

# Clean Water Plan

*Making the Right Investments at the Right Time*

Regional Water Quality Committee

April 7, 2021

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**Clean Water Plan**

Making the right investments at the right time



**King County**

Department of Natural Resources and Parks  
Wastewater Treatment Division

# Clean Water Plan Planning Process Overview



**Action: A specific program or set of projects that addresses one of the Decision Areas.**

Actions are not standalone solutions, but building blocks that will be shaped and combined in different ways to form Strategies.

**Strategy: A group of multiple Actions.**

Each Strategy reflects a complete water quality investment approach the County could take for water quality and the regional wastewater system.

# Developing Actions and Cost Estimate Ranges

- **Action Descriptions**

- **Forward-looking depiction of a conceptual program and its associated projects**

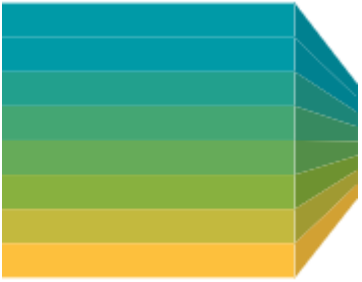
- **Action Characterization**

- **Long-term Conceptual Program Planning Cost Estimate**

- Used guidance from Association for the Advancement of Cost Engineering (AACE) International Estimating for Long Range Planning for the Public Sector
- Cost estimates have a range from lowest most optimistic to +150% based on scope and risk challenges, including economics, technology, population dynamics, regulations, climate, and energy over the 40-year planning horizon

- **Water Quality**

- Performance across water quality parameters
- Identification of potential pollution pathways and receiving waters



# Exploring a Range of Actions Within Each Decision Area

## Wastewater Treatment

*What treatment plant and wet weather facility investments should be made?*

## Today's Discussion

## Pollution Source Control and Product Stewardship

*Are there more efficient or effective methods to address pollutants of concern than wastewater treatment?*

## Wet Weather Management

*What approach should be taken to address stormwater and combined sewer overflows in King County's system?*

## Wastewater Conveyance

*What are the best investments in collections systems to ensure sufficient capacity and improve system condition?*

## Asset Management, Resiliency, and Redundancy

*What investments should be made to care for an aging regional wastewater system and protect the investments that have been made?*

## Legacy Pollution

*What are the opportunities to address legacy pollution?*

## Resource Recovery



*How should King County recover resources in wastewater?*

## Finance

*How will regional water quality investments be financed?*

# Policy Considerations - Existing Policies

## Metropolitan Functions - King County Code 28.86

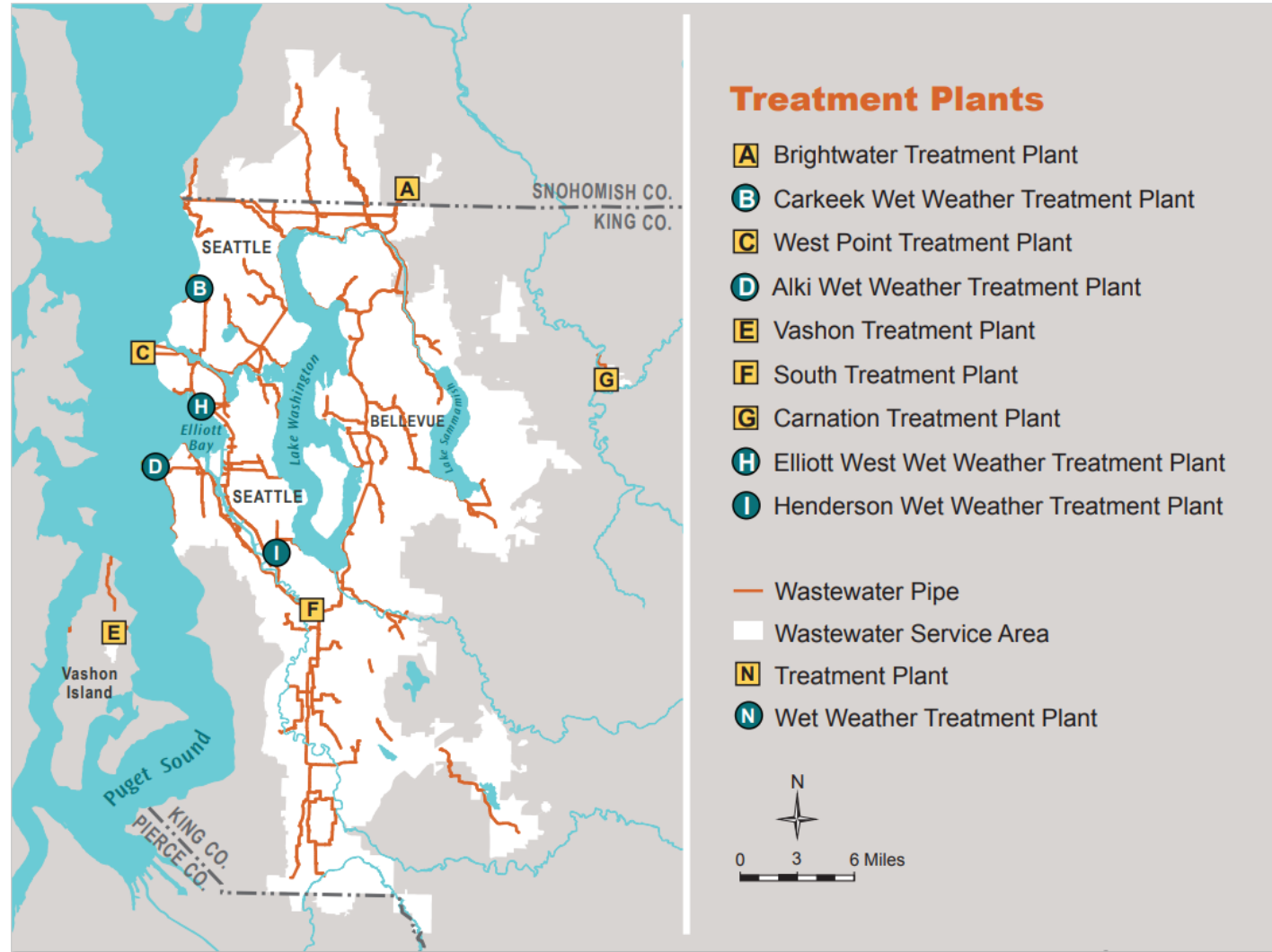
- Wastewater Treatment
  - **Treatment plant policies** (TPP). 
  - Conveyance policies (CP).
  - I/I policies (I/IP).
  - Combined sewer overflow control policies (CSOCP).
  - Biosolids policies (BP).
  - Water reuse policies (WRP).
  - **Wastewater services policies** (WWSP). 
  - Water quality protection policies (WQPP).
  - Wastewater planning policies (WWPP).
  - Environmental mitigation policies (EMP).
  - Public involvement policies (PIP).
  - Financial policies (FP).
  - Reporting policies.

