for rags and remove & dispose as needed.
- ☐ Check 3mx12 for rags and remove & dispose as needed..
- ☐ Check oil level & auto –lube 3mx23 report any deficiency on CAF
- ☐ Check 3mx21 cable for rags and remove & dispose as needed.
- ☐ Check 3mx22 cable for rags and remove & dispose as needed

Concrete Structure and Grounds

- ☐ Pressure Wash concrete once per year. Keep area neat & tidy.

Equipment

- o Defective, worn equipment not functioning as needed must be repaired and reported in writing immediately to the SIMT or EIMT. Operator is responsible to completion.

Carrousel Rounds

North End of Aeration Basin 3MX25 & 3MX15

- ☐ Check date on Desiccant replace if older than 1year or spent.
- ☐ Check for abnormal vibration and report on CAF in needed
- ☐ Check oil level and auto-lube report on CAF in needed
- ☐ Percent of Foam on Carrousel Surface 0-25 25-50 50-75 75-100

South End of Aeration Basin 3MX24 & 3MX14

- ☐ Check date on Desiccant replace if older than 1year or spent.
- ☐ Check for abnormal vibration and report on CAF in needed
- ☐ Check oil level and auto-lube report on CAF in needed
- ☐ Shades of Brown Floc- Lit. Med. Drk. Floc Size- Sm. Med. Lrg.

Anaerobic & Anoxic Zone Basin 1 & 2

- ☐ Check oil level & auto –lube 3mx13 report any deficiency on CAF
- ☐ Check 3mx11 for rags and remove & dispose as needed.
- ☐ Check 3mx12 for rags and remove & dispose as needed..
- ☐ Check oil level & auto –lube 3mx23 report any deficiency on CAF
- ☐ Check 3mx21 cable for rags and remove & dispose as needed.
- ☐ Check 3mx22 cable for rags and remove & dispose as needed

Concrete Structure and Grounds

- ☐ Pressure Wash concrete once per year. Keep area neat & tidy.

*Note any significant tasks completed above on the back of this page.

Day Month Year

HOURS	3MX25	3MX24	3MX15	3MX14
Current				
Totalized				
Current				
Totalized				
Current				
Totalized				
Current				
Totalized				
Current				
Totalized				
Current				
Totalized				
Current				
Totalized				

HOURS	3MX25	3MX24	3MX15	3MX14
Current				
Totalized				
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Totalized				
Current				
Totalized				

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Head works Rounds

Lower Section

- ☐ Check dumpster and rake down compactor tailing if needed
- ☐ Check grit dewatering screw bearing lubrication. (Lubricate weekly)
- ☐ Check grit dewatering screw packing gland lubrication. (Lubricate as weekly)
- ☐ Check grit lift flow for adequate flow while system is activated. (Twice weekly)
- ☐ Hose down area to keep area clean and free of debris and contaminants to reduce vectors.
- ☐ Notes:____

Upper Channels, bypass screen, and gates

- ☐ Check for debris, slime, and or scum build up and spray off as needed with high psi water.
- ☐ Fully operate all gates during the second week of March and September of each year.
- ☐ Lubricate gates as needed and report any repairs needed on sticky or tight gates
- ☐ Report any evidence of screen channel bypass in Treatment Log and on CAF to OIC
- ☐ Notes:____

General Inlet Head Structure

- ☐ Check lighting to ensure site properly lighted. Replace any lights not working.
- ☐ Check to ensure no birds are nesting in the roof.
- ☐ Clean area around sampler and control panels to ensure area looks neat and clean
- ☐ Check all piping for leaks.
- ☐ Clean and paint any pipes that are dingy or in need rust removal and maintenance
- ☐ Clean stairs and railing as needed to keep areas neat and clean
- ☐ Notes:____

Perforated Plate Screen

- ☐ Open covers remove any entangled material from machine with high pressure water. Clean Sensors and float.
- ☐ Check to ensure that the brush contacts the plates with 70% coverage adjust as needed.
- ☐ Check chain tension once in January, May, and September
- ☐ Have solids removed in front of screen bimonthly and check neoprene seal and brush for damage and replace if it shows signs of wear.
- ☐ Adjust Scraper plate so that it doesn't contact brush
- ☐ Every 4500 hrs check bottom chain bearing for any play and drive shaft flange bearing
- ☐ Notes:____

*Operator must correct any issues or problems.

WAP

- ☐ Lubricate self aligning roller bearing two strokes every week.
- ☐ Manually operate solenoid valves weekly
- ☐ High pressure wash internals of entire WAP monthly
- ☐ Replace screw brush in March and October of each year
- ☐ Check guide bars and screw flights in March of each year with 10 bags of ice
- ☐ Notes:____

Vortex Grit System

- ☐ Manually operate system on Monday and Thursday every week
- ☐ Check paddle for debris build up and clean as needed
- ☐ Notes:____

*Note any significant tasks completed above on the back of this page.

Tuesday Month Year

NAME	BRUSH HRS.	SCREEN HRS.	PRESS HRS.
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Tuesday Month Year

NAME	BRUSH HRS.	SCREEN HRS.	PRESS HRS.
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Tuesday Month Year

NAME	BRUSH HRS.	SCREEN	PRESS HRS.
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Tuesday Month Year

NAME	BRUSH HRS.	SCREEN	PRESS HRS.
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Tuesday Month Year

NAME	BRUSH HRS.	SCREEN	PRESS HRS.
Current Hours			
Previous Hours			
Tot Elapsed Hours			

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Power Outage Rounds

		DATE			
Complete These Rounds at the onset of a Power Outage					
Portable Generator	Use Kurk Key trapped interlock system to power portable generator				
Fuel	Ensure adequate fuel in both tanks for continued gerator operation order fuel at 2/3 Full				
HMI	Check each of the 19 plant screens for proper operation during power outage				
HMI	Check all lift station screen and monitor for additional power outages and visit sites as needed				
Headworks	Physically check to ensure screen is operating properly and no alarms on Huber panel are present				
Carrousel Systems	Visually watch the aerators operate via DO drop and ensure all mixers are running.				
Return Activated Sludge	Visually verify that the RAS pumps are working by checking the flow directly on the MAG meter				
Waste Activated Sludge	Verify WAS Valves are set to the proper setting on HMI and watch pump cycle in WAS Room				
Clarifier	Reset any Alarms on the reclaim screen and visually inspect that drive is operating normally				
Non-Potable Water System	Reset any alarms on the panel and inspect system for proper function				
Clarifier	Reset any Alarms on the reclaim screen and visually inspect that drive is operating normally				
Water heater	Check area around water heater for leaks. If you have hard water, drain 1-2 gallons water.				
Interior					
Wood cabinets and trim	Apply a wood protectant.				
Interior doors	Lubricate hinges.				
Garage door	Lubricate hardware. Inspect mechanism for free travel.				
Window and door tracks	Check to see if weep holes are open. Clean out dirt and dust. Lubricate rollers and latches.				
Basement or crawl space	Check for cracks or any sign of dampness or leaks. Check for any evidence of termites or wood-eating insects.				
Ceramic tile	Check and clean grout.				

Electrical and appliances					
Heating and cooling systems	Clean and replace filters if necessary.				
Kitchen exhaust fan	Remove and clean the filter. Clean accumulated grease deposits from the fan housing.				
Refrigerator	Clean dust from top. Clean refrigerator drain pan. Clean and defrost freezer if necessary.				
Dishwasher	Check for leaks.				
Wiring, electrical cords, and plugs	Check for wear or damage. Replace if necessary.				
Smoke detector	Test for proper operation and replace batteries if necessary.				
GFI outlets	Test for proper operation.				
Exterior					
Foundation	Inspect visible areas, vents, and ducts for cracks, leaks, or blockages.				
Landscaping	Check for proper drainage.				
Concrete and asphalt	Clean oil and grease.				

Fall		Date last completed			
Plumbing					
Plumbing shut-off valves	Inspect for proper operation.				
Outside faucets	Drain.				
Water heater	Flush out hot water to remove accumulated sediment.				
Faucet aerators	Check for proper flow of water. If the flow is reduced, clean the aerator screens. During the first two months, the faucet aerators could require more frequent cleaning.				
Interior					
Attic	Examine for evidence of any leaks. Check insulation and remove or add if necessary. Check for evidence of birds, squirrels, raccoons, etc. Check for proper ventilation.				
Countertops	Inspect for separations at sinks and backsplash. Recaulk where required.				
Tiled areas	Inspect for loose or missing grout or caulking. Regrout or recaulk if necessary.				
Shower doors/tub enclosures	Inspect for proper fit. Adjust if necessary. Inspect caulking and recaulk if necessary.				
Weather stripping	Check caulking around windows and doors. Check window and door screens. Adjust or replace if necessary.				
Sectional garage doors	Adjust the travel and tension.				
Fireplace	Inspect flues. Clean if necessary. Inspect fireplace brick and mortar for cracks or damage.				
Electrical and appliances					
Heating system	Service heating system and heat pump.				
Cooling system	Remove debris from around units and clean with garden hose. Remove window air conditioner or protect with weatherproof cover. Clean and replace filters if necessary.				
Refrigerator coils	Clean.				
Combustible appliances	Inspect and service if necessary.				
Exterior					
Roof	Check for leaks. Check for damaged, loose, or missing shingles. Check vents and louvers for birds, nests, squirrels, and insects. Check flashing around roof stacks, vents, and skylights for leaks.				
Chimney	Clean and check for deteriorating bricks and mortar. Check for leaks. Check for birds, nests, squirrels, and insects.				
Gutters and downspouts	Clean and check for leaks, misalignment, or damage.				
Exterior walls	Check for deteriorating bricks and mortar. Check siding for damage or rot. Check painted surfaces for flaking.				
Landscaping	Trim shrubbery around walls. Remove tree limbs, branches, or debris that can attract insects (no wood or shrubbery should be closer than 3 inches to your house). Maintain grading.				
Concrete and asphalt	Check for cracks or deterioration. Reseal or repair if necessary.				
Septic system	Examine septic system drain field for flooding and odor. Have tank pumped yearly.				
Lawn and patio furniture	Clean and store or cover with weatherproof material.				

Spring		Date last completed			
Plumbing					
Water heater	Flush out hot water to remove accumulated sediment.				
Interior					
Attic	Examine for evidence of any leaks. Check insulation and remove or add if necessary. Check for evidence of birds, squirrels, raccoons, etc. Check for proper ventilation.				
Countertops	Inspect for separations at sinks and backsplash. Recaulk where required.				
Tiled areas	Inspect for loose or missing grout or caulking. Regrout or recaulk if necessary.				
Shower doors/tub enclosures	Inspect for proper fit. Adjust if necessary. Inspect caulking and recaulk if necessary.				
Weather stripping	Check caulking around windows and doors. Check window and door screens. Adjust or replace if necessary.				
Electrical and appliances					
Heating and cooling system	General furnace inspection: Look for rust, scaling on heat exchanger, and proper flame color; note odd sounds or smells; and check condition of venting. Remove debris around units.				
Circuit breakers	Exercise.				
Refrigerator	Clean coils.				
Exterior					
Decks	Scrub mildewed areas and treat for water stains, mildew, and fungus.				
Roof	Clean. Check for leaks. Check for damaged, loose or missing shingles. Check vents and louvers for birds, nests, squirrels, and insects. Check flashing around roof stacks, vents, and skylights for leaks.				
Chimney	Clean and check for deteriorating bricks and mortar. Check for leaks. Check for birds, nests, squirrels, and insects.				
Gutters and downspouts	Clean and check for leaks, misalignment, or damage.				
Windows	Clean.				
Exterior walls	Check for deteriorating bricks and mortar. Check siding for damage or rot. Check painted surfaces for flaking.				
Landscaping	Trim shrubbery around walls. Remove tree limbs, branches, or debris that can attract insects (no wood or shrubbery should be closer than 3 inches to your house). Maintain grading.				
Concrete and asphalt	Check for cracks or deterioration. Reseal or repair if necessary.				

Clarifier Maintenance Log

Month	January	February	March	April	May	June	July	August	September	October	November	December
Clean Brushes												
Change Brushes												
Clean												
Clean with Chlorine												
Clarifier(s) Online												
Check Seals on scum sweeper												

Notes

Clarifier Maintenance Log

Date:

Clarifier Worked On:

Clarifier	#1	#2
Clarifier(s) Online		
Check Seals		
Change Seals		
Clean Brushes		
Changed Brushes		
Clean with Chlorine		

Other ______________________________

____

Part Description & Number ______________________________

____

____

____

____

____

Notes ______________________________

____

____

____

____

Clarifier Rounds

Aeration Basin 1 & 2

- ☐ Check clarifier side of weirs on both basins.
- ☐ Schedule Aqua Clean to remove excess debris as needed.

MLCS Mixed Liquor Control Structure

- ☐ Clean any rags from the top of the clarifier control gates and put in dumpster
- ☐ Check gate level for equal flow into both clarifiers and adjust as needed. Record on back of page.
- ☐ Clean area with high pressure water as needed to keep area tidy and clean.

Scum Pits

- ☐ Use WAS pumps to waste scum from pits on the first Wednesday of the month per mode two in 4.6-4 of the O&M. Add water to sump to fill it up prior to this mode. Spray vault lightly with Chlorine.
- ☐ Hose out sump after pumping scum and have eductor truck remove solids in Jan, May, Sept

Clarifier Drive Mechanism

- ☐ Weekly check the oil level of the Worm gear (upper sight glass) and Main gear (lower sight glass)
- ☐ Monthly drain condensate from each housing & replace oil level to operating level. Also clean sight glass vent openings.

RAS Collection Box

- ☐ Weekly verify flow through RAS tubes and back flush with fire hose to clean out tubes if flow is diminished.
- ☐ RAS Flow must be normalized by Operator at VFDs to ensure daily RAS flow is the same.

Scum Skimmer

- ☐ Check to ensure that when the scum skimmer passes over the scum box that the scum does not run down back down the ramp.
- ☐ Adjust wipers for proper contact with all wipe surfaces. Replace any worn wear parts.

Overall Structure

- ☐ Clean walkway, gear deck, and concrete walls of clarifier once per month as needed.
- ☐ Clean launders and weirs twice per month with chemical cleaning agent.
- ☐ Check to ensure water is flowing out of elevated tube above cabinet.

Clarifier Performance

- ☐ Note the overall appearance of clarifier supernatant
- ☐ Describe any particulate on surface of clarifier that is process significant on the back of this page. For instance straggler floc, ashing, pin floc, clumping. Refer to process manual for definitions.

* Any significant actions should be recorded on back side of this page.

** Operator completing these rounds must verify SCADA results are accurate for any grab results collected in the field.

*** Taken at Flow meter not SCADA

*Operator must correct any issues or problems.

MONTH YEAR INITIALS

DAY	4FE01 Flow gpm	4P11 4P12 psi	4FE02 Flow gpm	4P21 4P22 psi	RAS Total #1***	RAS Total #2***	All Checks Done
1							☐
2							☐
3							☐
4							☐
5							☐
6							☐
7							☐
8							☐
9							☐
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30							☐
31							☐

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Monthly Sewer Mainline Cleaning & Manhole Inspection Report 2015

Report Completed By:							Feet Cleaned	Manholes Inspected
		Date	Date	Date	Date	Date	Total	Total
JANUARY								
	Mainline Cleaned							
	Manholes Inspected							
FEBRUARY								
	Mainline Cleaned							
	Manholes Inspected							
MARCH								
	Mainline Cleaned							
	Manholes Inspected							
APRIL								
	Mainline Cleaned							
	Manholes Inspected							
MAY								
	Mainline Cleaned							
	Manholes Inspected							
JUNE								
	Mainline Cleaned							
	Manholes Inspected							
JULY								
	Mainline Cleaned							
	Manholes Inspected							
AUGUST								
	Mainline Cleaned							
	Manholes Inspected							
SEPTEMBER								
	Mainline Cleaned							
	Manholes Inspected							
OCTOBER								
	Mainline Cleaned							
	Manholes Inspected							
NOVEMBER								
	Mainline Cleaned							
	Manholes Inspected							
DECEMBER								
	Mainline Cleaned							
	Manholes Inspected							

Daily Process & Compliance Rounds

Date	Complete Mass Balance for Process Control	Print Mass Balance Report & File in Log Book	Make Process Control Adjustments and Record Changes in WWTP Log Book	Complete Dryer Daily Process Goal Report	Print Process Goal Report and File in Binder	Record Process Goal in Treatment Plant Log	Insert Compliance Data into DMR Set by Supervisor	Initials
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2	☐	☐	☐	☐	☐	☐	☐	
3	☐	☐	☐	☐	☐	☐	☐	
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31	☐	☐	☐	☐	☐	☐	☐	

* Any significant actions or corrections you made should be recorded on back side of this page.
** Operator completing these rounds must resolve any issues or discrepancies prior to leaving shift.
*** Do not check the box until you are sure you have verified that <u>all</u> the info is correct. Any permit violations need to be resolved immediately and reported to Superintendent on CAF.

Date	Notes

Daily Process Rounds

Date	Ensure Lab Completes Mass Balance for Process Control and Data Entry	Review Report and based on the data select the appropriate RAS and WAS rate	Have SR. Operator. Review and Approve your Process Changes	Make the Approved Process Changes and Record in the Log Book	File Process Report in Binder	Initials
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4	☐	☐	☐	☐	☐	
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29	☐	☐	☐	☐	☐	
30	☐	☐	☐	☐	☐	
31	☐	☐	☐	☐	☐	

** Operator completing these rounds must resolve any issues or discrepancies prior to leaving shift.
*** Do not check the box until you are sure you have verified that <u>all</u> the info is correct. Any permit violations need to be resolved immediately and reported to Sr. Operators on CAF.