### Treatment Plant Policy Examples

- **TPP-1:** "...provide secondary treatment to all base sanitary flow delivered to its treatment plants. Treatment beyond the secondary level may be provided to meet water quality standards and achieve other goals such as furthering the water reuse program or benefiting species listed under the ESA."
- **TPP-2:** "...provide additional wastewater treatment capacity to serve growing wastewater needs by..."
- **WWSP-15:** "...will consider development and operation of community treatment systems under the following circumstances."

# Your Regional Wastewater System

- King County currently serves 1.8 million people in the region
  - Three regional treatment plants, two smaller treatment plants
  - Over 400 miles of wastewater conveyance
  - 48 pump stations
  - 180 million gallons per day, on average
- Over the next 40 years, that number is projected to grow to 2.5 million people



# Wastewater Treatment Actions

- **Regional Treatment Actions**

(all include expanded capacity for population growth)

- **Existing treatment level**
- **Increased treatment level – Individual plant nitrogen reduction**
- **Increased treatment level – King County utility-wide nitrogen reduction**
- **Increased treatment level – Advanced treatment**
- **Water quality trading program for nitrogen reduction**

- **Decentralized Treatment Actions**

- **Secondary treatment at wet weather treatment stations**
- **City-scale**
- **Community/neighborhood scale**
- **Building-scale**

# Existing Treatment Level

- **Why explore:**
  - Address capacity for population growth
  - Continue to provide secondary treatment
- **Conceptual components:**
  - Capacity expansions at all three regional treatment plants
- **Key Considerations:**
  - Site space at West Point is very limited. Expansion to meet needs through 2060 would not leave space for any further expansion.



# Existing Treatment Level

- **Water Quality:**

- ▶ Existing treatment process is designed for and very good at removing regulated substances (e.g., bacteria, solids)
- ▶ Process is not designed to and, therefore, does not remove non-regulated substances (e.g., nutrients, organic toxins)

- **Long-term Conceptual Program Planning Estimate (order of magnitude) over a 40-year period:**

- ▶ \$1B to \$2B for capacity-related improvements
- ▶ \$3B to \$8B for operations and maintenance

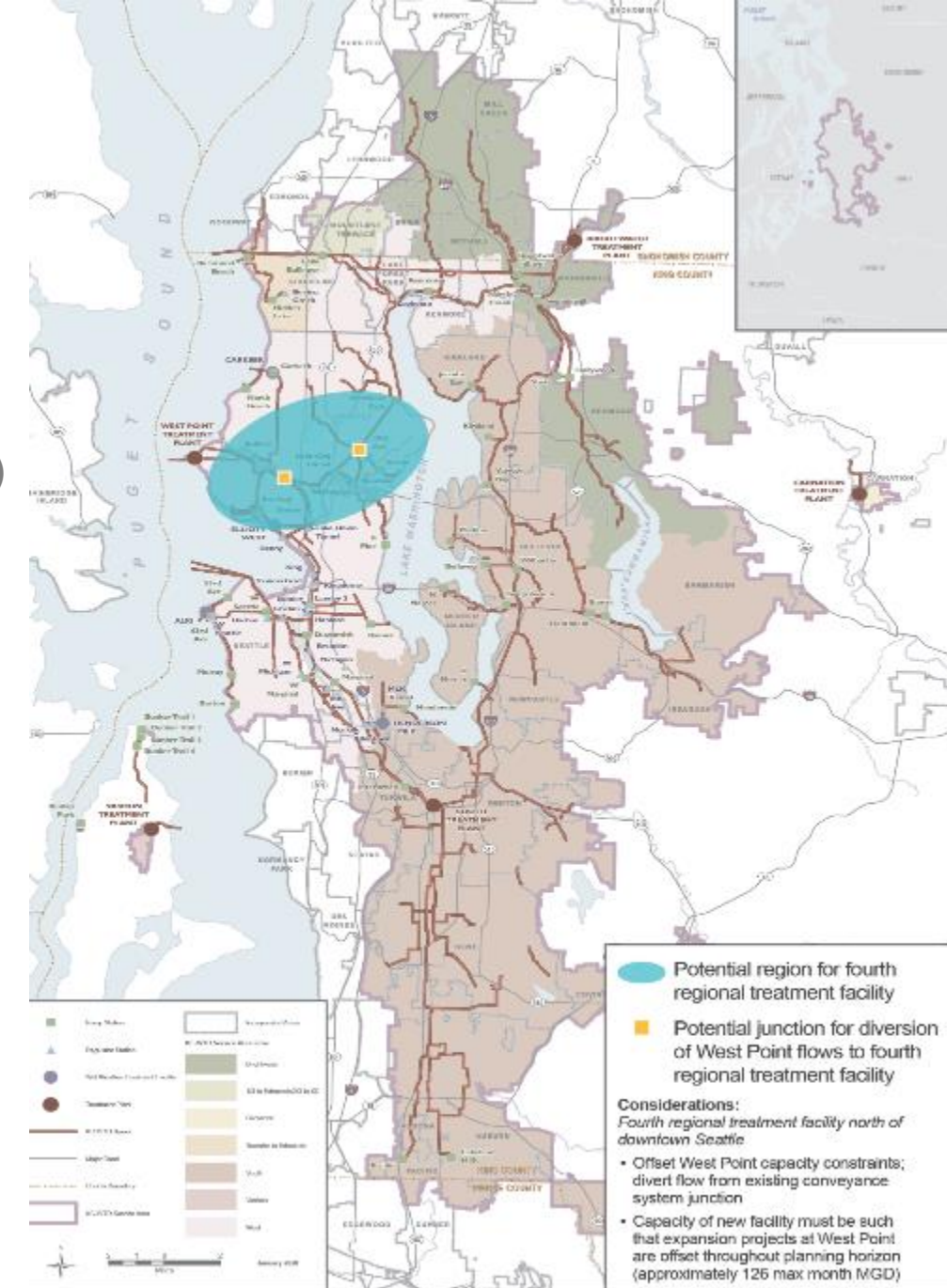
- **Other:**

- ▶ Does not require any additional partnerships or collaboration



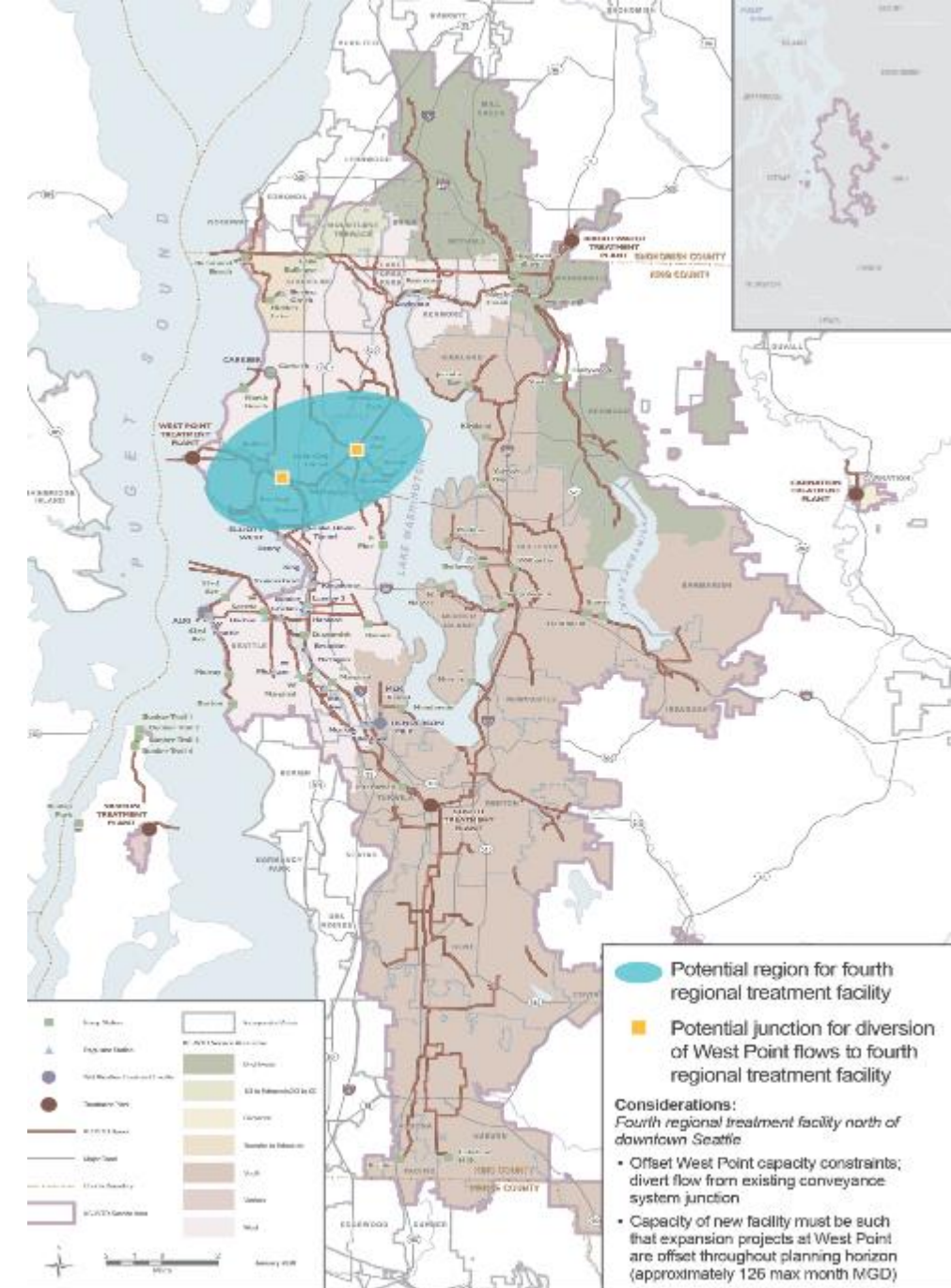
# Increased treatment level – Individual plant nitrogen reduction

- **Why Explore:**
  - Address capacity for population growth
  - Reduce effluent nitrogen (at each regional treatment plant)
- **Conceptual Components:**
  - Capacity expansion at each treatment plant
  - Process upgrades to reduce nitrogen to same level at each regional treatment plant
- **Key Considerations:**
  - Nitrogen removal at West Point would require a new regional treatment plant in the Seattle area
  - Adding nitrogen removal reduces space available for future capacity needs or removal of additional pollutants