Date	Notes

City of Snoqualmie

2011

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

	A	B	C	*D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
DATE	IN FLOW (2FE01)	IPPS FLOW (4FE03)	CENT. FLOW (7DB01)	DIFFERENCE (2FE01-7DB01)	SE FLOW (6FE01)	FE FLOW (6FE02)	WAS FLOW (5FE01)	RAS1 FLOW (4FE01)	RAS2 FLOW (4FE02)	FE pH AVE	FE pH MAX	FE pH MIN	FE TEMP MAX	REC FLOW (6FE03)	RAW WATER FLOW (6FE04)	SE DO MIN	SE TURB MAX	ALUM LBS	POLYMER LBS	FE TURB MAX	FE DO MIN	CL2	INITIALS
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*D= When Sand filters are in operation the results must be the difference between A & B, otherwise it is the difference between A & C.

NF=no flow or not applicable

If any numbers are unusual report to operations staff on corrective action form immediately!!!!

DMR QA/QC Report Rounds

Date	Laboratory Analyst will review and certify that all compliance data is collected and accurate bench sheets are in the lab notebook and ready for release (check and initial)	Operator Assigned to complete the *SCADA Daily Flow Report Rounds* will certify that all data on flow report is complete and accurate (check and initial)	Supervisor will insert all Compliance Data into DMR consistent with Red Book standards from the lab bench sheets and Daily Flow Report after both sets of data are checked and initialed.	Laboratory Analyst will check the DMR file to ensure all data in file matches lab bench sheets and all averages and totals are correctly tabulated to meet Red Book standards	Operator Assigned SCADA Daily Flow Report will check the DMR file to ensure all data in file matches flow report and check all DMR calculations and cell formulas meet RED BOOK standards	DMR and Bench Sheets submitted through WQWWEBDMR portal
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30	□	□	□	Initials:___________	Initials:____________	Initials:______
31	□	□	□	Date:____________	Date:_____________	Date:_______

Date	Notes

Month : ______________________

Year: ______________________

Permit No: WA-022403-B

Location: 38190 SE Stearns Rd
Snoqualmie, WA 98065

City of Snoqualmie

EQ Class A Biosolids Daily Operational Process - Data

Dryer Batch Date	Day	Batch Number	Bag Number	Dryer Cycle Time					Comments
				Start	Discharge	Total Time (minutes)	Product Temp @ Discharge	Product % Total Solids	
1/1/1900	Tue	46	2010-23	10:00 AM	11:30 AM	90	305	92	

Month :
Year:
Permit No: WA-022403-B
Location: 38190 SE Stearns Rd
Snoqualmie, WA 98065

City of Snoqualmie

EQ Class A Biosolids Centrifuge - Data

Date	Day of Week	Time	Bearing Temperature	Vibration Levels	Centrifuge					Polymer Mixing Ratio Stroke/Speed	Flow rate of liquid sludge feed to centrifuge (gpm)	Polymer consumption (Gallons used)	Cake % TS	Polymer consumption (lbs polymer/ dry tons solids produced)	Liquid Sludge Feed to Centrifuge TSS mg/L	Comments
					Centrifuge Hours	Beginning Gallons	Ending Gallons	Gallons Processed	Centrate Drain TSS mg/L							
1/1/2009	Tue	12:00:00 AM	125/131	1.5	254	2000	5000	3000	425.00	25/80	25.0	5.00	20.00	25.00	2000.00	

Month : _______
Year: _______

Permit No: WA-022403-B

Location: 38190 SE Stearns Rd
Snoqualmie, WA 98065

City of Snoqualmie

EQ Class A Biosolids Pathogen/Vector Reduction - Report

Alternative 5 PFRP (Heat Drying) Option 8

Dryer Batch Date	Batch Number	Dry Product Sample ID	Bag Number	Fecal Coliform CFU/g Total Solids (dry weight basis)	% Dryness (Prior to sealing in bag)	Product Temperature (> 176 F)	Meets Pathogen Requirements	Meets Vector Attraction Reduction Requirments	Meets Product Temperature Requirments
Total									
				GEM	AVG	AVG			
Limit				1000	***	***			
					MIN	MIN			
Limit					90	176			

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Thomas E. Holmes, Treatment Works Supervisor - Signature

(425) 888-4153
Phone Number

City of Snoqualmie

EQ Class A Biosolids Pollutant - Report

Alternative 5 PFRP (Heat Drying) Option 8

Month : ____________________

Year: ____________________

Permit No: WA-022403-B

Location: 38190 SE Stearns Rd
Snoqualmie, WA 98065

Pollutant	Required by 503 Rule	Ceiling Limits (milligram per kilogram)[a]	Pollutnat Concentration Limits for EQ (milligram per kilogram)[a]	Results mg/kg	Sample Composited from 7 Consecutive Batches Batch Numbers for Composited Samples:
Arsenic	Yes	75	41		
Cadmium	Yes	85	39		
Chromium	Yes	3000	1200		
Copper	Yes	4300	1500		
Lead	Yes	840	300		
Mercury	Yes	57	17		
Molybdenum[b]	Yes	75	-		
Nickel	Yes	420	420		
Selenium	Yes	100	36		
Zinc	Yes	7500	2800		
Applies to:		All land applied biosolids	Bulk and bagged biosolids[c]		
From Part 503		Table 1, Section 503.13	Table 3, Section 503.13		
Total Nitrogen	No				
Total Potasium	No				
Total Phosphorus	No				

[a] Dry-weight basis

[b] As a result of the february 25, 1994, Amendment to the rule, the limits for molybdenum were delted from the Part 503 rule pending EPA reconsideration.

[C] Bagged biosloids are sold or given away in a bag or other container.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

(425) 888-4153

Phone Number

Thomas E. Holmes, Wastewater Superintendent - Signature

Tuesday Month Year

NAME	NP P1	NP P2	NP P3
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Tuesday

NAME	NP P1	NP P2	NP P3
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Tuesday

NAME	NP P1	NP P2	NP P3
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Equipment

- ☐ Check for the proper operation and functioning of all equipment.
- ☐ Check the for the proper Oil level on the Quincy compressor.
- ☐ Check the NPWS and lubricate control valve weekly.
- ☐ Check water pressure on seal flush for was pumps. WAS pumps should drip 1 to 3 drips of water per minute.
- ☐ Check MMI for proper function.

Concrete Structure and Grounds

- ☐ Pressure Wash concrete once per year. Keep area neat & tidy.

*Note any significant tasks completed above on the back of this page.

* Record to nearest whole numbers once per week on Tuesday.

NP P1 NP P2

NP P1 NP P2

Tuesday

NAME	NP P1	NP P2	NP P3
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Tuesday

NAME	NP P1	NP P2	NP P3
Current Hours			
Previous Hours			
Tot Elapsed Hours			

MCC Room

- ☐ Clean floor and dispose of any garbage in the dumpster at least once per month.
- ☐ Check building interior and exterior for any deficiencies and report or correct as needed.
- ☐ Clean work station area and keep space neat and tidy.

Grounds

- ☐ Pressure wash side walks around building once per month.
- ☐ Remove any bird nests or spider webs from building as needed
- ☐ Provide weed control as needed.
- ☐ Clean chemical room and keep tidy & neat.

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Filter Building Rounds

SE Structure

- ☐ Lubricate gates once in April and October
- ☐ Clean structure with high pressure water.
- ☐ Scrape off moss on walls once per month.

Filter Building Structure

- ☐ Keep entire building clean and tidy with high pressure water. Clean grates and all concrete once per month.
- ☐ Replace site lights and clean lights as needed.
- ☐ Remove any birds' nests by looking for droppings ASAP.
- ☐ Clean railings April and October yearly.
- ☐ Empty any trash cans once per month in dumpster.

Electrical Panels and Equipment

- ☐ Wipe panels with suitable cleaner and rag to keep clean and free of muck and buildup.

UV Channels Out fall Structure

- ☐ Isolate one channel and clean every other week with fire hose or pressure washer.
- ☐ Scrape walls and or clean outfall structure once per month including v notch weir.

UV Lamp Cleaning

- ☐ Clean 4 modules per week with swipes and water.
- ☐ Review alarm screen and resolve any issues.

UV Lamp Replacement

- ☐ Lights and other parts must be replaced and ordered immediately to maintain disinfection.
- ☐ Replace any lamps, quartz sleeves, ballasts, or intensity sensors with only official Trojan parts.
- ☐ Spent lamps must be stored in the shipping box.
- ☐ Any lamp under warranty needs to be filed against the warranty claim by the operator for replacement.
- ☐ All lamps must be recorded in the replacement log located in the filter building.

Operation Center

- ☐ After any alarms are cleared from the UV lamp terminal they must be cleared from the MMI
- ☐ Report in writing on CAF any unresolved issue that need to be addressed.
- ☐ Record any operational changes in Treatment plant log book.

* Any significant actions should be recorded on back side of this page.

** Operator completing these rounds must verify SCADA results are accurate for any grab results collected in the field.

***Resolve any issues that could impact disinfection performance

MONTH YEAR INITIALS

DAY	6ME11 Hrs.	6ME12 Hrs.	6ME13 Hrs.	6ME21 Hrs.	6ME22 Hrs.	6ME23 Hrs.
1						
2						
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MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

CHECK SHEET FOR JCB 35D 4X4

Year: Month:	Week 1	Week 2	Week 3	Week 4
Initials :				
Walk Around				
Body frame work, forks				
Tire inflation				
rust around lug nuts				
leaking fluids				
Hydraulic fluid level				
Operators Station				
Remove Trash				
Remove unwanted tools				
Cond. of seat and belt				
Engine Compartment				
Check Oil				
Check cond. Of belts/tension				
Check/clean air filters				
Check for loose or corroded wires				
Check battery level/terminals				
Turn batters isolator off and attempt to start				
Start Machine				
Check warning lights				
check for excessive smoke, vibration, noise, overheating, and unusual smell				
Check fuel, fill at 1/2				
check head lights, horn, other electrical				
put into reverse and listen for alarm				
Note transmission operation				
Operation				
Check park break and service break				
Check throttle system				
Check hr meter/ fuel guage operation				
Monthly: grease Zurks with lithium No2 grease			Int:_____________	
Lift boom: 6 Zurks				
Carriage: 6 zurks				
Sideshift: 3 zurks				
rear axle: 4 zurks each side (8 total)				

Notes:

Generator Rounds

Generator Room

- ☐ Clean concrete floors with mop and check room functions, i.e. lights, fans ect…
- ☐ Dispose of any garbage and take out trash at least once per month.
- ☐ Check for any leaking fluids and report as needed.

Generator Batteries

- ☐ Check battery charger for equalization and function.

Generator Interface

- ☐ Check interface to ensure the unit is ready for operation and that no alarms are being reported.
- ☐ Check fuel level. Check Oil level
- ☐ Call for fuel at ½ tank or higher.
- ☐ Report any deficiencies to Fleet thorough computerized help desk ticket

Transfer Switch

- ☐ Check transfer switch interface for any unusual condition that may require repair or adjustment and report as needed.

*Note any significant tasks completed above on the back of this page.

** Please record hours to the nearest whole number.

First work day of Month Year Initials:

HOURS	GEN HR	# STARTS	FUEL	OP NORM
Current				
Totalized				☐
Current				
Totalized				☐
Current				
Totalized				☐
Current				
Totalized				☐
Current				
Totalized				☐
Current				
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HOURS	GEN HR	# STARTS	FUEL	OP NORM
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Totalized				☐
Current				
Totalized				☐

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Generator Rounds

	HOURS	GEN HR	STARTS	FUEL	OK
1	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
2	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
3	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
4	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
5	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
6	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
7	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
8	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
9	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
10	Today			F ¾ ½ ¼	☐
	Totalized				Time:
11	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
12	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
13	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
14	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
15	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:

	HOURS	GEN HR	STARTS	FUEL	OK
16	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
17	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
18	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
19	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
20	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
21	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
22	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
23	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
24	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
25	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
26	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
27	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
28	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
29	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
30	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:
31	Today			F ¾ ½ ¼	☐
In.	Totalized				Time:

MONTH ____ YEAR ____

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Generator Rounds

Generator Room

- ☐ Clean concrete floors with mop and check room functions, i.e. lights, fans ect…
- ☐ Dispose of any garbage and take out trash at least once per month.
- ☐ Check for any leaking fluids and report as needed.

Generator Batteries

- ☐ Check battery charger for equalization and function.

Generator Interface

- ☐ Check interface to ensure the unit is ready for operation and that no alarms are being reported.
- ☐ Check Oil level
- ☐ Call for fuel at ½ tank or higher.

- ☐ Report any deficiencies to Fleet thorough computerized help desk ticket

Transfer Switch

- ☐ Check transfer switch interface for any unusual condition that may require repair or adjustment and report as needed.
- ☐ Schedule annual test for transfer switch with Generator Company in October of each year.

Report and Repair

- ☐ Check alarm screen on HMI. If any alarms present for generator it is the operator's responsibility to resolve the issue ASAP. Operator must stick with the issue until it is resolved this may take several days or a week of coordination.
- ☐ Operator must coordinate with maintenance teams as needed to get the work done. It shall be the goal of every operator to get the issue resolved ASAP.

Generator Rounds

Generator Room

- ☐ Clean concrete floors with mop and check room functions, i.e. lights, fans ect…
- ☐ Dispose of any garbage and take out trash at least once per month.
- ☐ Check for any leaking fluids and report as needed.

Generator Batteries

- ☐ Check battery charger for equalization and function.

Generator Interface

- ☐ Check interface to ensure the unit is ready for operation and that no alarms are being reported.
- ☐ Check fuel level. Check Oil level
- ☐ Call for fuel at ½ tank or higher.
- ☐ Report any deficiencies to Fleet thorough computerized help desk ticket

Transfer Switch

- ☐ Check transfer switch interface for any unusual condition that may require repair or adjustment and report as needed.

*Note any significant tasks completed above on the back of this page.

** Please record hours to the nearest whole number.

First work day of Month Year Initials:

HOURS	GEN HR	# STARTS	FUEL	OP NORM
Current			F ¾ ½ ¼	
Totalized				☐
Current			F ¾ ½ ¼	
Totalized				☐
Current			F ¾ ½ ¼	
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HOURS	GEN HR	# STARTS	FUEL	OP NORM
Current			F ¾ ½ ¼	
Totalized				☐
Current			F ¾ ½ ¼	
Totalized				☐
Current			F ¾ ½ ¼	
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Current			F ¾ ½ ¼	
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Current			F ¾ ½ ¼	
Totalized				☐

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Head works Rounds

Lower Section

- ☐ Check dumpster and rake down compactor tailing if needed
- ☐ Check grit dewatering screw bearing lubrication. (Lubricate weekly)
- ☐ Check grit dewatering screw packing gland lubrication. (Lubricate as weekly)
- ☐ Check grit lift flow for adequate flow while system is activated. (Twice weekly)
- ☐ Hose down area to keep area clean and free of debris and contaminants to reduce vectors.
- ☐ Notes:____

Upper Channels, bypass screen, and gates

- ☐ Check for debris, slime, and or scum build up and spray off as needed with high psi water.
- ☐ Fully operate all gates during the second week of March and September of each year.
- ☐ Lubricate gates as needed and report any repairs needed on sticky or tight gates
- ☐ Report any evidence of screen channel bypass in Treatment Log and on CAF to OIC
- ☐ Notes:____

General Inlet Head Structure

- ☐ Check lighting to ensure site properly lighted. Replace any lights not working.
- ☐ Check to ensure no birds are nesting in the roof.
- ☐ Clean area around sampler and control panels to ensure area looks neat and clean
- ☐ Check all piping for leaks.
- ☐ Clean and paint any pipes that are dingy or in need rust removal and maintenance
- ☐ Clean stairs and railing as needed to keep areas neat and clean
- ☐ Notes:____

Perforated Plate Screen

- ☐ Open covers remove any entangled material from machine with high pressure water. Clean Sensors and float.
- ☐ Check to ensure that the brush contacts the plates with 70% coverage adjust as needed.
- ☐ Check chain tension once in January, May, and September
- ☐ Have solids removed in front of screen bimonthly and check neoprene seal and brush for damage and replace if it shows signs of wear.
- ☐ Adjust Scraper plate so that it doesn't contact brush
- ☐ Every 4500 hrs check bottom chain bearing for any play and drive shaft flange bearing
- ☐ Notes:____

WAP

- ☐ Lubricate self aligning roller bearing two strokes every week.
- ☐ Manually operate solenoid valves weekly
- ☐ High pressure wash internals of entire WAP monthly
- ☐ Replace screw brush in March and October of each year
- ☐ Check guide bars and screw flights in March of each year with 10 bags of ice
- ☐ Notes:____

Vortex Grit System

- ☐ Manually operate system on Monday and Thursday every week
- ☐ Check paddle for debris build up and clean as needed
- ☐ Notes:____

*Note any significant tasks completed above on the back of this page.