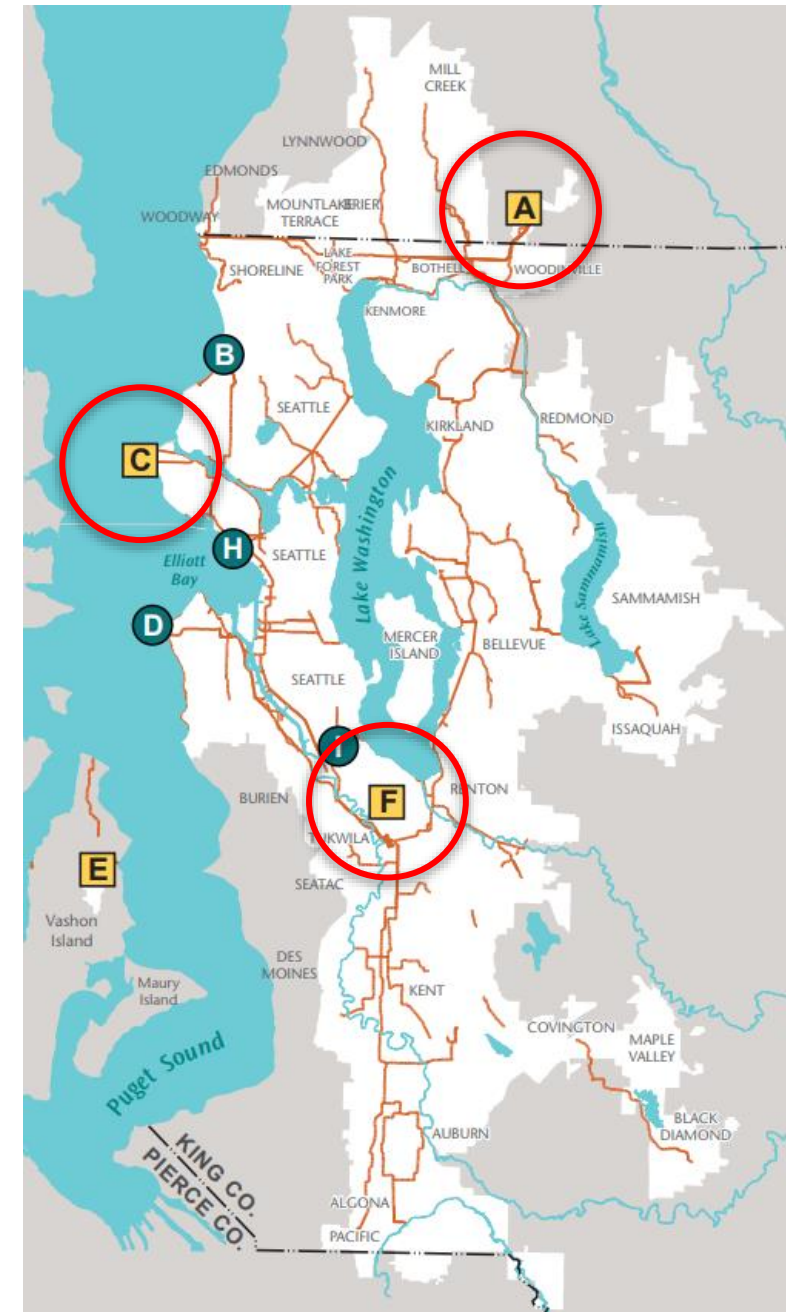
## Increased treatment level – Individual plant nitrogen reduction

- **Water Quality:**
  - Nitrogen removal process is designed for and effective at removing nitrogen
  - Process is not designed to and, therefore, does not remove non-regulated substances (e.g., organic toxins)
- **Long-term Conceptual Program Planning Estimate (order of magnitude) over a 40-year period:**
  - \$9B to \$22B for capacity and nitrogen removal upgrades, including more than \$6B for nutrient removal only
  - \$4B to \$10B for operations and maintenance
- **Other:**
  - Substantial increase in energy use and greenhouse gas emissions with nitrogen removal
  - Siting a large regional wastewater treatment plant would be challenging
  - New regional treatment plant could increase opportunity to produce recycled water



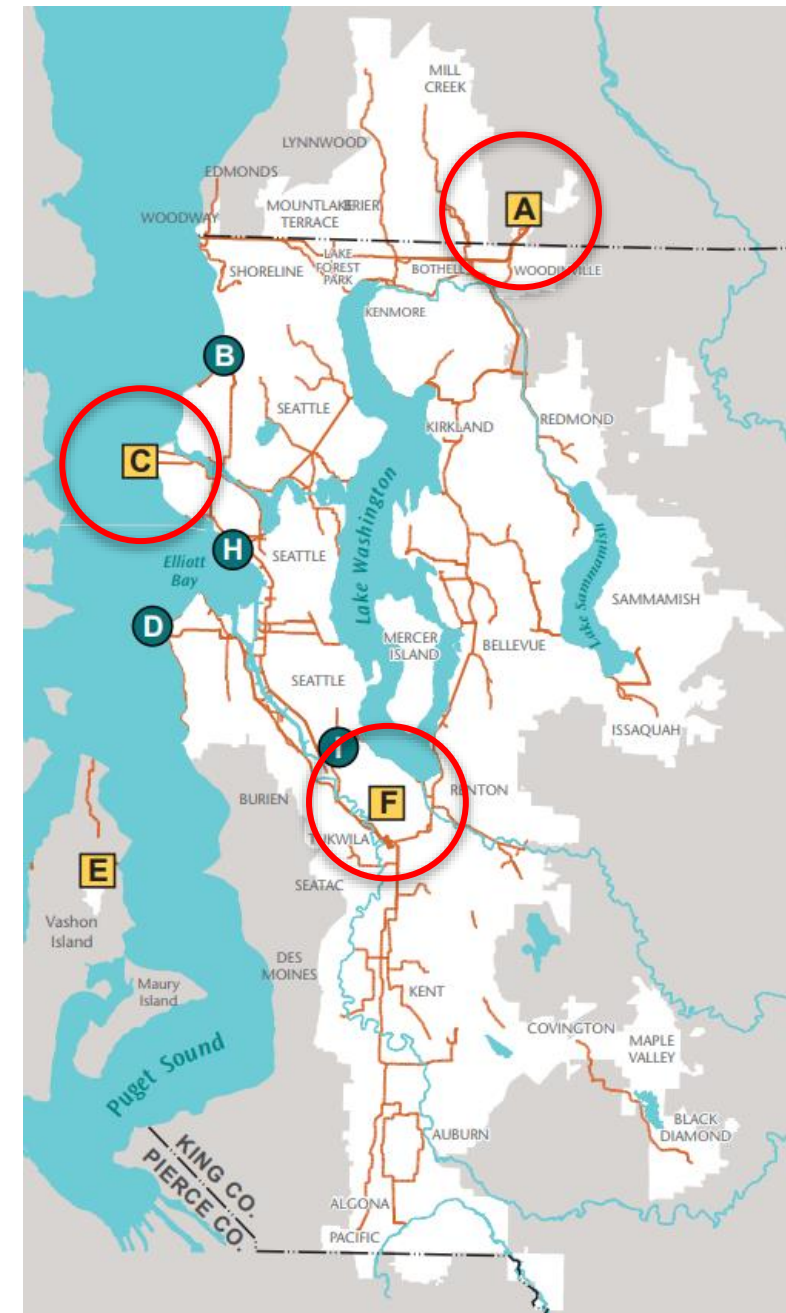
# Increased treatment level – King County utility-wide nitrogen reduction

- **Why Explore:**
  - Address capacity for population growth
  - Reduce effluent nitrogen (as a utility)
- **Conceptual Components:**
  - Capacity expansions at each treatment plant
  - Greater nitrogen removal at South Plant and Brightwater than at West Point
- **Key Considerations:**
  - Increased treatment levels at Brightwater may require expanding use of the current site
  - Adding nitrogen removal reduces space available for future capacity needs or additional pollutant removal



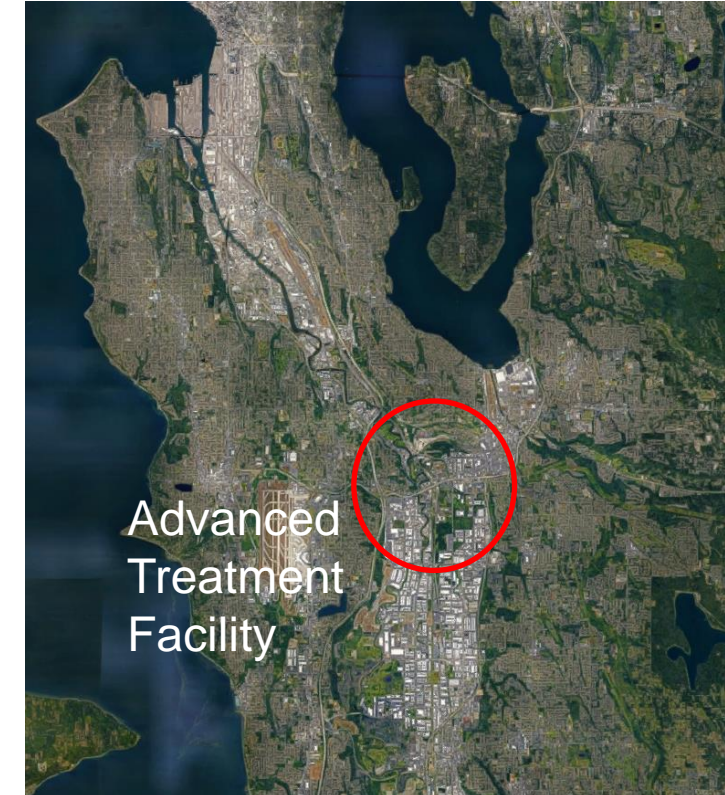
# Increased treatment level – King County utility-wide nitrogen reduction

- **Water Quality:**
  - Nitrogen removal process is designed for and effective at removing nitrogen
  - Process is not designed to and, therefore, does not remove non-regulated substances (e.g., organic toxins)
  - Slightly less nitrogen removed overall compared to individual plant approach
- **Long-term Conceptual Program Planning Estimate (order of magnitude) over a 40-year period:**
  - \$4B to \$9B for capacity and nitrogen removal upgrades
  - \$4B to \$9B for operations and maintenance
- **Other:**
  - Substantial increase in energy use and greenhouse gas emissions due to nitrogen removal process
  - Some potential community impacts around Brightwater Site



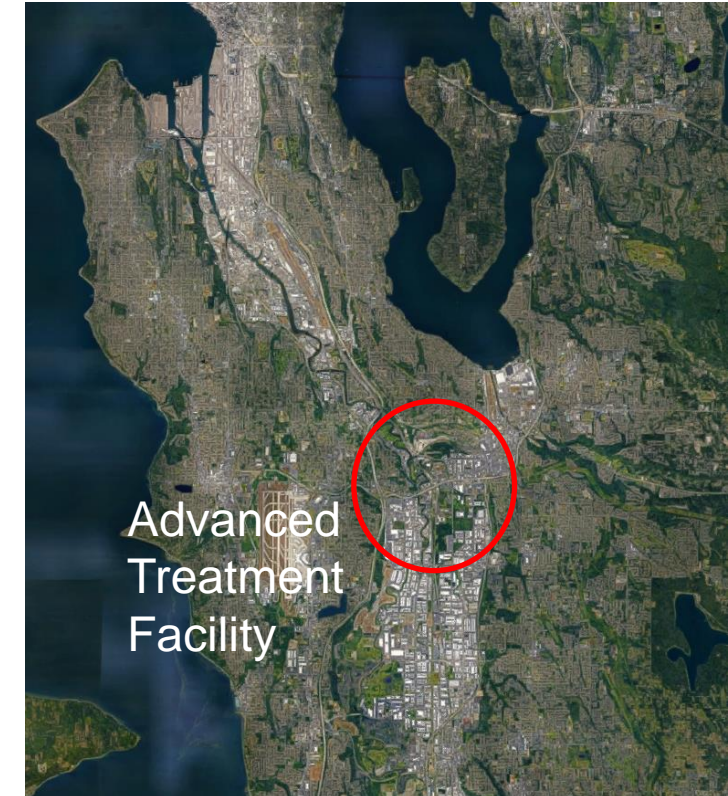
# Increased treatment level – Advanced treatment

- **Why Explore:**
  - Address capacity for population growth
  - Ability to reduce treated water discharged to Puget Sound
- **Conceptual Components:**
  - Capacity expansions at each treatment plant
  - Nitrogen removal at Brightwater and South Plant
  - Advanced treatment at South Plant
  - Treated water from South Plant is not sent to Puget Sound
- **Key Considerations:**
  - Additional site needed for the advanced treatment processes
  - Measurable reduction of discharge to Puget Sound requires a reliable, year-round use for the treated water
  - Advanced wastewater treatment and potable reuse have never been implemented at this scale in Washington



# Increased treatment level – Advanced treatment

- **Water Quality:**
  - Measurable decrease in treated water discharged to Puget Sound
  - Nitrogen levels similar to utility-wide nitrogen reduction approach
- **Long-term Conceptual Program Planning Estimate (order of magnitude) over a 40-year period:**
  - \$7B to \$18B for capacity, nitrogen removal, and advanced treatment upgrades
  - \$4B to \$11B for operations and maintenance
- **Other:**
  - Substantial increase in energy use and greenhouse gas emissions with nitrogen removal and advanced treatment processes
  - Potential for partnerships to make beneficial use of treated water as recycled water use
  - Development of new advanced treatment facility would have community impacts associated with large public works projects



# Water quality trading program for nitrogen reduction

- **Why Explore:**

- ▶ Potential alternate method for Clean Water Act compliance (for nitrogen in Puget Sound)