Tuesday Month Year

NAME	BRUSH HRS.	SCREEN HRS.	PRESS HRS.
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Tuesday Month Year

NAME	BRUSH HRS.	SCREEN HRS.	PRESS HRS.
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Tuesday Month Year

NAME	BRUSH HRS.	SCREEN	PRESS HRS.
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Tuesday Month Year

NAME	BRUSH HRS.	SCREEN	PRESS HRS.
Current Hours			
Previous Hours			
Tot Elapsed Hours			

Tuesday Month Year

NAME	BRUSH HRS.	SCREEN	PRESS HRS.
Current Hours			
Previous Hours			
Tot Elapsed Hours			

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Head works Rounds

Lower Section

- ☐ Check dumpster and rake down compactor tailing if needed
- ☐ Check grit dewatering screw bearing lubrication. (Lubricate weekly)
- ☐ Check grit dewatering screw packing gland lubrication. (Lubricate as weekly)
- ☐ Check grit lift flow for adequate flow while system is activated. (Twice weekly)
- ☐ Hose down area to keep area clean and free of debris and contaminants to reduce vectors.
- ☐ Notes:____

Upper Channels, bypass screen, and gates

- ☐ Check for debris, slime, and or scum build up and spray off as needed with high psi water.
- ☐ Fully operate all gates during the second week of March and September of each year.
- ☐ Lubricate gates as needed and report any repairs needed on sticky or tight gates
- ☐ Report any evidence of screen channel bypass in Treatment Log and on CAF to OIC
- ☐ Notes:____

- ☐

General Inlet Head Structure

- ☐ *Check lighting to ensure site properly lighted. Replace any lights not working.*
- ☐ *Check to ensure no birds are nesting in the roof.*
- ☐ *Clean area around sampler and control panels to ensure area looks neat and clean*
- ☐ *Check all piping for leaks.*
- ☐ *Clean and paint any pipes that are dingy or in need rust removal and maintenance*
- ☐ *Clean stairs and railing as needed to keep areas neat and clean*
- ☐ *Notes:____*

Perforated Plate Screen

- ☐ *Open covers remove any entangled material from machine with high pressure water. Clean Sensors and float.*
- ☐ *Check to ensure that the brush contacts the plates with 70% coverage adjust as needed.*
- ☐ *Check chain tension once in January, May, and September*
- ☐ *Have solids removed in front of screen bimonthly and check neoprene seal and brush for damage and replace if it shows signs of wear.*
- ☐ *Adjust Scraper plate so that it doesn't contact brush*
- ☐ *Every 4500 hrs check bottom chain bearing for any play and drive shaft flange bearing*
- ☐ *Notes:____*

WAP

- ☐ *Lubricate self aligning roller bearing two strokes every week.*
- ☐ *Manually operate solenoid valves weekly*
- ☐ *High pressure wash internals of entire WAP monthly*
- ☐ *Replace screw brush in March and October of each year*
- ☐ *Check guide bars and screw flights in March of each year with 10 bags of ice*
- ☐ *Notes:____*

Vortex Grit System

- ☐ *Manually operate system on Monday and Thursday every week*
- ☐ *Check paddle for debris build up and clean as needed*
- ☐ *Notes:____*

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Headworks Rounds

First work day of month: Year: Initials:

Day	Hours	Brush	Screen	Press
	Current			
	Totalized			
	Current			
	Totalized			
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Day		Brush	Screen	Press
	Current			
	Totalized			
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	Totalized			

Holiday and Weekend Rounds

Date	Check Lift Station- Honey Farm	Check Lift Station- Pickering Court	Check Lift Station- Parkway	Check Lift Station- F	Check & Dump Headwork's Dumpster	Walk the Entire Treatment Process	Complete Round Sheets Marked with Weekend Labels	Complete any Lab work not finished	Complete any Reclaim Season Testing work Or Reclaim Rounds During Reclaim Season	Initials
1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
2	☐	☐	☐	☐	☐	☐	☐	☐	☐	
3	☐	☐	☐	☐	☐	☐	☐	☐	☐	
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* Any significant actions or corrections you made should be recorded on back side of this page.
** Operator completing these rounds must resolve any issues or discrepancies prior to leaving shift, Operator is Authorized to take any corrective actions they believe are necessary.
*** Do not check the box until you are sure you have verified that <u>all</u> the info is correct. Any permit violations need to be resolved immediately per section S3.E. And reported to Sr. Operator.

Date	Notes

In-Plant Pump Station Rounds

Above Ground Structures

- ☐ Clean concrete and pipes with high pressure water or soap once per month.
- ☐ Replace any worn items including pipe markers for identification
- ☐ Keep area clean and tidy. Control weeds as needed.

External Gauges

- ☐ Check that flow meter reading in field
- ☐ Check Pressure gauge on force main record pressure on back of page weekly for each pump.

Wet Well

- ☐ Check wet well for any corrosion or deficiency and correct if needed

MCC

- ☐ Pressure Wash concrete once per year. Keep area neat & tidy.
- ☐ Any deficiencies must be notes in the log book, and an action must be taken by the operator to fix issue and or complete CAF for SIMT.

*Note any significant tasks completed above on the back of this page.

** Please record hours to the nearest whole number.

First work day of Month   Year   Initials:

HOURS	4P41	4P42	FLOW MGD	OP NORM
Current				
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HOURS	4P41	4P42	FLOW MGD	OP NORM
Current				
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Current				
Totalized				☐

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

DMR QA/QC Report Rounds

Date	Laboratory Analyst will review and certify that all compliance data is collected and accurate bench sheets are in the lab notebook and ready for release	Laboratory Analyst has checked the DMR DATA the was entered and certifies that it is correct	Operators assigned SCADA Rounds on weekdays and weekends will review and certify that all compliance data is collected and accurate flow reports are printed and ready for release	Operators has checked the DMR DATA the was entered and certifies that it is correct	Super has reviewed DMR QC/QA Report Rounds and it is ok and the Web DMR can be signed
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31	□	□	□ Initials_______	□	
	Initials_______	Initials_______		Initials_______	

Date	Notes

DMR QA/QC Report Rounds

Date	Laboratory Analyst will review and certify that all compliance data is collected and accurate bench sheets are in the lab notebook and ready for release	Laboratory Analyst will log into share point and find the monthly DMR spreadsheet and shall keep it updated daily as results are recorded.	Operators assigned SCADA Rounds on weekdays and weekends will review and certify that all compliance data is collected and accurate flow reports are printed and ready for release	Operators will log into share point and find the monthly DMR spreadsheet and shall keep it updated daily as results are checked.	Super has reviewed DMR data Weekly and submitted WQWWEBDMR portal and signs by 15th of each month.
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31	☐	☐	☐ Initials________	☐ Initials________	☐

Date	Notes

Lift Station Rounds

Station:

Building Interior

- ☐ Clean floor and dispose of any garbage at least once per month.
- ☐ Check building interior for any deficiencies and report or correct as needed.
- ☐ Calibrate gas sensor if above 2% of LEL, note if sensor does not hold calibration.
- ☐ Perform 1 minute pump down test on each pump at station record on back of sheet.
- ☐ Run sump pump if applicable
- ☐ Check inside panel for correct operation, pumps/check valves

Generator

- ☐ Note hours and # of starts on gen-set daily
- ☐ Check, note, report and attempt to fix any anomalies
- ☐ Check oil heater for warmth.

Wet well

- ☐ Inspect wet well for FOG deposits, corrosion, and any general deficiencies. Note and report any issue.
- ☐ Note sound of pump(s) when they run.

Valve Vault

- ☐ Inspect valve vault for deficiencies (paint, dirt, etc.)
- ☐ Exercise valves weekly
- ☐ Note operation of swing arm and actuator switch.

Building and Grounds

- ☐ Pressure wash concrete around building once in June.
- ☐ Check level of Bioxide in tank, and condition of Bioxide pumping system (if applicable)
- ☐ Check exterior building functions
- ☐ Keep area clean
- ☐ Check operation of outside light
- ☐ Check building exterior for any deficiencies and report or correct as needed.
- ☐ Check heat tape, if in operation.

Ancillary equipment / Etc.

- ☐ Check for proper operation and cleanliness of any other equipment.

*Note any significant tasks completed, or observations made above on the back of this page.
Initiate and correct issues as needed by reporting any needed repairs to the appropriate maintenance staff and work with staff and vendors to ensure work is completed and system functions as specified.

First Day	Month	Year
MONDAY	P1	P2
Current Hours		
Previous Hours		
Tot Elapsed Hours		
AMPS		
TUESDAY	P1	P2
Current Hours		
Previous Hours		
Tot Elapsed Hours		
AMPS		
WEDNESDAY	P1	P2
Current Hours		
Previous Hours		
Tot Elapsed Hours		
AMPS		
THURSDAY	P1	P2
Current Hours		
Previous Hours		
Tot Elapsed Hours		
AMPS		
FRIDAY	P1	P2
Current Hours		
Previous Hours		
Tot Elapsed Hours		
AMPS		
SATURDAY	P1	P2
Current Hours		
Previous Hours		
Tot Elapsed Hours		
AMPS		
SUNDAY	P1	P2
Current Hours		
Previous Hours		
Tot Elapsed Hours		
AMPS		

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

FLUSHING LOG

DATE	LOCATION	SIZE OF MAIN Dia, in D	Length, ft L	Press, psi P	Disch. Opening, in d	Flush Rate, GPM Q	Flush Velocity, FPS V	Time Req'd. to Clear, min T	CHLORINE RESIDUAL Initial Free/Total, ppm	Final Free/Total, ppm	Flushed Water Description
						$ -	#DIV/0!				
						$ -	#DIV/0!				
						$ -	#DIV/0!				
						$ -	#DIV/0!				
						$ -	#DIV/0!				
						$ -	#DIV/0!				
						$ -	#DIV/0!				
						$ -	#DIV/0!				
						$ -	#DIV/0!				

Q = Flushing rate in GPM

d = Diameter of nozzle or opening in inches

P = Gage pressure at nozzle or opening in psi

$Q = 26.8\ d^2\ P^{1/2}$

V = Flushing velocity in main in FPS ideally 5ft/sec for proper cleaning action

D = Diameter of main being flushed in inches

$V = 0.409\ Q / D^2$

SEWER DIVISION

MONTHLY MANHOUR REPORT

Job Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
Administrative/Budgeting/Reports/clerical																																0
Assist Other Departments/City General Fcn.																																0
Operation of Process Equipment																																0
Maintennace of Process Equipment																																0
Laboratory																																0
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Scheduled OT																																0
Unscheduled OT																																0
Seminars/Schooling/Training																																0
Vacation/Per./Comp. Time/Holiday/Sick																																0

4/10 should add upto 9.5 hours

5/8 should add upto 7.5 hours

SEWER DIVISION

MONTHLY MANHOUR REPORT

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SEWER DIVISION

MONTHLY MANHOUR REPORT

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SEWER DIVISION

MONTHLY MANHOUR REPORT

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SEWER DIVISION

MONTHLY MANHOUR REPORT

Job Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
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Vacation/Per./Comp. Time/Holiday/Sick																																

Procedure: Standards Methods for the Examination of Water and Wastewater, 21st Edition 9222 D & 9223 B (Colilert) -97

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	p	Q
Collection			**Laboratory Preperation**			**Incubation**		**Post Incubation Analysis**						**Results**		
						Analyst:		Analyst:		Fecal Coliform Blue only	Total Coliform Yellow Only			Fecal Coliform		Total Coliform
Site Name (Indicate Blanks or Dupes as needed)	**Date**	**Time**	**Sample Vol (mL)**	**Sterile Dilution Water Vol (mL)**	**Dilution Factor (f)= (E + D)/D**	**Start Date**	**Time**	**Final Date**	**Time**	**# of blue or partially blue colonies**	**# of large wells**	**# of Small wells**	**MPN from Table**	**CFUs/100mL = 100(K ÷ D)**	**Combined Result = 100[(T+X)÷(R+S)]**	**MPN/100mL= N × F**
LAB FUNNEL &BOTTLE BLANK																
EFFLUENT LAB REPLICATE			R							T						
EFFLUENT LAB REPLICATE			S							X						
PRE-UV POSITIVE QC FOR MEMBRANE																
RECLAIM BOTTLE LAB BLANK																
RECLAIM HYDRANT LAB REPLICATE																
RECLAIM HYDRANT LAB REPLICATE																
PRE-UV POSITIVE QC FOR IDEXX																

NOTES: 1. At least one lab blank should be performed for every batch of 10 or more samples. 2. Membrane filters with counts higher than 200 are considered TNTC. 3. If multiple membranes of the same samples are all TNTC then use 200 as the plate count and make calculation based on the smallest dilution. 4. Ideally the only plates that should be used are those with colony counts between 20 and 60. In this case, counts outside of this range should not be used to calculate the result.

Opening-up sheet for Snoqualmie Water Reclamation Facility

Month: year:

day of the month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
HEADWORKS																															
Operate Grit System																															
Visually Inspect Screen																															
Bar Screen Hours																															
Brush Run Time Hours																															
Compactor Hours																															
Compressor PSI 1/2																															
Operate Bar Screen																															
Flush Water Running (4)																															
Div Chnl Bar Rack Check																															
Check Paddle for Rags																															
Check Classifier Packing																															
Check Grit Hopper																															
Grit Screw Packing Gland																															
AERATION BASIN #1																															
D.O.																															
3MX11 Clear Debris																															
3MX12 Clear Debris																															
3MX13 Oil/Vibration																															
3MX14 Oil/Vibration																															
3MX15 Oil/Vibration																															
AERATION BASIN #2																															
D.O.																															
3MX21 Clear Debris																															
3MX22 Clear Debris																															
3MX23 Oil/Vibration																															
3MX24 Oil/Vibration																															
3MX25 Oil/Vibration																															
Clarifier #1																															
Oil Level																															
Torque																															
RAS Pump Flow																															
PSI																															

Clarifier
#2

Oil Level																															
Torque																															
RAS Pump Flow																															
PSI																															

RAS
#1

Flow																															
Pump Operation	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12	4P11 4P12

RAS
#2

Flow																															
Pump Operation	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22	4P21 4P22

MCC
ROOM

In-Plant Pump 4P41 Hours																															
In-Plant Pump 4P41 Amps																															
In-Plant Pump 4P42 Hours																															
In-Plant Pump 4P42 Amps																															
RAS Pump 4P22 Hours																															
RAS Pump 4P21 Hours																															
RAS Pump 4P12 Hours																															
RAS Pump 4P11 Hours																															
Clarifier #1 Drive Hours																															
Clarifier #1 Drive Amps																															
Clarifier #2 Drive Hours																															
Clarifier #2 Drive Amps																															
Reclaim H20 6P42 Hours																															
Reclaim H20 6P42 Amps																															
Reclaim H20 6P41 Hours																															
Reclaim H20 6P41 Amps																															
Aerator 3MX14 Hours																															
Aerator 3MX14 Amps																															
Aerator 3MX24 Hours																															
Aerator 3MX24 Amps																															
Mixer 3MX21 Hours																															
Mixer 3MX22 Hours																															
Anoxic 3MX23 Hours																															
Aerator 3MX15 Hours																															
WAS Pump 5P12 Hours																															
WAS Pump 5P12 Amps																															
WAS Pump 5P11 Hours																															
WAS Pump 5P11Amps																															
WAS Sump 5P21 Hours																															
WAS Sump 5P21 Amps																															
Mixer 3MX11 Hours																															
Mixer 3MX11 Amps																															

Mixer 3MX12 Hours																															
Mixer 3MX12 Amps																															
Mixer 3MX13 Hours																															
Mixer 3MX13 Amps																															
Filter Air Scour 5CPR81 Amps																															
Filter Air Scour 5CPR81 Hours																															
Aerator 3MX25																															

GENERATOR ROOM

Number of Starts																															
Fuel Level																															
Battery VDC																															
Check Oil Heater																															
Run Hours																															

EQUIPMENT BUILDING

NPW SYSTEM

Non-Pot Pump # 3 Hours																															
Non-Pot Pump # 2 Hours																															
Non-Pot Pump # 1 Hours																															
non-pot Pump Volts																															
Problems?																															

SLUDGE

STORAGE TANK

level %																															
Screen running																															
Conveyor running																															
Blower running																															
Blower temp																															
Blower pressure																															

UV Lights

Channel in use	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2
ME11 Hours																															
ME11 Intensity																															
ME12 Hours																															
ME12 Intensity																															
ME13 Hours																															
ME13 Intensity																															
ME21 Hours																															
ME21 Intensity																															
ME22 Hours																															
ME22 Intensity																															
ME23 Hours																															
ME23 Intensity																															

INITIALS																															

TERTEARY
FILTRATION
SYSTEM

on / off																															
Check air compressor oil																															
Check blower oil																															
coagulant draw down test																															
coagul aid draw down test																															
NTU on SECS																															
DO on SECS																															
Drain SECS Turbidity meter																															
Sand filter # 1																															
Sand filter # 2																															
Sand filter # 3																															
Control Panel issues																															
Backwash filter																															
6FE03 GPM Flow																															
Non-pot Pump 6P41 PSI																															
Non-Pot Pump 6P42 PSI																															
Final Effluent NTUs																															
Final Effluent DO																															
Drain FE Turbidty Meter																															

NOTES:

pH BENCH SHEET

Procedure: Standards Methods for the Examination of Water and Wastewater, 21st Edition 4500-H+ B-00

1. Meter shall be calibrated prior to use. 2. Batches longer than 15 samples shall have the calibration verified with 8.00 buffer.