- **Conceptual Components:**

- ▶ **Point sources within a watershed participate in nitrogen water quality trading programs by:**
  - Reducing effluent nitrogen below requirements to generate and sell credits to other dischargers, or
  - Buying credits generated by other point and/or non-point dischargers, or
  - Mix of buying credits and implementing some nitrogen upgrades

- **Key Considerations:**

- ▶ **Nitrogen water quality credit trading framework for Puget Sound would need to be established**
  - Requires program development phase to determine trading processes, locations, delivery factors, credit price, etc. (likely a multi-year effort)
  - Program is partnership based, with collaboration among Ecology, point source dischargers, other public/private/non-profits during program development and implementation
- ▶ **Potential for other localized water quality and habitat benefits along with nitrogen removal**

# Decentralized secondary treatment at wet weather treatment stations

- **Why Explore:**

- ▶ Add wastewater treatment capacity in conjunction with CSO treatment investments

- **Conceptual Components:**

- ▶ Add secondary treatment processes wet weather treatment stations (WWTS) to alleviate capacity needs at West Point
- ▶ Treat base flows year-round; no change to WWTS operations
- ▶ Solids treatment not included

- **Water Quality:**

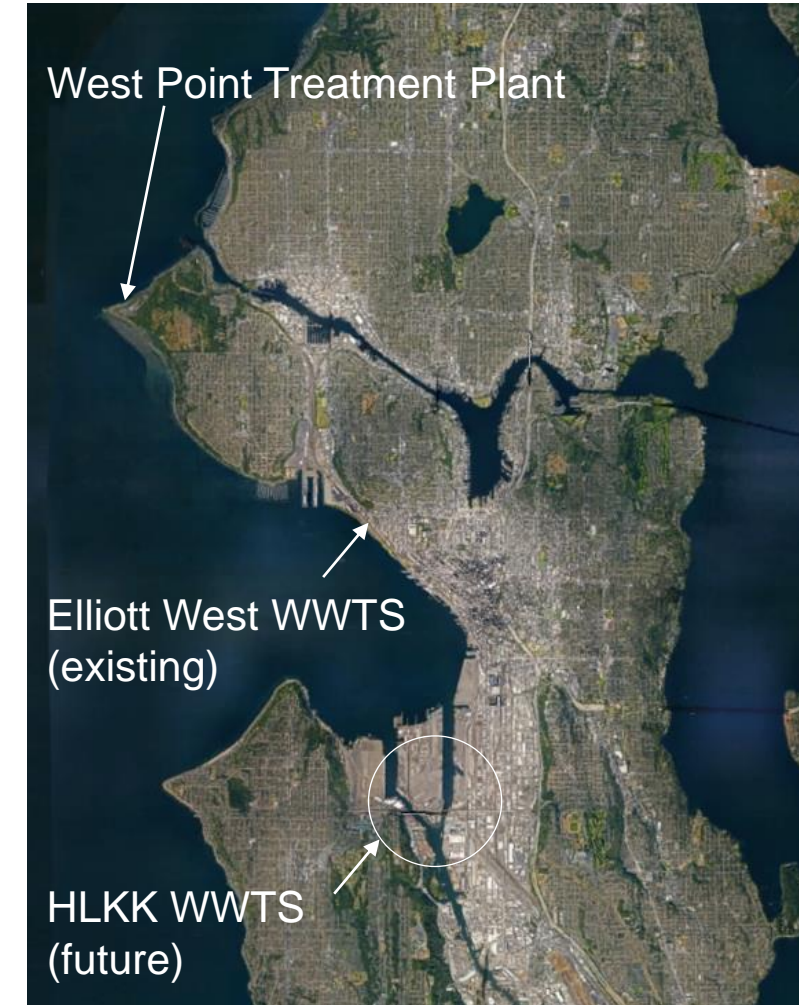
- ▶ Smaller footprint technology (i.e., membrane bioreactor or MBR) results in slightly higher treatment levels than West Point's current process

- **Long-term Conceptual Program Planning Estimate (order of magnitude) over a 40-year period:**

- ▶ \$1.3B to \$3.3B for new secondary treatment facilities
- ▶ \$0.2B to \$0.5B for operations and maintenance

- **Other:**

- ▶ Capacity needs at West Point delayed, but not eliminated
- ▶ Would require effluent permit modifications with Ecology



# City-scale decentralized treatment

- **Why Explore:**

- ▶ Address conveyance and treatment capacity needs in localized areas with significant upcoming development and population growth

- **Conceptual Components:**

- ▶ New satellite treatment facility in Black Diamond to offset need for increased conveyance system improvements (other locations explored did not meet planning criteria)
- ▶ Treated water discharged to aquifers; solids sent to South Plant