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Day	Analysts Initials	Time	Calibration Standard Readings S.U.			Temp ℃	Calibration Slope (98 - 103%)	Check Verification 8.00 NIST	Sample Readings S.U. at 20 ℃				
			4.01	7.00	10.01				Dil. Water	Effluent	Influent	DSHS	Casino
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
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25													
26													
27													
28													
29													
30													
31													

pH 4 Buffer:	pH 7 Buffer:	pH 10 Buffer:
Lot #: ________________	Lot #: ________________	Lot #: ________________
Manufacturer: __________	Manufacturer: __________	Manufacturer: __________
Expiration Date: ________	Expiration Date: ________	Expiration Date: ________

Intruments - Hach HQ 440d SN 110300052859 **PHC 101 Probe SN** ____________________________

Batches larger than 15 shall be verfired with 8.00 buffer. Result must be ± 1.0 S.U. of the true value

Comments-

Month ____________________ **Year**____________________

Wastewater Action Plan

Plan Created by:	Deadline in Days	Deadline:	Highlight Activities
		6/22/2020	This Month [1 - 30, Nov]

This Plan is for:

Action	Responsible Employee	Due By	Budget if any	% Done	Progress	Notes
Planning		3/24/2020	$476.00	25%		
Preparation		6/20/2020	$301.00	10%		
Task A		6/15/2020	$429.00	0%		
Task B		7/12/2020	$332.00	70%		
Task C		8/1/2020	$471.00	10%		
Task D		8/6/2020	$418.00	✓ 100%		
Paperwork		8/16/2020	$150.00	0%		Start After Task B is Complete
Hand-off		8/31/2020	$330.00	25%		

Highlight Settings

The tables below store settings and calculations for the Highlight Activities drop down list.
Any changes could result in errors or loss of functionality.

No Highlight			No Highlight
Interval:	Start:	End:	Due:
This Week	Monday, June 22, 2020	Sunday, June 28, 2020	This Week [22 Jun - 28 Jun]
This Month	Monday, June 1, 2020	Tuesday, June 30, 2020	This Month [1 - 30, Jun]
This Quarter	Sunday, March 1, 2020	Tuesday, June 30, 2020	This Quarter [1 Mar - 30 Jun]
This Year	Wednesday, January 1, 2020	Thursday, December 31, 2020	This Year [2020]
Interval:			Interval:
Last Week	Monday, June 15, 2020	Sunday, June 21, 2020	Last Week [15 Jun - 21 Jun]
Last Month	Friday, May 1, 2020	Sunday, May 31, 2020	Last Month [1 - 31, May]
Last Quarter	Sunday, December 1, 2019	Saturday, February 29, 2020	Last Quarter [1 Dec - 29 Feb]
Last Year	Tuesday, January 1, 2019	Tuesday, December 31, 2019	Last Year
Selected Highlight:		This Month [1 - 30, Nov]	FALSE
Highlight Start			
Highlight End			

Power Outage Rounds

		DATE			
Complete These Rounds at the onset of a Power Outage					
Portable Generator	Use Kirk Key trapped interlock system to power portable generator (see SOP @ breaker)	☐	☐	☐	☐
Fuel	Ensure adequate fuel in both tanks for continued generator operation order fuel at 2/3 Full	☐	☐	☐	☐
HMI	Check each of the 19 plant screens for proper operation during power outage	☐	☐	☐	☐
HMI	Check all lift station screens and monitor for widespread regional power outages and visit any sites as needed.	☐	☐	☐	☐
Headworks	Physically check to ensure screen is operating properly and no alarms on Huber panel are present	☐	☐	☐	☐
Carousel Systems	Visually watch the aerators operate via DO drop and ensure all mixers are running and HMI dip switch is ENABLED for the online aerator.	☐	☐	☐	☐
Return Activated Sludge	Visually verify that the RAS pumps are working by checking the flow directly on the MAG meter	☐	☐	☐	☐
Waste Activated Sludge	Verify WAS Valves are set to the proper setting on HMI and watch pump cycle in WAS Room	☐	☐	☐	☐
Clarifier	Reset any Alarms on the reclaim screen and visually inspect that drive is operating normally	☐	☐	☐	☐
Non-Potable Water System	Reset any alarms on the panel and inspect system for proper function	☐	☐	☐	☐
WAS Storage Tank	Reset blower and screen ensure both are functioning normally.	☐	☐	☐	☐
Biosolids Facility	Visually inspect all equipment for proper operation, check centrifuge scroll settings carefully.	☐	☐	☐	☐
Reclaim System	Reset all reclaim alarms. Visually inspect all chemical dosing and pumps. Check entire UV disinfection system for 100% proper channel activation.Check air compressor.	☐	☐	☐	☐
Complete these Rounds after Power has been restored					
Portable Generator	Use Kirk Key trapped interlock system to reenergize commercial power system. See SOP @ breaker for portable generator.	☐	☐	☐	☐
Fuel	Ensure adequate fuel in both tanks for continued generator operation, order fuel at 2/3 Full	☐	☐	☐	☐
HMI	Aerators should show green activation boxes for *DO High* and *DO Control.*	☐	☐	☐	☐
Headworks	Physically check to ensure screen is operating properly and no alarms on Huber panel are present	☐	☐	☐	☐
Carrousel Systems	Visually watch the aerators operate via DO drop and ensure all mixers are running and HMI dip switch is *ENABLED* for the online aerator.	☐	☐	☐	☐
Return Activated Sludge	Visually verify that the RAS pumps are working by checking the flow directly on the flowmeter	☐	☐	☐	☐
Waste Activated Sludge	Verify WAS Valves are set to the proper setting (5CV01) (5CV02) in manual. *WAS Pumps* switch set to AUTO. (5CV03) lagoon valve @ MANUAL. Visually verify pump cycle in WAS Room	☐	☐	☐	☐
Clarifier	Reset any Alarms on the reclaim screen and visually inspect that drive is operating normally	☐	☐	☐	☐
Non-Potable Water System	Reset any alarms on the panel and inspect system for proper function	☐	☐	☐	☐
WAS Storage Tank	Reset blower and screen ensure both are functioning normally	☐	☐	☐	☐
Biosolids Facility	Visually inspect all equipment for proper operation, check centrifuge scroll settings carefully	☐	☐	☐	☐
Reclaim System	Reset all reclaim alarms. Visually inspect all chemical dosing and pumps. Check entire UV disinfection system for 100% proper channel activation. Check air compressor.	☐	☐	☐	☐
Lift Stations	Visually inspect any lift station that may have lost power for proper function.	☐	☐	☐	☐
HMI	Check All computer control systems and ensure data is updating by monitoring data on screen	☐	☐	☐	☐
Generator	The stationary generator will not switch back to commercial power if the Kirk key is activated. Operator must stay on site and coordinate with PSE to determine when commercial power has been restored before deactivating the Kirk key trapped interlock. Operator must not leave until main transfer switch has switched back to commercial power and stationary has finished running. All systems above must be checked after generator has powered down.	☐	☐	☐	☐
	Initials:				

Power Outage Rounds

		DATE			
Complete These Rounds at the onset of a Power Outage					
Portable Generator	Use Kurk Key trapped interlock system to power portable generator	☐	☐	☐	☐
Fuel	Ensure adequate fuel in both tanks for continued gerator operation order fuel at 2/3 Full	☐	☐	☐	☐
HMI	Check each of the 19 plant screens for proper operation during power outage	☐	☐	☐	☐
HMI	Check all lift station screen and monitor for additional power outages and visit sites as needed	☐	☐	☐	☐
Headworks	Physically check to ensure screen is operating properly and no alarms on Huber panel are present	☐	☐	☐	☐
Carrousel Systems	Visually watch the aerators operate via DO drop and ensure all mixers are running.	☐	☐	☐	☐
Return Activated Sludge	Visually verify that the RAS pumps are working by checking the flow directly on the MAG meter	☐	☐	☐	☐
Waste Activated Sludge	Verify WAS Valves are set to the proper setting on HMI and watch pump cycle in WAS Room	☐	☐	☐	☐
Clarifier	Reset any Alarms on the reclaim screen and visually inspect that drive is operating normally	☐	☐	☐	☐
Non-Potable Water System	Reset any alarms on the panel and inspect system for proper function	☐	☐	☐	☐
WAS Storage Tank	Reset Blower and ensure Blower is functioning normally	☐	☐	☐	☐
Dryer Facility	Visually inspect all equipment for proper operation, especially if dryer was processing sludge	☐	☐	☐	☐
Reclaim System	Reset all reclaim alarms. Visually inpect compressor and make sure air is being provided to filters.	☐	☐	☐	☐
Reclaim System	Visually inspect chlorine injection system and all disinfection monitoring equipment.	☐	☐	☐	☐
Reclaim System	Reset all reclaim alarms. Visually inpect compressor and make sure air is being provided to filters.	☐	☐	☐	☐
Complete these Rounds after Power has been restored					
Portable Generator	Use Kurk Key trapped interlock system to power portable generator	☐	☐	☐	☐
Fuel	Ensure adequate fuel in both tanks for continued gerator operation order fuel at 2/3 Full	☐	☐	☐	☐
HMI	Check each of the 19 plant screens for proper operation during power outage	☐	☐	☐	☐
HMI	Check all lift station screen and monitor for additional power outages and visit sites as needed	☐	☐	☐	☐
Headworks	Physically check to ensure screen is operating properly and no alarms on Huber panel are present	☐	☐	☐	☐
Carrousel Systems	Visually watch the aerators operate via DO drop and ensure all mixers are running.	☐	☐	☐	☐
Return Activated Sludge	Visually verify that the RAS pumps are working by checking the flow directly on the MAG meter	☐	☐	☐	☐
Waste Activated Sludge	Verify WAS Valves are set to the proper setting on HMI and watch pump cycle in WAS Room	☐	☐	☐	☐
Clarifier	Reset any Alarms on the reclaim screen and visually inspect that drive is operating normally	☐	☐	☐	☐
Non-Potable Water System	Reset any alarms on the panel and inspect system for proper function	☐	☐	☐	☐
WAS Storage Tank	Reset Blower and ensure Blower is functioning normally	☐	☐	☐	☐
Dryer Facility	Visually inspect all equipment for proper operation, especially if dryer was processing sludge	☐	☐	☐	☐
Reclaim System	Reset all reclaim alarms. Visually inpect compressor and make sure air is being provided to filters.	☐	☐	☐	☐
Reclaim System	Visually inspect chlorine injection system and all disinfection monitoring equipment.	☐	☐	☐	☐
Reclaim System	Reset all reclaim alarms. Visually inpect compressor and make sure air is being provided to filters.	☐	☐	☐	☐
Lift Stations	Visually inspect any lift station that may have lost power for proper function.	☐	☐	☐	☐
HMI	Check All computer control systems and ensure data is updating by monitoring data on screen	☐	☐	☐	☐
Generator	The stationary generator will not switch back to commercial power if the Kurk key is activated. Operator must stay on site and coordinate with PSE to determine when proper commercial power has been restored before deactivating the Kurk key trapped interlock. Operator must not leave until main transfer switch has switched back to commercial power and stationary has finished running. All Systems above must be checked after generator has powered down.	☐	☐	☐	☐
	Initials:				

Power Outage Rounds

	DATE				
Complete These Rounds at the onset of a Power Outage					
Portable Generator	Use Kurk Key trapped interlock system to power portable generator				
Fuel	Ensure adequate fuel in both tanks for continued gerator operation order fuel at 2/3 Full				
HMI	Check each of the 19 plant screens for proper operation during power outage				
HMI	Check all lift station screen and monitor for additional power outages and visit sites as needed				
Headworks	Physically check to ensure screen is operating properly and no alarms on Huber panel are present				
Carrousel Systems	Visually watch the aerators operate via DO drop and ensure all mixers are running.				
Return Activated Sludge	Visually verify that the RAS pumps are working by checking the flow directly on the MAG meter				
Waste Activated Sludge	Verify WAS Valves are set to the proper setting on HMI and watch pump cycle in WAS Room				
Clarifier	Reset any Alarms on the reclaim screen and visually inspect that drive is operating normally				
Non-Potable Water System	Reset any alarms on the panel and inspect system for proper function				
Clarifier	Reset any Alarms on the reclaim screen and visually inspect that drive is operating normally				
Water heater	Check area around water heater for leaks. If you have hard water, drain 1-2 gallons water.				
Interior					
Wood cabinets and trim	Apply a wood protectant.				
Interior doors	Lubricate hinges.				
Garage door	Lubricate hardware. Inspect mechanism for free travel.				
Window and door tracks	Check to see if weep holes are open. Clean out dirt and dust. Lubricate rollers and latches.				
Basement or crawl space	Check for cracks or any sign of dampness or leaks. Check for any evidence of termites or wood-eating insects.				
Ceramic tile	Check and clean grout.				
Electrical and appliances					
Heating and cooling systems	Clean and replace filters if necessary.				
Kitchen exhaust fan	Remove and clean the filter. Clean accumulated grease deposits from the fan housing.				
Refrigerator	Clean dust from top. Clean refrigerator drain pan. Clean and defrost freezer if necessary.				
Dishwasher	Check for leaks.				
Wiring, electrical cords, and plugs	Check for wear or damage. Replace if necessary.				

Smoke detector	Test for proper operation and replace batteries if necessary.				
GFI outlets	Test for proper operation.				
Exterior					
Foundation	Inspect visible areas, vents, and ducts for cracks, leaks, or blockages.				
Landscaping	Check for proper drainage.				
Concrete and asphalt	Clean oil and grease.				

Fall		Date last completed			
Plumbing					
Plumbing shut-off valves	Inspect for proper operation.				
Outside faucets	Drain.				
Water heater	Flush out hot water to remove accumulated sediment.				
Faucet aerators	Check for proper flow of water. If the flow is reduced, clean the aerator screens. During the first two months, the faucet aerators could require more frequent cleaning.				
Interior					
Attic	Examine for evidence of any leaks. Check insulation and remove or add if necessary. Check for evidence of birds, squirrels, raccoons, etc. Check for proper ventilation.				
Countertops	Inspect for separations at sinks and backsplash. Recaulk where required.				
Tiled areas	Inspect for loose or missing grout or caulking. Regrout or recaulk if necessary.				
Shower doors/tub enclosures	Inspect for proper fit. Adjust if necessary. Inspect caulking and recaulk if necessary.				
Weather stripping	Check caulking around windows and doors. Check window and door screens. Adjust or replace if necessary.				
Sectional garage doors	Adjust the travel and tension.				
Fireplace	Inspect flues. Clean if necessary. Inspect fireplace brick and mortar for cracks or damage.				
Electrical and appliances					
Heating system	Service heating system and heat pump.				
Cooling system	Remove debris from around units and clean with garden hose. Remove window air conditioner or protect with weatherproof cover. Clean and replace filters if necessary.				
Refrigerator coils	Clean.				
Combustible appliances	Inspect and service if necessary.				
Exterior					
Roof	Check for leaks. Check for damaged, loose, or missing shingles. Check vents and louvers for birds, nests, squirrels, and insects. Check flashing around roof stacks, vents, and skylights for leaks.				
Chimney	Clean and check for deteriorating bricks and mortar. Check for leaks. Check for birds, nests, squirrels, and insects.				
Gutters and downspouts	Clean and check for leaks, misalignment, or damage.				
Exterior walls	Check for deteriorating bricks and mortar. Check siding for damage or rot. Check painted surfaces for flaking.				
Landscaping	Trim shrubbery around walls. Remove tree limbs, branches, or debris that can attract insects (no wood or shrubbery should be closer than 3 inches to your house). Maintain grading.				
Concrete and asphalt	Check for cracks or deterioration. Reseal or repair if necessary.				
Septic system	Examine septic system drain field for flooding and odor. Have tank pumped yearly.				
Lawn and patio furniture	Clean and store or cover with weatherproof material.				

Spring		Date last completed			
Plumbing					
Water heater	Flush out hot water to remove accumulated sediment.				
Interior					
Attic	Examine for evidence of any leaks. Check insulation and remove or add if necessary. Check for evidence of birds, squirrels, raccoons, etc. Check for proper ventilation.				
Countertops	Inspect for separations at sinks and backsplash. Recaulk where required.				
Tiled areas	Inspect for loose or missing grout or caulking. Regrout or recaulk if necessary.				
Shower doors/tub enclosures	Inspect for proper fit. Adjust if necessary. Inspect caulking and recaulk if necessary.				
Weather stripping	Check caulking around windows and doors. Check window and door screens. Adjust or replace if necessary.				
Electrical and appliances					
Heating and cooling system	General furnace inspection: Look for rust, scaling on heat exchanger, and proper flame color; note odd sounds or smells; and check condition of venting. Remove debris around units.				
Circuit breakers	Exercise.				
Refrigerator	Clean coils.				
Exterior					
Decks	Scrub mildewed areas and treat for water stains, mildew, and fungus.				
Roof	Clean. Check for leaks. Check for damaged, loose or missing shingles. Check vents and louvers for birds, nests, squirrels, and insects. Check flashing around roof stacks, vents, and skylights for leaks.				
Chimney	Clean and check for deteriorating bricks and mortar. Check for leaks. Check for birds, nests, squirrels, and insects.				
Gutters and downspouts	Clean and check for leaks, misalignment, or damage.				
Windows	Clean.				
Exterior walls	Check for deteriorating bricks and mortar. Check siding for damage or rot. Check painted surfaces for flaking.				
Landscaping	Trim shrubbery around walls. Remove tree limbs, branches, or debris that can attract insects (no wood or shrubbery should be closer than 3 inches to your house). Maintain grading.				
Concrete and asphalt	Check for cracks or deterioration. Reseal or repair if necessary.				

MASS BALANCE REPORT FOR OPERATIONS

DATE (Proccess Collected)

Influent			Date
COD	TSS	TP	INFLUENT BOD⁵
mg/L	mg/L	mg/L	mg/L

Influent		A-Basin	
(NO_3^-)-N	NH3-N (GRAB)	NH3-N (GRAB)	(NO_3^-)-N
mg/L	mg/L	mg/L	mg/L

Anoxic Basin		
(NO_3^{-N}) Out Den. Channel	(NO_3^{-N}) In Rec. Channel	SCOD In Rec. Channel
mg/L	mg/L	mg/L

Effluent			Date
COD	TSS	TP	EFFLUENT BOD⁵
mg/L	mg/L	mg/L	mg/L

Clarifier Effluent			
(NO_3^-)-N	Percent Transmittance		NH3-N (GRAB)
mg/L	DR5000	SC100	mg/L

Influent	RAS	WAS
Flow	Flow	Flow
Million Gallons	Million gallons	Gallons

Process Control												
ATC (Spin)	RAS (Spin)	C. Core (Spin)	WAS (Spin)	MLSS TSS	MLVSS	RAS TSS	C. Core TSS	WAS TSS	Depth of Blanket C1	Depth of Blanket C2	D.O.B Average
%	%	%	%	mg/L	mg/L	mg/L	mg/L	mg/L	Feet	Feet	Feet

Settleometer											
5 Minutes	10 Minutes	15 Minutes	20 Minutes	25 Minutes	30 Minutes	35 Minutes	40 Minutes	45 Minutes	50 Minutes	55 Minutes	60 Minutes
SSV	SSV	SSV	SSV	SSV	SSV	SSV	SSV	SSV	SSV	SSV	SSV

Settleometer (continued)									
90 Minutes	120 Minutes	150 Minutes	180 Minutes	210 Minutes	240 Minutes	270 Minutes	300 Minutes		Day Tank TSS
SSV	SSV	SSV	SSV	SSV	SSV	SSV	SSV		mg/L

SOUR/OUR																							
DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48

Notes:	COD is requred to be done every day, TSS and TP are to be done on the regular lab schedule and the results are to be entered onto this sheet.

**NT means no test was performed for the date

DMR QA/QC Report Rounds

Date	Laboratory Analyst will review and certify that all compliance data is collected and accurate bench sheets are in the lab notebook and ready for release	Laboratory Analyst will log into share point and find the monthly DMR spreadsheet and shall keep it updated daily as results are recorded.	Operators assigned SCADA Rounds on weekdays and weekends will review and certify that all compliance data is collected and accurate flow reports are printed and ready for release	Operators will log into share point and find the monthly DMR spreadsheet and shall keep it updated daily as results are checked.	Super has reviewed DMR data Weekly and submitted WQWWEBDMR portal and signs by 15th of each month.
1	☐	☐	☐ Initials_______	☐ Initials_______	☐
2	☐	☐	☐ Initials_______	☐ Initials_______	☐
3	☐	☐	☐ Initials_______	☐ Initials_______	☐
4	☐	☐	☐ Initials_______	☐ Initials_______	☐
5	☐	☐	☐ Initials_______	☐ Initials_______	☐
6	☐	☐	☐ Initials_______	☐ Initials_______	☐
7	☐	☐	☐ Initials_______	☐ Initials_______	☐
8	☐	☐	☐ Initials_______	☐ Initials_______	☐
9	☐	☐	☐ Initials_______	☐ Initials_______	☐
10	☐	☐	☐ Initials_______	☐ Initials_______	☐
11	☐	☐	☐ Initials_______	☐ Initials_______	☐
12	☐	☐	☐ Initials_______	☐ Initials_______	☐
13	☐	☐	☐ Initials_______	☐ Initials_______	☐
14	☐	☐	☐ Initials_______	☐ Initials_______	☐
15	☐	☐	☐ Initials_______	☐ Initials_______	☐
16	☐	☐	☐ Initials_______	☐ Initials_______	☐
17	☐	☐	☐ Initials_______	☐ Initials_______	☐
18	☐	☐	☐ Initials_______	☐ Initials_______	☐
19	☐	☐	☐ Initials_______	☐ Initials_______	☐
20	☐	☐	☐ Initials_______	☐ Initials_______	☐
21	☐	☐	☐ Initials_______	☐ Initials_______	☐
22	☐	☐	☐ Initials_______	☐ Initials_______	☐
23	☐	☐	☐ Initials_______	☐ Initials_______	☐
24	☐	☐	☐ Initials_______	☐ Initials_______	☐
25	☐	☐	☐ Initials_______	☐ Initials_______	☐
26	☐	☐	☐ Initials_______	☐ Initials_______	☐
27	☐	☐	☐ Initials_______	☐ Initials_______	☐
28	☐	☐	☐ Initials_______	☐ Initials_______	☐
29	☐	☐	☐ Initials_______	☐ Initials_______	☐
30	☐	☐	☐ Initials_______	☐ Initials_______	☐
31	☐	☐	☐ Initials_______	☐ Initials_______	☐

Date	Notes

MONTH/YEAR:

Reclaim Water Rounds

DAY	UVT	FLOW	DOSAGE	Bank Power % A, B, C			# of Active Banks	Poly Tank lbs.		Clay Valve PSI	NTU DAILY MAX	
								Tank	*Total*		SE	FE
1												
2												
3												
4												
5												
6												
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8												
9												
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Chemical Room Equipment Building

- ☐ Check polymer pump to ensure it is pumping
- ☐ Estimate barrel level in percent
- ☐ Record scale reading and make calculation for 24-hour lb. usage.

Reclaim Pumps

- ☐ Check Clay Valve assembly for water hammer when pumps start and look for leaks and irregularities record pressure on gauge on back of page.
- ☐ Check Clay Valve PSI and log on this sheet.
- ☐ Note any leaks or irregularities in operation

Water Reclamation Facility Treatment Plant

- ☐ Collect Total Coliform sample in 250 ml sterile bottle w/ sodium thiosulfate.
- ☐ Preserve sample for analysis at 4 degrees C and run Total Coliform within six (6) hours.

Operation Center (NOT LAB ANALYST)

- ☐ Ensure Flow report printed all necessary compliance data for previous day
- ☐ Check to ensure all compliance numbers are within permit limits. Shut system off if standards are not met and report to Supervisor on CAF and by phone. Check for proper operation of all 3 filters.

Filter Building/Process (NOT LAB ANALYST)

- ☐ Back wash filters on Monday Wednesday and Friday or as needed.
- ☐ Note appearance and NTU reduction and consider dosing of coagulant and secondary effluent quality.
- ☐ Air Scour monthly with team approach as often as possible.

** Operator completing these rounds must verify SCADA results are accurate for any grab results collected in the field.

** Check Flow Report specifically for permit based numbers are recorded and if any are missing, stay at WRF until the cause of instrument or SCADA failure is determined.

Safety Rounds

Weekly Safety Talks

- ☐ Conduct one weekly safety talk or training class with all sewer staff.
- ☐ Record safety talk or training in training log book and have each employee sign participation sheet.
- ☐ Present any new MSDS sheets to staff and file any new MSDS sheets in appropriate log books.
- ☐ Perform Weekly eyewash checks and record test.

Monthly

- ☐ Inspect all fire extinguishers and record on tag located on apparatus.

Conduct yearly the following training in the listed months.

- ☐ January- Confined spaces and Lock out/Tag out Watch video and explain policy listed in red three ring binders.
- ☐ February- Forklifts Work shop and Trenching & Shoring. Explain any associate policy in red three ring binders.
- ☐ March- Electrical Safety and Blood borne Pathogens. Explain any associated policy in the red three ring binders.
- ☐ April- Explain Ladder Policy in Red Binder
- ☐ May- Explain Chemical Hazard Communication Policy.
- ☐ June- Explain Respirator Policy
- ☐ July- Explain Accident prevention program. Update PPE needs assessment logs if needed.
- ☐ August- Schedule or conduct overhead crane inspections and file work report in binder at safety center.
- ☐ September- Schedule or conduct annual fire sprinkler test and file work report in binder at safety center.
- ☐ October- Schedule or conduct annual fire alarm confidence test and file report in binder at safety center.

**Record all items you complete above on the calendar located on the back of this page. When you complete a safety training session put a note on the day that corresponds to the training. All items you complete listed under weekly, monthly or yearly must be recorded on the calendar.

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Sensor Rounds

Date	Basin 1 LDO Clean Calibrate & Verify	Basin 2 LDO Clean Calibrate & Verify	SE LDO Clean Calibrate & Verify	SE Turbidity Clean Calibrate & Verify	FE Turbidity Clean Calibrate & Verify	FE pH Clean Calibrate & Verify	FE LDO Clean Calibrate & Verify	Total Cl Water Plant Clean Calibrate	Cl POC Replace Reagents Verify Cal.	Initials
7/16	☐	☐	☐	☐	☐	☐	☐	☐	☐	
7/16/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
7/30/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
8/13/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
8/27/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
9/10/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
9/24/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
10/8/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
10/22/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
11/5/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
11/19/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
12/3/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
12/17/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
12/31/2013	☐	☐	☐	☐	☐	☐	☐	☐	☐	
1/14/2014	☐	☐	☐	☐	☐	☐	☐	☐	☐	
1/28/2014	☐	☐	☐	☐	☐	☐	☐	☐	☐	
2/11/2014	☐	☐	☐	☐	☐	☐	☐	☐	☐	
2/25/2014	☐	☐	☐	☐	☐	☐	☐	☐	☐	
3/11/2014	☐	☐	☐	☐	☐	☐	☐	☐	☐	
3/25/2014	☐	☐	☐	☐	☐	☐	☐	☐	☐	

* Any significant actions should be recorded on back side of this page.
** Operator completing these rounds must verify SCADA results are accurate any grab results collected in the field
*** Do not check the box until you obtain a successful calibration. You may need to replace the probe or parts to get the unit to calibrate. Note these changes on back of page

Date	Notes

SCADA Daily Flow Report Rounds

Date	Influent < 2.15 MGD max month	Final Effluent MGD No Limit	pH Effluent 6.3≤pH≥9	Effluent Temp ̊c 24.7 C Max Daily Value	SE DO mg/L No Limit	SE Turbidity NTU No Limit	Reclaim Flow to Irrigation MGD <1.56 MGD	Reclaim Cl POC ≥.7 mg/L	Initials
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** Operator completing these rounds must resolve any issues or discrepancies in the flow report prior to leaving shift. If the report failed to print Operator must recreate flow report by hand on blank sheet of paper and insert into stack with other flow reports from the trending data and field equipment.
*** Do not check the box until you are sure you have verified that all the info is correct. Any permit limit violations need to be resolved as outlined in the NPDES permit section S3.E. And reported to the Sr. Operator.

Date	Notes

SCADA Daily Flow Report Rounds

Date	Influent < 2.15 MGD	Final Effluent MGD No Limit	pH Effluent 6≤pH≥9	Effluent Temp ̊c No Limit	SE DO mg/L No Limit	SE Turbidity NTU No Limit	Reclaim Flow to Irrigation MGD <1.56 MGD	Reclaim Cl POC ≥.7 mg/L	Initials
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*** Do not check the box until you are sure you have verified that <u>all</u> the info is correct. Any permit limit violations need to be resolved immediately and reported to Superintendent on CAF.

Date	Notes

BP Lift

Seasonal Lift Station Rounds

Date	Clean Interior of Station Monthly	Spray gravel with KillzAll monthly	Spray vegetation with KillzAll twice monthly	Mop floors in station monthly with cleaner	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Burke **Lift**

Seasonal Lift Station Rounds

Date	Clean Interior of Station Monthly	Spray gravel around station twice monthly	Spray weed vegetation with KillzAll twice monthly	Mop floors in station monthly with cleaner	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Carmichael Lift

Seasonal Lift Station Rounds

Date	Clean Interior of Station Monthly	Mow grass blow asphalt weekly	Spray weed vegetation with KillzAll twice monthly	Mop floors in station monthly with cleaner	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Crestview Lift

Seasonal Lift Station Rounds

Date ☐	Clean Interior of Station Monthly	Use mower, trimmer, blower weekly	Spray weed vegetation with KillzAll twice monthly	Mop floors in station monthly with cleaner	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Fir Street Lift Station

Seasonal Lift Station Rounds

Date	Clean Interior of Station weekly top and bottom	Use trimmer weekly	Pick up any trash around lift station weekly	Spray all gravel with KillzAll twice monthly	Mop floors in station once per month with cleaner	Pressure Wash All Exterior Concrete Once per month	Paint any faded or chipped paint as needed, Paint barge board once
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Date	Notes

Gala Lift

Seasonal Lift Station Rounds

Date ☐	Clean Interior of Station Monthly	Use Blower to clean asphalt weekly	Use mower, trimmer, & hedger weekly	Spray all vegetation with KillzAll twice monthly	Mop floors in station once per month with cleaner	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Honey Farm Lift Station

Seasonal Lift Station Rounds

Date	Prune any shrubs or trees as needed	Lightly pressure was exterior 3 days prior to painting once this season	Pick up any trash around lift station weekly	Spray all weeds with KillzAll twice monthly	Pressure Wash All Exterior Concrete Once this season.	Paint any faded or chipped paint as needed, Paint barge board once this season
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Date	Notes

Hospital Lift

Seasonal Lift Station Rounds

Date	Clean Interior of Station Monthly	Use mower, trimmer, blower weekly	Spray weed vegetation with KillzAll twice monthly	Mop floors in station monthly with cleaner	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Meadowbrook Lift

Seasonal Lift Station Rounds

Date	Clean Interior of Station once per month vacuum as needed	Spray KillzAll on all vegetation weekly	Use line trimmer & pick up trash weekly	Mop floors in station monthly with cleaner	Pressure Wash All Concrete once in June and August	Clean Gutters once per season July	Paint any faded or chipped trim as needed
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Date	Notes

Muir Lift

Seasonal Lift Station Rounds

Date	Clean Interior of Station Monthly	Use mower, trimmer, blower weekly	Spray weed vegetation with KillzAll twice monthly	Mop floors in station monthly with cleaner	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Park Street Lift

Seasonal Lift Station Rounds

Date	Clean Interior of Station once per month	Use Blower to clean asphalt monthly	Chip off Mortar and paint concrete	Mop floors in station monthly with cleaner	Pressure Wash All Concrete once in June and August	Clean Gutters once per season July	Paint any faded or chipped trim as needed
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Date	Notes

Rail Road Place

Seasonal Lift Station Rounds

Date ☐	Clean Interior of Station once per week	Use Blower to clean asphalt weekly	Use mower, trimmer, & hedger weekly	Spray all vegetation with KillzAll twice monthly	Mop floors in station once per month with cleaner	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Snoqualmie Parkway

Seasonal Lift Station Rounds

Date	Clean Interior of Station twice per month	Mop Control, Gen.,fuel, Aux, Vault room monthly	Lightly pressure wash trim 3 days prior to painting once per season	Mop floors in station once per month	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Vaughn Lift

Seasonal Lift Station Rounds

Date	Clean Interior of Station Monthly	Spray driveway edge with KillzAll monthly	Spray all vegetation with KillzAll twice monthly	Mop floors in station monthly with cleaner	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Whitaker Lift

Seasonal Lift Station Rounds

Date ☐	Clean Interior of Station Monthly	Use trimmer, blower weekly	Spray weed vegetation with KillzAll twice monthly	Mop floors in station monthly with cleaner	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Rail Road Place

Seasonal Lift Station Rounds

Date	Clean Interior of Station once per week	Use Blower to clean asphalt weekly	Use mower, trimmer, & hedger weekly	Spray all vegetation with KillzAll twice monthly	Mop floors in station once per month with cleaner	Pressure Wash All Concrete Once per month	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Water Reclamation Facility Projects

Seasonal WWTP Rounds

Date	Mow Grass on Tuesday and Friday weekly	Spray 4 loads of KillzAll on Monday & other vegetation management weekly	Clean and scrub floors in Equipment bldg once this season	Assist Matt on Wednesdays 7:30-2:30pm	Pressure Wash Concrete 7:30-11:30 Mondays & Fridays	Clean Gutters once per season	Paint any faded or chipped paint as needed
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Date	Notes

Water Reclamation Facility Projects

Seasonal WWTP Rounds

Date	Seasonal Lift Station Rounds on Thursdays All Day	Season lift Station Rounds on Tuesday 1:00 – 3:00pm	If you have free time on Monday ask Brian if you can Assist him.	If you have free time on Tuesday ask Bill if you can assist him	If you have free time on Wednesday ask Lyle if you can assist him	If you have free time on Friday ask Shane if you can assist him
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Date	Notes

Water Reclamation Facility Projects

Seasonal WWTP Rounds

Date	Mow Grass on Tuesday and Friday weekly	Spray 4 loads of KillzAll on Monday & other vegetation management weekly	Clean and scrub floors in Equipment bldg once this season	Assist Matt on Wednesdays 7:30-2:30pm	Pressure Wash Concrete 7:30-11:30 Mondays & Fridays	Clean Gutters once per season	Paint any faded or chipped paint as directed
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Date	Notes

Sensor Rounds

Date	Basin 1 LDO Clean Calibrate & Verify	Basin 2 LDO Clean Calibrate & Verify	SE LDO Clean Calibrate & Verify	SE Turbidity Clean Calibrate & Verify	FE Turbidity Clean Calibrate & Verify	FE Temperature Sensor Clean Calibrate & Verify	FE pH Clean Calibrate & Verify	FE LDO Clean Calibrate & Verify	Cl Water Plant Clean Calibrate Verify	Cl POC Replace Reagents Verify Cal.	Initials
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*** Do not check the box until you obtain a successful calibration and verification. You may need to replace the probe or parts to get the unit to calibrate. Note these changes on back of page

Date	Notes

Sensor Rounds

Date	Basin 1 LDO/ORP Clean Calibrate & Verify	Basin 2 LDO/ORP Clean Calibrate & Verify	SE LDO Clean Calibrate & Verify	SE Turbidity Clean Calibrate & Verify	FE Turbidity Clean Calibrate & Verify	FE pH Clean Calibrate & Verify	FE LDO Clean Calibrate & Verify	FE temp Clean Calibrate	UVASS Clean	Initials
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Date	Notes

Sensor Rounds

Date	Basin 1 LDO Clean Calibrate & Verify	Basin 2 LDO Clean Calibrate & Verify	SE LDO Clean Calibrate & Verify	SE Turbidity Clean Calibrate & Verify	FE Turbidity Clean Calibrate & Verify	FE Temperature Sensor Clean Calibrate & Verify	FE pH Clean Calibrate & Verify	FE LDO Clean Calibrate & Verify	Cl POC Verify Cl17 with SCADA	Cl POC Replace Reagents Verify Cal.	Initials
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* Calibration must be done per manufactures recommendation, make calibration notes on back if needed.
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Date	Notes

Shift B Work Plan

2012

Daily	Weekly
o Walk plant & Visually Inspect for Deficiencies Complete CAF o Spray plate screen front and back of panels o Complete Preliminary Treatment Rounds o Complete Equipment Building Rounds o Complete Disinfection Rounds & Filter Rounds when in service o Complete Closing Rounds o Complete Mass Balance with Process Report from Lab by 1:30	o Calibrate process probe at Inlet Head o Schedule and give MSDS awareness talks as needed o Complete assigned lift station rounds o Update Daily Monitoring Report o Back wash filters when in operation once each o Clean filter walls keep area clean and free of debris

Monthly
o Clean inlet head concrete , stairs, channels, grit hopper area o Clean equipment building. o Clean 4 UV modules and replace any fatigued parts o Alternate cleaning one clarifier

Yearly
o Clean and pressure wash entire filter building area o Prepare lift station log books for new year o Winterize hose bibs o Winterize reclaim system o Schedule and calibrate chlorine analyzers for reclaim process o Service & maintain chlorine disinfection pumps

Monday	Tuesday	Wednesday	Thursday	Friday
o	o Clean Sludge Storage tank	o	o Complete insulation of NPW pipes	o

Monday	Tuesday	Wednesday	Thursday	Friday
o	o	o	o	o

SIMT Work Plan 2012

Daily	Weekly
o PM o Unscheduled repairs	o PM o Unscheduled repairs

Monthly
o PM o Unscheduled repairs

Yearly
o PM o Unscheduled repairs

Monday	Tuesday	Wednesday	Thursday	Friday
o	o	o	o	o

Monday	Tuesday	Wednesday	Thursday	Friday
o	o	o	o	o Complete RAS PUMP panel modifications.