- **Water Quality:**

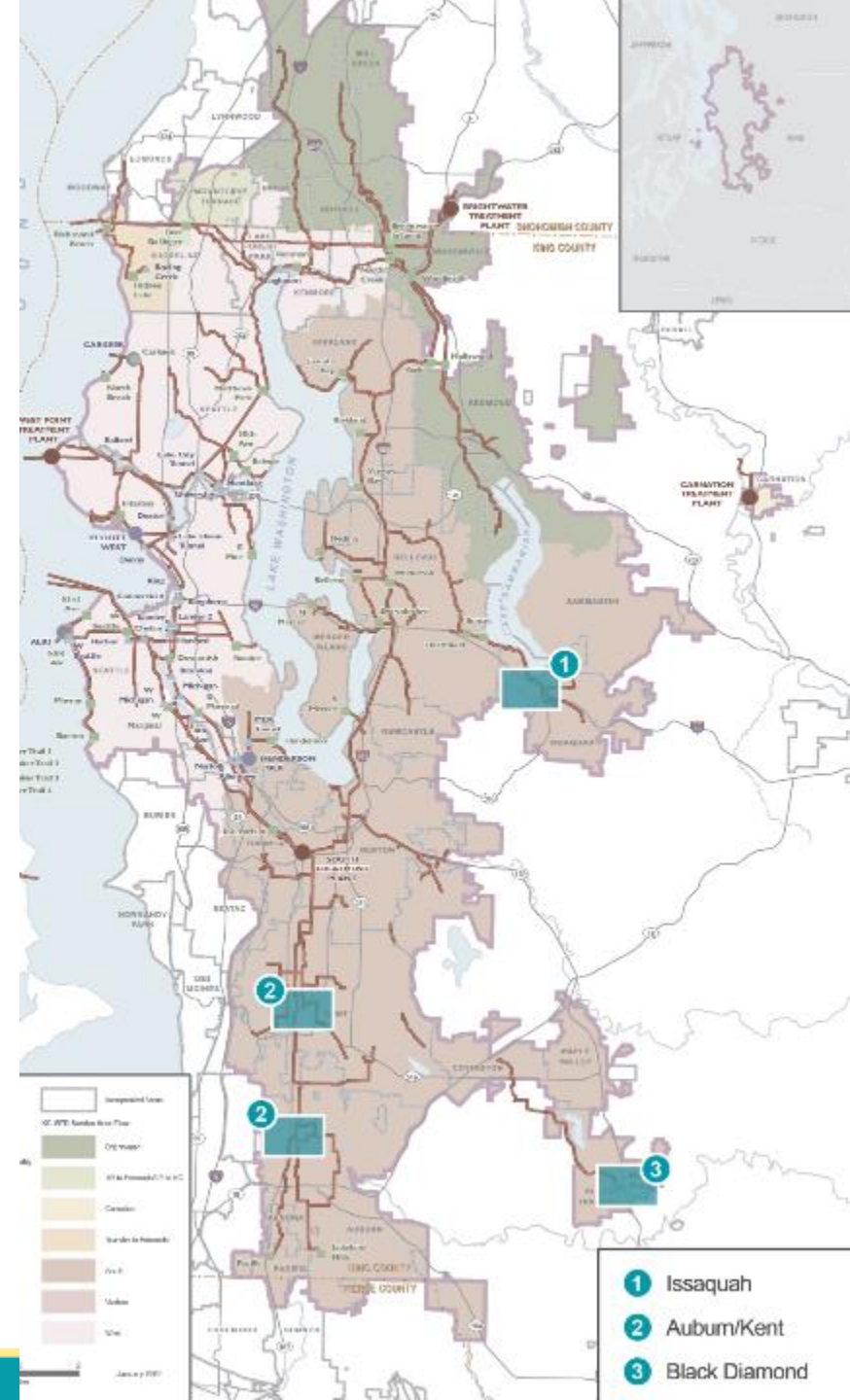
- ▶ Small decrease in treated water discharged to Puget Sound

- **Long-term Conceptual Program Planning Estimate (order of magnitude) over a 40-year period:**

- ▶ \$0.1B to \$0.3B for satellite treatment facility
- ▶ Up to \$0.1B for operations, maintenance, administrative
- ▶ \$0.1B to \$0.2B in avoided capacity expansion

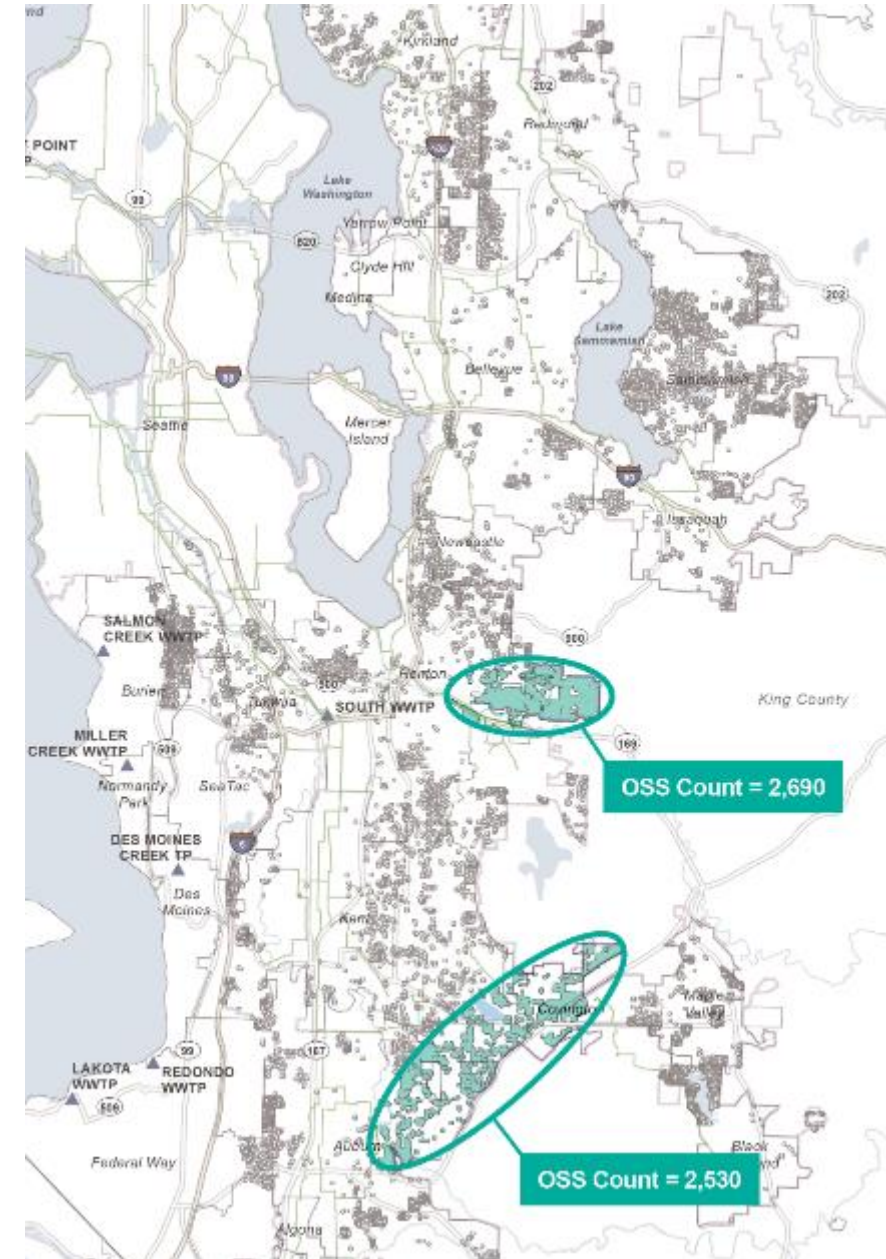
- **Other:**

- ▶ Satellite treatment facilities would provide increased opportunity for partnerships to use recycled water
- ▶ Development of satellite treatment facility would have community impacts associated with infrastructure projects



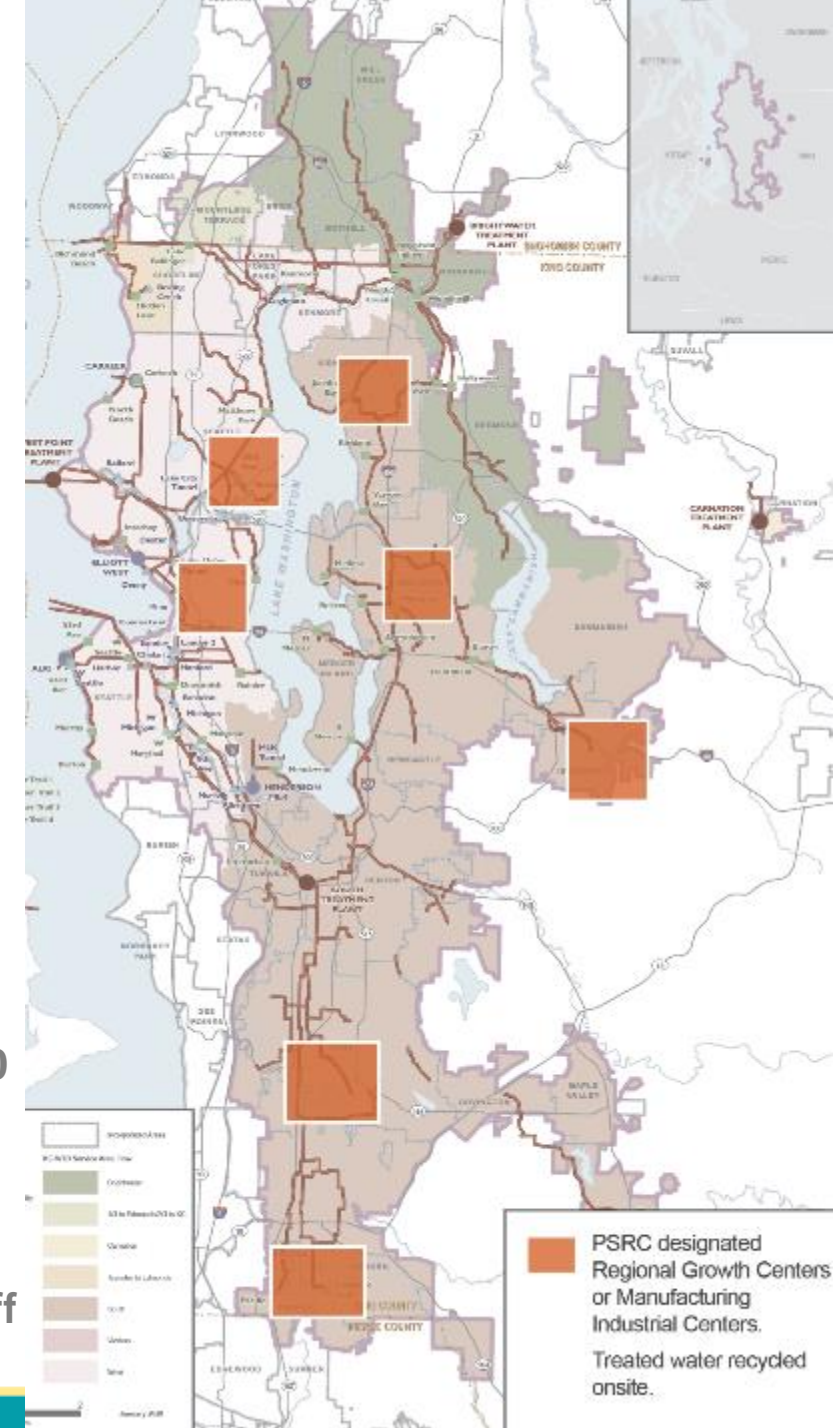
# Community/neighborhood-scale decentralized treatment

- **Why Explore:**
  - ▶ Planning for densification of Urban Growth Area and septic system conversion to regional conveyance and treatment with increased wastewater flows in concentrated areas
- **Conceptual Components:**
  - ▶ Collection system to convey flows to community satellite treatment facilities
  - ▶ Discharge reclaimed water to aquifer; solids are trucked to South Plant for treatment
- **Water Quality:**
  - ▶ Small decrease in treated water discharged to Puget Sound
- **Long-term Conceptual Program Planning Estimate (order of magnitude) over a 40-year period:**
  - ▶ \$0.5B to \$1.3B for new community satellite treatment facilities
  - ▶ \$0.1B to \$0.3B for operations and maintenance
- **Other:**
  - ▶ Capacity expansion needs at South Plant are not avoided before 2060
  - ▶ Satellite treatment facilities would provide increased opportunity for partnerships to use recycled water



# Building-scale decentralized treatment

- **Why Explore:**
  - Planning for densification of Urban Growth Area and exploring alternate technology approach to managing wastewater
- **Conceptual Components:**
  - Building code revisions that require developments over a size threshold to include on-site treatment
  - On-site treatment would include recycling water; connection to sewer typically for emergency use only
- **Water Quality:**
  - Small decrease in treated water discharged to Puget Sound
- **Long-term Conceptual Program Planning Estimate (order of magnitude) over a 40-year period:**
  - \$20M to \$60M in administrative costs, assumes King County would administer
  - \$4B to \$11B borne by owners and tenants of new developments to build, operate, and maintain new treatment systems
- **Other:**
  - Capacity expansion needs at regional treatment plants not avoided before 2060
  - Would require changes to existing and building new partnerships
  - Resiliency may improve with more distributed treatment under some circumstances, such as earthquakes
  - Reliability may decrease with less experienced operation and maintenance staff



# Clean Water Plan Treatment Policy Considerations

## Anticipated policy discussions:

- Level of treatment – secondary, nutrient removal, advanced – at regional wastewater treatment plants
- Incorporation of additional centralized wastewater treatment facilities into the regional system
- Incorporation of decentralized wastewater treatment facilities into the region's wastewater management approach
- Partnerships and collaboration on investments in the region's wastewater treatment system

# Thank you!

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