Solids Handling Weekly Rounds 2015

Daily

- Daily check to ensure the main bearing temperatures are less than 220F. If not then shut down equipment and resolve problem.
- Daily check to ensure the main bearing autoluber is full of grease and that it is dispensing grease. It should dispense about 8 shots of grease every 6 hours of operation.
- Daily monitor vibration levels. If vibration levels increase then the unit must be flushed to clear any solids build-up that may be causing the imbalance.
- Daily check the hydraulic back drive pump oil level, Also check for any leaks of oil and complete CAF as needed.
- Daily check to ensure hydraulic back drive pump temperature does not exceed 120F. Report any issue on CAF and shut down equipment.
- Daily prior to start up check NPW skid,
- Daily prior to start up check thermal fluid level
- Daily prior to start up check Lube rotor chain
- Daily prior to start up check compressor condensation drain.
- Daily operation of the facility should follow the operational outline located in the dryer building or operations manual provided by equipment manufacture.

Monthly

- On the first Monday of the month check the tension of the V-belts and re-tighten or replace as needed.
- On the first Monday of the month Check scroll conveyor for excessive wear on front of flights by removing the solids upper housing. Wear should not exceed 4 mm or .156". If it does then make arrangements with SIMT to have unit overhauled at factory.

Weekly

- On Wednesday grease and purge scroll bearing. Remove opposite plug on internal bearing and pump until clean grease emerges. When no plug is present grease with 10 shots from hand pump. 4 grease point's total. Do not grease electric motor.
- Once per week check the tension of the V-belts and re-tighten or replace as needed.
- Once per week check scroll conveyor for excessive wear on front of flights by removing the solids upper housing. Wear should not exceed 4 mm or .156". If it does then make arrangements with SIMT to have unit overhauled at factory.
- Clean up any grease or polymer. Keep equipment as clean as possible and replace all pig mats at least once per week.
- Clean up storage area and table and take out trash regularly and at least once at the end of your rotation.
- Control weeds around building as needed.
- Keep bagging area clean.
- During polymer tote replacement left over polymer must be emptied to new tote when possible.
- Place dumpsters at curb on Thursdays
- Clean WAS tank bar screen on Thursday of each week.

Yearly

- March 1 and September 1 of each year complete CAF to have hydraulic fluid replaced

Date/Initials____________ ________/________ _______/__________ ________/________ ________/_________

Monday	Tuesday	Wednesday	Thursday	Friday
o Main Bearing Temp < 220F o Main Bearing Autoluber working o Vibration less than 4 o Daily check the hydraulic back drive pump oil level and check for leaks o Hydraulic drive temp less than 120F o Ready NPW skid o Check thermal fluid level o Lubricate Chain o Drain bio filter Condensation o Clean any spent oil o Clean any polymer residue up o Vacuum greater than 4 o Follow operational outline located equipment manual	o Main Bearing Temp < 220F o Main Bearing Autoluber working o Vibration less than 4 o Daily check the hydraulic back drive pump oil level and check for leaks o Hydraulic drive temp less than 120F o Ready NPW skid o Check thermal fluid level o Lubricate Chain o Drain bio filter Condensation o Clean any spent oil o Clean any polymer residue up o Vacuum greater than 4 o Follow operational outline located equipment manual	o Main Bearing Temp < 220F o Main Bearing Autoluber working o Vibration less than 4 o Daily check the hydraulic back drive pump oil level and check for leaks o Hydraulic drive temp less than 120F o Ready NPW skid o Grease and Purge Scroll Bearing o Check tension V belts o Check for wear on flights o Follow operational outline located equipment manual o	o Main Bearing Temp < 220F o Main Bearing Autoluber working o Vibration less than 4 o Daily check the hydraulic back drive pump oil level and check for leaks o Hydraulic drive temp less than 120F o Ready NPW skid o Check thermal fluid level o Lubricate Chain o Drain bio filter Condensation o Place dumpster at curb o Clean bar screen on tank o Empty out all trash cans o Follow operational outline located equipment manual	o Main Bearing Temp < 220F o Main Bearing Autoluber working o Vibration less than 4 o Daily check the hydraulic back drive pump oil level and check for leaks o Hydraulic drive temp less than 120F o Ready NPW skid o Check thermal fluid level o Lubricate Chain o Drain bio filter Condensation o Clean any spent oil o Clean any polymer residue up o Vacuum greater than 4 o Follow operational outline located equipment manual

Dryer Shift Rotation SOP

1. Each operator will rotate into the dryer for a period of one week and the cycle will repeat once all the operators have worked a dryer shift.
2. If the operator working the dryer shift is gone during the 5 day period for any reason the operator that is set to rotate in on the next week will temporarily fulfill the duties for any and all days the operator is gone.
3. Days will not be made up and rotations will not be shifted to accommodate days off.
4. Operators will clean up any mess regardless of who may have created the mess, and report any issues to the supervisor for resolution. It is the intent of this section to hold operators accountable for their actions formally.

Solids Handling Rounds

Centrifuge

- ☐ Daily check to ensure the main bearing temperatures are less than 220F. If not then shut down equipment and resolve problem.
- ☐ Daily check to ensure the main bearing autoluber is full of grease and that it is dispensing grease. It should dispense about 8 shots of grease every 6 hours of operation.
- ☐ Daily monitor vibration levels. If vibration levels increase then the unit must be flushed to clear any solids build-up that may be causing the imbalance.
- ☐ Daily check the hydraulic back drive pump oil level, Also check for any leaks of oil and complete CAF as needed.
- ☐ Daily check to ensure hydraulic back drive pump temperature doe not exceed 120F. Report any issue on CAF and shut down equipment.
- ☐ Weekly grease and purge scroll bearing. Remove opposite plug on internal bearing and pump until clean grease emerges. When no plug is present grease with 10 shots from hand pump. 4 zerks total. Do not grease electric motor.
- ☐ Once per month check the tension of the V-belts and re-tighten or replace as needed.
- ☐ Once per month Check scroll conveyor for excessive wear on front of flights by removing the solids upper housing. Wear should not exceed 4 mm or .156”. If it does then make arrangements with SIMT to have unit overhauled at factory.
- ☐ In March and September of each year complete CAF to have hydraulic fluid replaced
- ☐ If CIP is initiated or unit becomes plugged all internal bearings will need to be purged of grease.

Building

- ☐ Keep entire building exterior and interior clean and tidy.
- ☐ Clean up any grease or polymer. Keep equipment as clean as possible and replace all pig mats at least once per week.
- ☐ Clean up storage area and table and take out trash regularly and at least once at the end of your rotation.
- ☐ Control weeds around building as needed.
- ☐ Keep bagging area clean.
- ☐ During polymer tote replacement left over polymer must be emptied to new tote when possible.

Process start up

- ☐ Daily prior to start up check NPW skid,
- ☐ Daily prior to start up check thermal fluid level
- ☐ Daily prior to start up check Lube rotor chain
- ☐ Daily prior to start up check compressor condensation drain.
- ☐ Place dumpsters at curb on Thursdays
- ☐ Clean WAS tank bar screen on Thursday of each week.

Operation of the facility

- ☐ Daily operation of the facility should follow the operational outline located in the dryer building or operations manual provided by equipment manufacture.
- ☐ Other dryer operational logs must be completed daily and are located on the process table in the facility.
- ☐ Order polymer and bags at appropriate interval to ensure ample stock and to allow for shipping times of 3 weeks.

*Note any significant tasks completed above on the back of this page.

**All deficient items must be corrected immediately and proper written notification needs to be submitted to Superintendent and recorded in plant log book.

Month Year

DAY	CENTRIFUGE OPERATING NORMAL	DRYER OPERATING NORMAL	GENERAL FACILITY NORMAL
1	☐	☐	☐
2	☐	☐	☐
3	☐	☐	☐
4	☐	☐	☐
5	☐	☐	☐
6	☐	☐	☐
7	☐	☐	☐
8	☐	☐	☐
9	☐	☐	☐
10	☐	☐	☐
11	☐	☐	☐
12	☐	☐	☐
13	☐	☐	☐
14	☐	☐	☐
15	☐	☐	☐
16	☐	☐	☐
17	☐	☐	☐
18	☐	☐	☐
19	☐	☐	☐
20	☐	☐	☐
21	☐	☐	☐
22	☐	☐	☐
23	☐	☐	☐
24	☐	☐	☐
25	☐	☐	☐
26	☐	☐	☐
27	☐	☐	☐
28	☐	☐	☐
29	☐	☐	☐
30	☐	☐	☐
31	☐	☐	☐

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Daily Wasting	Current Level of Tank %	Today's Date and Time	Last Process day prior to holiday	Date of Next run after holiday	Tank Level Goal	Daily Process Goal
25000	95%	1/30/2013 13:00	2/1/2013 17:00	2/4/2013 6:00	36%	37434

SIMT Work Plan 2012

Daily	Weekly
o	o

Monthly
o

Yearly
o

Monday	Tuesday	Wednesday	Thursday	Friday
o	o Class Two Inspection DOE o Complete staff work plans	o	o Tank Clean FU	o RAS PUMP FU

Monday	Tuesday	Wednesday	Thursday	Friday
o	o Kimball FU	o	o UV FU	o Complete NPDES and Reclaim Permit Applications

Additional Routine Tasks

2012

Daily	Weekly
o Walk plant & Visually Inspect for Deficiencies Complete CAF o Check for Overflow on Turbidity Analyzers o Drain SE & FE Turbidity Analyzer o Reclaim Testing and Sample Recording when Applicable o Check for the completion of the Mass Balance and Process Report from Lab by 1:30 pm	o Calibrate pH probes Headwork's & FE o Schedule and conduct Safety Training and awareness o Check Completion of Opening report o Check completion of Closing report o Check completion of Daily Flow Report Logs

Monthly
o Clean and Calibrate Turbidity Analyzers SE and FE o Clean and Calibrate LDO Probes; Ditches, SE, and FE o File any flow Reports older than two months

Yearly
o Schedule and conduct any refresher safety training o Review new safety regulation for our industry o Prepare lift station log books for following years o File old lift station logs in 3 ring binder or file cabinet

Monday	Tuesday	Wednesday	Thursday	Friday
o Lubricate "A" zerks	o Safety Training	o Lubricate "A" zerks	o	o Lubricate "A" zerks

Shift B Work Plan

2012

Daily	Weekly
◦ Walk plant & Visually Inspect for Deficiencies Complete CAF ◦ Spray plate screen front and back of panels ◦ Complete Preliminary Treatment Rounds ◦ Complete Equipment Building Rounds ◦ Complete Disinfection Rounds & Filter Rounds when in service ◦ Complete Closing Rounds ◦ Complete Mass Balance with Process Report from Lab by 1:30	◦ Calibrate process probe at Inlet Head ◦ Schedule and give MSDS awareness talks as needed ◦ Complete assigned lift station rounds ◦ Update Daily Monitoring Report ◦ Back wash filters when in operation once each ◦ Clean filter walls keep area clean and free of debris

Monthly
◦ Clean inlet head concrete , stairs, channels, grit hopper area ◦ Clean equipment building. ◦ Clean 4 UV modules and replace any fatigued parts ◦ Alternate cleaning one clarifier

Yearly
◦ Clean and pressure wash entire filter building area ◦ Prepare lift station log books for new year ◦ Winterize hose bibs ◦ Winterize reclaim system ◦ Schedule and calibrate chlorine analyzers for reclaim process ◦ Service & maintain chlorine disinfection pumps

Monday	Tuesday	Wednesday	Thursday	Friday
◦	◦ Clean Sludge Storage tank	◦	◦ Complete insulation of NPW pipes	◦

Monday	Tuesday	Wednesday	Thursday	Friday
◦	◦	◦	◦	◦

Shift A Work Plan

2012

Daily	Weekly
o Walk plant & Visually Inspect for Deficiencies Complete CAF o Check for Overflow on Turbidity Analyzers o Drain SE & FE Turbidity Analyzer o Reclaim Testing and Sample Recording when Applicable o Check for the completion of the Mass Balance and Process Report from Lab by 2:00 pm	o Calibrate pH probes Headwork's & FE o Schedule and conduct safety training and awareness o Check Completion of Opening report o Check completion of Closing report o Check completion of Daily Flow Report

Monthly
o Clean and Calibrate Turbidity Analyzers SE and FE o Clean and Calibrate LDO Probes; Ditches, SE, and FE o File any flow Reports older than two months

Yearly
o Schedule and conduct any refresher safety training o Review new safety regulation for our industry o File old lift station logs in 3 ring binder or file cabinet o Calculate and complete yearly totals bench sheet o Start up reclaim system

Monday	Tuesday	Wednesday	Thursday	Friday
o Perform lab work per lab work plan. o Perform secondary treatment rounds.	o Perform secondary treatment rounds.	o Perform secondary treatment rounds.	o Perform secondary treatment rounds.	o Perform secondary treatment rounds.

Monday	Tuesday	Wednesday	Thursday	Friday
o Perform lab work per lab work plan. o Perform secondary treatment rounds.	o Perform secondary treatment rounds.	o Perform secondary treatment rounds.	o Perform secondary treatment rounds.	o Perform secondary treatment rounds.

Temporary Reclaim Water Rounds

SE Structure

- ☐ Drain Turbidity meter. Record instantaneous reading for SCADA verification
- ☐ Calibrate turbidity meter Second and Fourth Tuesday of Month
- ☐ Check DO probe and clean as needed

Chemical Room Equipment Building

- ☐ Check polymer pump to ensure it is pumping
- ☐ Estimate tank level in percent

Filter Building

- ☐ Check for proper operation of all 3 filters.
- ☐ Back wash filters on Monday Wednesday and Friday or as needed.
- ☐ Drain Turbidity meter. Record instantaneous reading for SCADA verification
- ☐ Calibrate turbidity meter Second and Fourth Tuesday of Month
- ☐ Check FE DO probe and clean as needed.

Surge Tank

- ☐ Record pressure on gauge on back of page

Water Treatment Plant

- ☐ Perform 15 second Cl pump draw down and record flow rate as GPH.

Reclaim Hydrant

- ☐ Take grab instantaneous reading with hand held Cl meter record for SCADA verification
- ☐ Collect sample for Total Coliform per SOP lab bench sheet.

Reclaim Cl POC

- ☐ Record instantaneous reading for CL for SCADA verification Collect Total Coliform Sample and run test in lab
- ☐ Check reagent bottles for solution and replace as needed every 28 days.
- ☐ Check to ensure water is flowing out of elevated tube above cabinet.

Operation Center

- ☐ Ensure Flow report printed all necessary compliance data for previous day
- ☐ Check to ensure all compliance numbers are within permit limits. Shut system off if standards are not met and report to Supervisor on CAF and by phone.

** Operator completing these rounds must verify SCADA results are accurate for any grab results collected in the field.

*** These numbers are not intended for compliance only for verification.

Any grab samples not meeting the minimum limits will require the operator to follow the procedures outlined in the O&M manual located adjacent to the plant operator log book.

1) Operator must start reclaim system at the beginning of their shift and collect samples below.
2) During the shift the reclaim water rounds and bacterial testing needs to be completed.
3) Operator must shut down reclaim system pumps via HMI by pressing the off button at the end of their shift.
4) While reclaim system is running without continuous chlorine analyzer at POC grab samples for chlorine must be recorded every three hours.

MONTH DAY YEAR

Hour	System Start Up	System Shut Down	WTP Chlorine Injection point mg/L	SE NTU Turbidity	Coag Tank lbs.	FE NTU Turbidity	Cl Flow GPH	POC DR900 mg/L	POC Cl17 mg/L	POC SCADA mg/L
1	◯	◯							NA	NA
2	◯	◯							NA	NA
3	◯	◯							NA	NA
4	◯	◯							NA	NA
5	◯	◯							NA	NA
6	◯	◯							NA	NA
7	◯	◯							NA	NA
8	◯	◯							NA	NA
9	◯	◯							NA	NA
10	◯	◯							NA	NA
11	◯	◯							NA	NA
12	◯	◯							NA	NA
13	◯	◯							NA	NA
14	◯	◯							NA	NA
15	◯	◯							NA	NA
16	◯	◯							NA	NA
17	◯	◯							NA	NA
18	◯	◯							NA	NA
19	◯	◯							NA	NA
20	◯	◯							NA	NA
21	◯	◯							NA	NA
22	◯	◯							NA	NA
23	◯	◯							NA	NA
24	◯	◯							NA	NA

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

OPERATIONAL TRAINING DMR			
Project:		**Training Date:**	12/17/2013
Trainer:	Tom Holmes	**Place/Room:**	Wastewater Operations Center

Name	Signature	Date

Topics Covered:

1. **DOE Red Book DMR Chapter relating to weekly and monthly data**
2. **SWRF SOP for DMR refresher discuss SOP**
3. **This training will show employees where to find the Red Book with instructions on how to use the Red Book. This training also covers a refresher of the SWRF SOP for DMR DATA input, using the formulas, and instructions on completing the *Daily Process & Compliance Rounds*.**

TRAINING RECORD

Employee Name:

Job Class:

Hire Date:

TRAINING IDENTIFIED ON THE TRAINING NEEDS FORM SHALL BE COMPLETED NO LESS FREQUENT THAT 1/YEAR.

CITY OF SNOQUALMIE

		SAFETY TRAINING										SAFETY POLICIES							LAB		OPERATIONS										
		TRENCHING AND SHORING SAFETY	CONFINED SPACE AWARENESS	LOCK OUT TAG OUT KEY TO SAFETY	BLOOD BORN PATHOGENS	WORK PLACE SAFETY 101	BACK SAFETY	ELECTRICAL SAFETY	WEEKLY SAFETY MEETINGS	CONFINED SPACE RESCUE	FORK LIFT WORK SHOP	CHEMICAL HAZARD COM POLICY	CONFINED SPACE POLICY	RESPIRATOR POLICY	ACCIDENT PREVENTION POLICY	LADDER POLICY	CONTROL OF ENERGY POLICY	LOCATION OF MSDS	LABORATORY COMPLIANCE	LABORATORY SAFETY	PUMP REPAIR MAINTENANCE	ELECTRICAL	LEADERSHIP	SEASONAL LIFT STATION ROUINDS	SEASON. HOW TO USE POWER TOOLS	RECLAIM WATER ROUINDS	PROCESS TESTING	SOLIDS HANDLING ORIENTATION	CDL CLASS A	CDL CLASS B	COLLECTION SYSTEM ORIENTATION
CHECK THE APPROPRIATE BOXES ON THIS LINE TO SHOW ANNUAL TRAINING REQUIRED FOR THIS JOB CLASSIFICATION →																															
Class Name / Training Description	**DATE**	CHECK THE BOXES CORRESPONDING TO EACH SUBJECT COVERED BY TRAINING CLASSES																													

Procedure: Standards Methods for the Examination of Water and Wastewater, 21st Edition RESIDUE-NON FILTERABLE (TSS) 2540 D 1. Filters must be prewashed & dried until the difference between Initial and final weigh is either 4% or .5 mg or less from the previous weigh skip if certified prewashed filters are used. 2. If filtered residue from sample is less than .0025g or more than .200g the sample volume should be adjusted to fall in the range. If adjustment results in filtration times longer than 10 minutes the filter diameter needs to be increased to stay under 10 minutes.

ANALYST	Time In Oven	Time Out Oven	Desiccate 20 min □	Date Sampler Set up	1.) REPEAT CYCLE OF DRY & DESICCATE DRY & DESICCATE UNTIL A CONSTANT WEIGHT IS OBTAINED OR UNTIL WEIGHT CHANGE IS LESS THAN 4% OR .0005g

A	B	E	F	G	H	I	J	P	p
General		**Pre Oven Analysis**		**Post Oven Analysis**				**Results**	
Site Name (Indicate Blanks or Dupes as needed)	**Date Sample Analyzed**	**Sample Vol (mL)**	**Tare Weight (g)**	**Initial Dry Weight (g)**	**Final Dry Weight (g)**	**[1]Weight Requirement QA = G-H (g)**	**[2]Filter Yield- Non Filterable Residue = H - F (g)**	**TSS =** (J×1,000,000)÷E (mg/L)	**TSS Combined Result (mg/L)**
LAB METHOD BLANK									
QC STANDARD 100 mg/L									
EFFLUENT LAB REPLICATE									
EFFLUENT LAB REPLICATE									
INFLUENT LAB REPLICATE									
INFLUENT LAB REPLICATE									

1 **[(G - H)** ÷ G] 100 < = 4 or (G - H) < .0005 Keep repeating the cycle of dry and desiccate dry and desiccate until criteria is met.

2 .0025 < (J) < .200 if this condition is not met future test sample volumes should be adjusted up or down to stay within the range.

WAS Pump Station Rounds

WAS Valve Pit

- ☐ Clean concrete and use high pressure water or fire hose to clean out valve pit as needed.
- ☐ Fully operate all valves in the pit that are accessible from the top. Put valves back into correct position for normal operations.
- ☐ Correct or report any deficiencies as needed. Control weeds as needed.

WAS Room

- ☐ Activate WAS sump pump with water once per week.
- ☐ Check piping, pumps, and room for any deficiencies & report on CAF or correct as needed.
- ☐ Clean room and keep room clean and tidy once per month.

WAS Pump Room Valves

- ☐ Manual operate all valves while maintaining proper plant function once per month.
- ☐ Restore all valves to correct position ASAP
- ☐ Flush scum pit drain lines with water for 2 minutes monthly if applicable.

Pump Flow

- ☐ Verify pumps flow the correct volume.

*Note any significant tasks completed above on the back of this page.

** Please record hours to the nearest whole number.

First work day of Month Year Initials:

HOURS	5P11	5P12	FLOW MGD	OP NORM
Current				
Totalized				☐
Current				
Totalized				☐
Current				
Totalized				☐
Current				
Totalized				☐
Current				
Totalized				☐
Current				
Totalized				☐
Current				
Totalized				☐

HOURS	5P11	5P12	FLOW MGD	OP NORM
Current				
Totalized				☐
Current				
Totalized				☐
Current				
Totalized				☐
Current				
Totalized				☐
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Totalized				☐

MONTH YEAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Sewer Division
Annual Performance Report Card
January 30, 2014

Wastewater Division Annual Report
2013

Benchmarks	2011 Actual	2012 Actual
Financial Performance		
Operating cost per lb of CBOD removed	$3.07	$4.26
Operating cost per lb of TSS removed	$3.68	$4.25
Operating cost of Dryer per Ton of Dry solids produced (each Bag)	$754	$888
Sewer Rate	$37.30	$38.40
Operating cost of Class A Irrigation Water per 100 ft^3 produced	$3.97	$1.22
Class A Irrigation Water Rate per 100 ft^3		
Process Performance		
NPDES Permit Compliance	98%	98%
BOD Capacity Limit Trigger Yearly	1,613,300	1,613,300
Gallons of Sewage received Yearly Total	361,001,254	335,690,999
lbs of BOD received Yearly Total	790,944	644,250
lbs of TSS received Yearly Total	658,824	603,205
Total Dry Weight tonnage of solids Produced	226	250
Gallons of Sludge Produced Monthly Average	338,400	501,002
# of Solids Handling Dryer Batches completed	556	630
Total Dry weight of EQ Class A Taken offsite in Tons	226	250
Total Dry weight of Class B taken offsite in Tons	46	0
Reclaimed-Irrigation Water Treated and Distributed by Sewer Plant (gallons)	44,000,000	42,000,000
% of Water Pollution Study Analytes within limits for National Laboratory Accreditation	100%	100%
# of analysis/tests performed in house	7228	8580
Total Number of Assets Compiled	160	20
# of Scheduled Maintenance Work Orders on Assets	83	68
Total Hours to Complete Scheduled Work Orders	341	825
Total Hours to Complete Emergency Work	1023	573
# of Lost Time days due to Accidents	0	0
Employee Satisfaction with Workplace Safety (rating of 1-6)	4	5
Employee Satisfaction with Sewer Division Workplace Safety Training program(rating of 1-6)	5	5
Employee Satisfaction with overall City Safety program(rating of 1-6)	3	3
Customer Relations		
# of Wastewater Complaints	1	4
$ dollars spent on customer education through Public Out Reach, Tours, etc.	$225	$300
Employee Relations		
Overall Satisfaction with Jobs (rating of 1-6)	4	4
Employee Retention	100%	100
Employee Rating of Innovation (rating 1-6)	3	4
Employee Satisfaction w/ Supervisor Communication and Support (rating of 1-6)	4	4
Satisfaction with Leadership Structure and Management in Sewer Division(rating 1-6)	4	4
Satisfaction with Leadership and Management in Public Works(rating 1-6)	3	4
Satisfaction with Leadership and Management in City Hall(rating 1-6)	3	4
Satisfaction w/ participation in Decision Making within Sewer Division(rating 1-6)	5	6
Hours of Training per Employee	60	68
Satisfaction w/ Training and Development (rating 1-6)	3	3

		Most Dissatisfied	Somewhat Dissatisfied	No Opinion	Somewhat Satisfied	Satisfied	Very Satisfied
	Employee Operations						
1	Employee Satisfaction with Workplace Safety (rating of 1-6)	1	2	3	4	5	6
2	Employee Satisfaction with Sewer Division Workplace Safety Training program(rating of 1-6)	1	2	3	4	5	6
3	Employee Satisfaction with overall City Safety program(rating of 1-6)	1	2	3	4	5	6
	Employee Relations						
4	Overall Satisfaction with Jobs (rating of 1-6)	1	2	3	4	5	6
6	Employee Rating of Innovation (rating 1-6)	1	2	3	4	5	6
7	Employee Satisfaction w/ Supervisor Communication and Support (rating of 1-6)	1	2	3	4	5	6
8	Satisfaction with Leadership Structure and Management in Sewer Division(rating 1-6)	1	2	3	4	5	6
9	Satisfaction with Leadership and Management in Public Works(rating 1-6)	1	2	3	4	5	6
10	Satisfaction with Leadership and Management in City Hall(rating 1-6)	1	2	3	4	5	6
11	Satisfaction w/ participation in Decision Making within Sewer Division(rating 1-6)	1	2	3	4	5	6
13	Hours of Training per Employee						
14	Satisfaction w/ Training and Development (rating 1-6)	1	2	3	4	5	6

Weekend Plant Checks

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

DATE: _______________

		ASSET	SAT		SUN	
		GRIT SCREW HOPPER				
		GRIT SCREW PACKING GLAND				
	PLATE SCREEN	BRUSH HOURS				
		CHECK BYPASS SCREEN				
		SCREEN HOURS				
	COMPACTOR	HOURS				
	TAILINGS DUMPSTER	MANUALLY EMPTY				
Offline	AERATION 24	Visually inspect oil & record HOURS				
	AERATION 25	Visually inspect oil & record HOURS				
Offline	AERATION14	Visually inspect oil & record HOURS				
	AERATION 15	Visually inspect oil & record HOURS				
offline	ANOXIC MIXER 23	Visually inspect oil & record HOURS				
Offline	ANOXIC MIXER 13	Visually inspect oil & record HOURS				
oOffline	RAS 1	Flow Rate				
		Balanace Flow as needed				
		PSI				
		PUMP OPERATION	4P11 / 4P12		4P11 / 4P12	
Offline	RAS 2	Total Hours				
		Balance flow as needed				
		PSI				
		PUMP OPERATION	4P21 / 4P22		4P21 / 4P22	
Offline	CLARIFIER 1	SLUDGE DEPTH				
		VISUAL OBSERVATION				
Offline	CLARIFIER 2	SLUDGE DETPH				
		VISUAL OBSERVATION				
	IPPS	FLOW TOTALIZER				
	WAS	5P11 HOURS				
		5P11 AMPS				
		5P12 HOURS				
		5P12 AMPS				
	GENERATOR	NUMBER OF STARTS				
		FUEL LEVEL				
		BATT VDC				
	NPW SYSTEM	PUMP 1 HOURS				
		PUMP 2 HOURS				
		PUMP 3 HOURS				
		FLOW TOTALIZER				
	DISINFECTION	Dose				
		UVT				
		Flow				
		Mode				
		Health Status				
	SCADA	SYSTEM OPERATIONAL				
		PUMP SCUM PITS				
		INITIALS				

Operator needs to assess the treatment plant for any difficencies and take corrective actions to solve any issue that the operator believes could lead to performance issues. All critical systems need to be checked in the field and the operator is required to resolve any issue prior to departing the facility. Operator is authorized to take any and all actions necessary to correct issues that could lead to permit violaions.

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Appendix K

Staffing Recommendations

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Process/Activity/Task	*Current Operations Time (hours)*	*Unfunded Operations Time (hours)*	*Notes*
	No. 1 – Basic and Advanced Operations and Processes		
Preliminary Treatment	260	-	As per NEIWPCC (1 to 5 mgd)
Extended Aeration w/ BNR	1,465	-	NEIWPCC range of 1820 to 2600. Portion could be allocated to inspection program below
Nitrification	130	-	As per NEIWPCC (1 to 5 mgd)
Denitrification	130	-	As per NEIWPCC (1 to 5 mgd)
Phosphorus Removal (Biological)	130	-	As per NEIWPCC (1 to 5 mgd)
Granular Media Filters (Sand)	260	-	As per NEIWPCC (1 to 5 mgd)
Water Reuse	450	-	Increased from NEIWPCC (1 to 5 mgd) due to offsite service of reuse water
Ultraviolet Disinfection	600	-	Increased from NEIWPCC (1 to 5 mgd) due to complexity of Class A system
Wet Odor Control	265	-	As per NEIWPCC (1 to 5 mgd). Minor add for separate dry system.
Pretreatment Program	-	300	Operator input for requested program or item
No. 1 – SUBTOTAL:	**3,690**	**300**	
	No. 2 – Maintenance		
Manually Cleaned Screens	130	-	For 2 as per NEIWPCC (1 to 5 mgd)
Mechanically Cleaned Screens with grinders/washer/compactors	260	-	As per NEIWPCC (1 to 5 mgd)
Vortex Grit Removal	65	-	As per NEIWPCC (1 to 5 mgd)
Chemical Addition (varying dependent upon degree of treatment)	26	-	As per NEIWPCC (1 to 5 mgd)
Circular Clarifiers	130	-	For 2, reduced from NEIWPCC (1 to 5 mgd)
Pumps	100	-	As per NEIWPCC (1 to 5 mgd)
Mechanical Mixers	156	-	For 6, as per NEIWPCC (1 to 5 mgd)
Oxidation Ditch Aerators	208	-	For 4, estimated as blowers per NEIWPCC (1 to 5 mgd)
Aerobic Digestion	78	-	For 3, as per NEIWPCC (1 to 5 mgd)
Ultraviolet Light Disinfection	156	-	For 6, as per NEIWPCC (1 to 5 mgd)
Biofilter	98	-	As per NEIWPCC (1 to 5 mgd) - 1 single large biofilter assumed
Rotary Drum Thickener	100	-	Increased from NEIWPCC for pre-thickening and recuperative thickening
Final Sand Filters	156	-	For 3 as per NEIWPCC (1 to 5 mgd)
Probes/Instrumentation/Calibration	390	-	For 15 probes per NEIWPCC (1 to 5 mgd)
Annual Clarifier 1 Inspection Program	-	40	Operator input for requested program or item
Annual Clarifier 2 Inspection Program	-	40	
Annual Aeration Basin 1 Inspection Program	-	160	
Annual Aeration Basin 2 Inspection Program	-	160	
Annual Digester 1 Inspection Program	-	80	
Annual Digester 2 Inspection Program	-	80	
Annual Digester 3 Inspection Program	-	80	
Rust and Corrosion Abatement Program		260	
No. 2 – SUBTOTAL:	**2,060**	**900**	
	No. 3 – Laboratory Operations		
Alkalinity, total	25	-	As per operator input with NEIWPCC estimate
Biochemical Oxygen Demand (BOD)	250	-	
Chemical Oxygen Demand (COD)	100	-	
Coliform, Total, Fecal, E.coli	65	-	
Dissolved Oxygen (DO)	22	-	
Hydrogen Ion (pH)	30	-	
Metals	12	-	
Toxicity	8	-	
Ammonia	85	-	
Total Nitrogen	8	-	
Oil and Grease	12	-	
Total and Dissolved Phosphorus	24	-	
Solids, Total, Dissolved, and Suspended	250	-	
Temperature	45	-	
Turbidity	7	-	
Bacteriological Enterococci	150	-	
Lab QA/QC Program	208	-	
Process Control Testing	401	-	
Sampling for Contracted Lab Services	103	-	
No. 3 – SUBTOTAL:	**1,810**	**0**	
	No. 4 – Biosolids/Sludge Handling		
Rotary Drum Thickening	250	-	Increased from NEIWPCC for pre-thickening and recuperative thickening
Aerobic Digestion	130	-	As per NEIWPCC (0.5 to 1 mgd)
Centrifuges	260	-	As per NEIWPCC (0.5 to 1 mgd)
Transported Off-Site for Disposal	260	-	As per NEIWPCC (0.5 to 1 mgd)
No. 4 – SUBTOTAL:	**900**	**0**	
	No. 5 – Lift Stations/Sewer Mains		
33 Pumps	191	-	Based on operator input and similar collection systems
16 Wet wells/Floats/Ultrasonic Levels Transducers	76	-	
16 Remote Site Communications Systems/PLCs	62	-	
33 Check Valves	43	-	
43 Plug Valves	38	-	
25 miles of gravity sewer main	162	-	
16 Remote Site Facilities with Generators and Grounds	30	-	
4326 Manhole Inspection	-	300	
Cable/Rail Guide Replacement Program	-	300	
Utility Access Road Maintenance Program	-	150	
Smoke Testing Program I&I Reductions	-	400	
CCTV Inspection Program I&I Reductions	-	200	
No. 5 – SUBTOTAL:	**610**	**1,350**	
	No. 6 – Facilities		
Janitorial/Custodial	70	-	Reduced from NEIWPCC (average plant size)
Snow removal	15	-	Minor/infrequent
Mowing	120	-	As per NEIWPCC (average plant size)
Vehicle Washing/Cleaning/Fueling	175	-	For 7 vehicles, as per NEIWPCC (average plant size)
Facility Painting	35	-	Based on availability - separate from proposed Rust/Corrosion Abatement Program
Rust removal	20	-	Based on availability - separate from proposed Rust/Corrosion Abatement Program
No. 6 – SUBTOTAL:	**440**	**0**	
	No. 7 – Automation/SCADA		
Automated attendant or Interactive voice recognition (IVR) equipment	25	-	Based on operator input
Daily Communication Test	183	-	
Weekend Rounds	325	-	
Billing system	20	-	
Computerized Asset Management System MaintStar	30	-	
Holiday Rounds	48	-	
Computerized recordkeeping	40	-	
E-mail	110	-	
Geographical Information System (GIS)	30	-	
Purchasing and Billing Authorizations	44	-	
Local Area Network (LAN)	5	-	
Emergency Response Supervisory Control and Data Acquisition (SCADA)	783	-	
Telemetry	10	-	
Internet website	-	3	Operator input for requested program or item or item
Laboratory Information Management System (LIMS)	-	260	Operator input for requested program or item or item
Utility Customer Information Packet	-	20	Operator input for requested program or item or item
Legacy Communication Replacement Program	-	150	Operator input for requested program or item or item
Legacy Remote Site PLC Replacement Program	-	150	Operator input for requested program or item or item
No. 7 – SUBTOTAL:	**1,660**	**590**	

No. 8 – General Small City Work			
Management responsibilities (i.e., human resources, budgeting, outreach, training, town/city meetings, scheduling, etc.) and responsibility for clerical duties (i.e., billing, reports, correspondence, phones, time sheets, mailings, etc.)	450	-	Based on operator input
Plant operators responsible for operating generators and emergency power	25	-	
Plant responsible for industrial pre-treatment program	1	-	
Plant staff responsible for plant upgrades and large projects done both on-site and off-site (i.e., collection systems, manholes, etc.)	120	-	
Plant operators responsible for machining parts on-site	10	-	
Age of plant and equipment (over 15 years of age)	10	-	
Plant operators responsible for snow plowing, road/sidewalk repair, or other municipal projects	325	-	
City Sponsored Events- (Arbor Day, Block Party, Recycling, Railroad Days, Easter Egg hunt, Teen egg hunt, streamside planting events,	101	-	
Special Projects for Comp Plan, Construction Start Up activities, and data requests to support other City projects	86	-	
Confined Space Rescue Program	-	***250***	Operator input for requested program or item
No. 8 – SUBTOTAL:	**1,130**	**250**	
No. 9 – Storm Water			
Public Outreach	85	-	Based on operator input
MS4 Mapping & Documentation	61	-	
I.D.D.E	571	-	
O&M	1,204	-	
Management/Office Work	250	-	
Pond Fence & Gate Replacements and Repairs	4	-	
MS4 Conveyance Inspections	-	75	
MS4 Outfall Inspections & Maintenance	-	40	
Social Marketing	-	40	
Ditch Line Cleaning	-	260	
City Owned Facility CB Inspections	-	50	
Invasive Species Management	-	50	
Storm Facility Utility Road Maintenance	-	50	
Manage Fence Contractor to Replace Fences	-	50	
No. 9 – SUBTOTAL:	**2,180**	**620**	
Total Hours	**14,480**	**4,010**	

* WRF portion of staff estimate adapted from the Northeast Guide for Estimating Staffing at Publicly and Privately Owned Wastewater Treatment Plans as recommended for use by Ecology CRO in 2019. City operations staff input used for WRF and other sections as noted.

* Staff hours per Task Nos. 1 through 9 are rounded up to the nearest 10 hours.

Appendix L

Public Agency Review Correspondence

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Stephanie Perkins

From:	Leung, Kevin (ECY) <KLEU461@ECY.WA.GOV>
Sent:	Wednesday, December 22, 2021 3:17 PM
To:	Kenny Gomez
Cc:	tholmes@snoqualmiewa.gov; jhamlin@snoqualmiewa.gov; McKone, Shawn (ECY)
Subject:	FW: City of Snoqualmie General Sewer Plan - Ecology Review Comments
Attachments:	Snoqualmie GSP_Ecology Review_2021 December.xlsx

Resent this with corrected email address.

From: Leung, Kevin (ECY)
Sent: Wednesday, December 22, 2021 3:05 PM
To: 'kgomez@rh2.com' <kgomez@rh2.com>
Cc: 'tholmes@ci.snoqualmie.wa.us' <tholmes@ci.snoqualmie.wa.us>; 'jhamlin@ci.snoqualmie.wa.us' <jhamlin@ci.snoqualmie.wa.us>; McKone, Shawn (ECY) <SHMC461@ECY.WA.GOV>
Subject: City of Snoqualmie General Sewer Plan - Ecology Review Comments

Hi Kenny:

Ecology received the following submittal.

- "City of Snoqualmie General Sewer Plan" (July 2021) prepared by RH2 Engineering.

Please see our review comments in the attached file. Please review and provide your revised report. Also, please include your response in the spreadsheet and send it back to us. So it's easier to follow your revised report.

If you have any questions please let me know.
Thanks,
Kevin

Kevin Leung, P.E. | Environmental Engineer | Washington State Department of Ecology | Water Quality Program | Mailing Address: PO Box 330316, Shoreline, WA 98133-9716 | Physical Address: 15700 Dayton Avenue North, Shoreline, WA 98133
Phone: 206-594-0168, Cell: 425-200-8996, Email: kevin.leung@ecy.wa.gov
NWRO 24-hour reception line (including ERTS): 206-594-0000

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Stephanie Perkins

From: Hill, Jae <jhill@kingcounty.gov>
Sent: Thursday, December 9, 2021 4:59 PM
To: Kenny Gomez
Subject: UTRC Meeting 12/15
Attachments: UTRC Agenda 2021-1215.pdf; Snoqualmie GSP Initial Comments 2021-1215.docx

Hi Kenny,

The City of Snoqualmie's General Sewer Plan will be heard by the King County UTRC next Wednesday, December 15, at 2:30pm. This meeting will occur remotely via Teams, and you'll have the opportunity to respond to questions from the Committee.

The agenda is attached, with the meeting info at the top. Also attached are a draft set of comments. This is staff's initial review and there may be additional items added by the UTRC at the meeting. You're not required to respond before the meeting.

If you need any further info, please contact me.

Jae Hill, AICP, CFM
Principal Planner | Utilities Technical Review Committee
King County Dept. of Local Services
jhill@kingcounty.gov
o: 206-263-5690 | m: 206-485-6499

DLS Staff are working remotely. Permitting services will continue to be online and available on the Permitting website and MyBuildingPermit.com.

King County
Utilities Technical Review Committee
Department of Local Services
35030 SE Douglas St #210
Snoqualmie, WA 98065
www.kingcounty.gov

City of Snoqualmie General Sewer Plan

The City of Snoqualmie has submitted a periodic update to their General Wastewater Plan for review by the King County Utilities Technical Review Committee (UTRC). The City's sewer service area includes the City of Snoqualmie, the Snoqualmie Casino, and most of the Urban Growth Area around the City.

On December 15, 2021, the UTRC held an open public meeting and deliberated the plan content, then directed Staff to issue this comment letter. The UTRC would like to see the following clarifications and revisions as detailed below:

- Page numbers are not correct in table of contents.
- Table of contents isn't live linked, which would be helpful for document navigation.
- Figure 2-6: "Sewer Service Area" but just shows city limits and UGA, not existing/future service areas.
- Fig 11-1: "Existing Deficiencies" actually shows improvements to repair existing issues.
- Fig 11-2: "Projected Future Deficiencies" actually shows improvements to repair future issues.
- Is there a future service area map? Or is it simply that the future service area is all area within the UGA boundary? There doesn't seem to be one clear definition within the text or one clear boundary on a map.
- Is there a future buildout map in the PAAs? We understand buildout will likely be developer driven, but there must be trunk lines and additional infrastructure elsewhere in the system to support that future development.
- Is there a timeline for PAA incorporation? The document (on Page 3-8) says all sewer customers in the UGA outside of City limits are assumed to be incorporated by 2030. Does this include only current customers, or all PAA parcels?

UTRC Recommendation: Request revisions by applicants before final review and approval.

City of Snoqualmie General Sewer Plan (July 2021)

Reviewing Phase: Draft Report					**Phase:**		
Reviewing Agency: Ecology					**Organization: City of Snoqualmie**		
Contact: Kevin Leung					**Responders: Kenny Gomez (RH2), Eric Smith (RH2), Jeff Hamlin (City), and Tom Holmes (City)**		
Date: December 22, 2021					**Response Date: July 5, 2022**		
Comment No.	**Section**	**Page Number**	**Comment**	**Reviewer (Last Name)**	**Response**	**Responder (Last Name)**	**Resolution**
1	2	2-15	It should include a statement regarding compliance with SEPA in the final report when you complete the SEPA documentation and determination.	Leung	This sentence has been added to the end of the Existing WRF Environment section (page 2-15) "This GSP is in compliance with the SEPA Checklist and corresponding Determination of Nonsignificance." The DNS is provided in Appendix B of the finalized GSP.	RH2 (Gomez)	
2	10	10-1	"Wastewater treatment plants have special employment requirements for staff as outlined in Chapter 70.95B Revised Code of Washington (RCW)." It's an outdated reference. Please update this.	Leung	This has been updated to ""Wastewater treatment plants have special employment requirements for staff as outlined in Chapter 70A.212 Revised Code of Washington (RCW)."	RH2 (Gomez)	
3	10	10-3	"This position serves as the City's RCW 70.95B.30 required Operator in Responsible Command (OIC)." It's an outdated reference. Please update this.	Leung	This has been updated to ""This position serves as the City's RCW 70A.212.030 required Operator in Responsible Command (OIC)."	RH2 (Gomez)	
4	10	10-4	Please update the operator certification information in Table 10-1 in the final report.	Leung	Table 10-1 has been revised.	City (Holmes)	
5	10	10-10	Table 10-3: Ecology's NWRO has relocated from Bellevue to Shoreline. Please revise the phone number from "(425)-649-7000" to "(206) 594-0000".	Leung	Table 10-3 has been revised.	RH2 (Gomez)	
6	Appendices		Need to include Appendix B and Appendix L in the final report.	Leung	Noted. Appendix B and Appendix L are provided in the finalized GSP.	City (Hamlin) and RH2 (Gomez)	
7	---	---	---	---	In 2021, the Snoqualmie Casino (Casino) requested additional sewer service from the City to accommodate for a Casino expansion, which would result in increased flows and loadings discharged by the Casino to the City's existing sewer system. The following parts of the GSP have been updated to incorporate the Casino expansion. -Pages E-2, E-8 through E-9, E-13 through E-15, and E-17 -Pages 4-4, 4-10 through 4-11, and 4-26 through 4-29 -Page 6-6 -Pages 7-12, and 7-41 through 7-42 -Pages 8-3 and 8-4 -Pages 9-3 through 9-11 and 9-20 -Pages 11-6, 11-14, and 11-19 and Figure 11-2 -Page 12-1 -Appendix F -Appendix G	RH2 (Gomez and Smith)	

City of Snoqualmie General Sewer Plan (July 2021)

Reviewing Phase: Draft Report					**Phase:**		
Reviewing Agency: King County					**Organization: City of Snoqualmie**		
Contact: Jae Hill					**Responder: Kenny Gomez (RH2) and Jeff Hamlin (City)**		
Date: December 15, 2021					**Response Date: July 5, 2022**		
Comment No.	**Section**	**Page Number**	**Comment**	**Reviewer (Last Name)**	**Response**	**Responder (Last Name)**	**Resolution**
1	Table of Contents		Page numbers are not correct in table of contents.	Hill	The table of contents has been updated to address this comment.	RH2 (Gomez)	
2	Table of Contents		Table of contents isn't live linked, which would be helpful for document navigation.	Hill	The table of contents has been updated to address this comment.	RH2 (Gomez)	
3	2	Fig 2-6	"Sewer Service Area" but just shows city limits and UGA, not existing/future service areas.	Hill	Figure 2-6 has been updated to include the existing and future sewer service areas. Page 2-4 contains the following text regarding the existing sewer service area: "The majority of the developed area within the City limits is currently served by the City's existing sewer system.... Additionally, there are four residential properties and the Snoqualmie Casino that currently are served by the City's existing sewer system but are not within the City limits." On page 2-4, text related to the future sewer service area was updated from "The City's sewer planning area includes the City's UGA and the area in the City limits outside the UGA, which is located south of Interstate 90." to "The City's sewer planning area (i.e. future sewer service area) includes the City's UGA and the area in the City limits outside the UGA, which is located south of Interstate 90 (as shown in Figure 2-6)."	RH2 (Gomez)	
4	11	Fig 11-1	"Existing Deficiencies" actually shows improvements to repaid existing issues.	Hill	Figure 11-1 title has been updated to read "Existing Sewer System Capital Improvement Projects."	RH2 (Gomez)	
5	11	Fig 11-2	"Projected Future Deficiencies" actually shows improvements to repair future issues.	Hill	Figure 11-2 title has been updated to read "Projected Future Sewer System Capital Improvement Projects."	RH2 (Gomez)	
6			Is there a future service area map? Or is it simply that the future service area is all area within the UGA boundary? There doesn't seem to be one clear definition within the text or one clear boundary on a map.	Hill	See response to Comment No. 3.	RH2 (Gomez)	
7			Is there a future buildout map in the PAAs? We understand buildout will likely be developer driven, but there must be trunk lines and additional infrastructure elsewhere in the system to support that future development.	Hill	There is not a future buildout map of sewer mains in the PAAs at this time. We concur that interceptors and collector sewer mains will be needed to serve development and extensions in the PAAs, but these will be primarily developer driven and developer-funded projects, similar to the lift stations. The sewer main alignments will depend on when and how development in those areas actually occurs.	RH2 (Gomez)	
8	3	3-8	Is there a timeline for PAA incorporation? The document (on Page 3-8) says all sewer customers in the UGA outside of City limits are assumed to be incorporated by 2030. Does this include only current customers, or all PAA parcels?	Hill	This only includes **current** sewer customers that are outside the existing City limits. Text on page 3-8 was updated from "It was assumed that by 2030 the sewer customers in the UGA outside the City limits would all be annexed to the City,..." to "It was assumed that by 2030 the current sewer customers in the UGA outside the City limits would all be annexed to the City,..." The general timeline presumed for the Snoqualmie Southwest Potential Annexation Area (PAA) incorporation and growth is from 2026 to 2032.	RH2 (Gomez)	

Appendix M

City Adoption

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RESOLUTION NO. 1621

A RESOLUTION OF THE CITY OF SNOQUALMIE, WASHINGTON, ADOPTING THE FINAL GENERAL SEWER PLAN AND AUTHORIZING ITS SUBMITTAL TO THE DEPARTMENT OF ECOLOGY AND KING COUNTY

WHEREAS, in April 2018, the City of Snoqualmie authorized RH2 Engineering, Inc, to prepare an update of the City's General Sewer Plan pursuant to RCW 90.48.110 and WAC 173-240-050, and in conformance with current regulations and guidelines; and

WHEREAS, on July 26, 2021, City Council participated in a roundtable discussion with RH2 Engineering about the draft General Sewer Plan; and

WHEREAS, on September 27, 2021, the City Council adopted Resolution No. 1593, which approved the draft General Sewer Plan for submittal to the Washington State Department of Ecology ("Ecology"); and

WHEREAS, the draft Sewer Plan was submitted to Ecology and the King County Utilities Technical Review Committee ("UTRC"), which reviewed the draft General Sewer Plan and provided comments thereon; and

WHEREAS, the draft Sewer Plan was revised to include information and updates requested by Ecology and the King County UTRC, and a matrix detailing agency comments and City responses thereto is included in Appendix L of the final General Sewer Plan; and

WHEREAS, the final General Sewer Plan is ready to be submitted to Ecology and King County for approval prior to implementation;

NOW, THEREFORE, BE IT HEREBY RESOLVED BY THE CITY COUNCIL OF THE CITY OF SNOQUALMIE AS FOLLOWS:

Section 1. The July, 2022 City of Snoqualmie Final General Sewer Plan, as prepared by RH2 Engineering, Inc., is hereby approved and adopted as the general sewer plan required by RCW 90.48.110 and WAC 173-240-050, and authorized for submittal to the Washington State Department of Ecology and King County for approval.

PASSED by the City Council of the City of Snoqualmie, Washington, this 22nd day of August, 2022.

Katherine Ross

Katherine Ross, Mayor

Attest:

Reina McCauley

Deputy City Clerk

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