



KING COUNTY

1200 King County Courthouse
516 Third Avenue
Seattle, WA 98104

Signature Report

Ordinance 19644

Proposed No. 2023-0023.1

Sponsors McDermott

1 AN ORDINANCE authorizing the King County executive
2 to enter into an agreed order amendment with the
3 Washington state Department of Ecology for final cleanup
4 of King County's Maury Island Site, the former
5 Glacier/Northwest Aggregates Sand and Gravel Mine, and
6 to take those actions necessary to complete the cleanup as
7 required by the agreed order amendment.

8 **STATEMENT OF FACTS:**

- 9 1. On December 30, 2010, King County acquired from Glacier/Northwest
10 Aggregates four tax parcels comprising approximately two hundred fifty
11 acres of land on Maury Island.
- 12 2. King County acquired the property "as is." The property is known as
13 the "Maury Island Site" and the King County parks and recreation division
14 of the department of natural resources and parks is the custodian of the
15 property.
- 16 3. The Maury Island Site is located within the Tacoma Smelter Plume, a
17 large area contaminated by lead, arsenic and other pollutants from a
18 former copper smelter located in Tacoma. Soils on Maury Island are
19 impacted by the smelter plume.

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20 4. The Washington state Department of Ecology, Glacier/Northwest
21 Aggregates and King County conducted investigations of the Maury
22 Island Site over the past decade which found elevated levels of arsenic,
23 lead and cadmium in surface soils.

24 5. Before King County acquiring the Maury Island Site,
25 Glacier/Northwest Aggregates and the Washington state Department of
26 Ecology were negotiating the terms of a potential agreed order for
27 remedial work, in accordance with the Washington state Model Toxic
28 Control Act, chapter 70.105D RCW.

29 6. The purchase and sale agreement between Glacier/Northwest
30 Aggregates and King County committed King County to assume all
31 responsibility for remedial obligations related to hazardous substances at
32 the Maury Island Site, including, but not limited to, all remedial
33 obligations arising under the Model Toxic Control Act and the
34 implementation of any future orders imposing remedial obligations issued
35 under the Model Toxic Control Act by the Washington state Department
36 of Ecology.

37 7. On April 18, 2011, and in accordance with the Model Toxic Control
38 Act, the Washington state Department of Ecology notified King County
39 that it determined King County to be a "Potentially Liable Person" with
40 regard to the Maury Island Site making King County potentially liable for
41 the cost of actions necessary to remediate contamination at the Maury
42 Island Site.

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43 8. On January 31, 2013, the Washington state Department of Ecology and
44 King County entered into an agreed order No. 8439 requiring a remedial
45 investigation, feasibility study and draft cleanup action plan for the former
46 mining facility on the Maury Island Site. The county successfully
47 completed the order's requirements including the preparation of a draft
48 cleanup action plan.

49 9. In 2019, the Washington state Department of Ecology issued the final
50 Cleanup Action Plan that describes the cleanup remedy selected by the
51 Washington state Department of Ecology for the Maury Island Site and
52 actions to be taken to complete the cleanup. The Cleanup Action Plan is
53 based on the remedial investigation and feasibility study prepared per the
54 requirements of the agreed order.

55 10. King County has undertaken certain actions in the interim towards
56 cleanup of the Maury Island Site, with Washington state Department of
57 Ecology oversight and consent.

58 11. The amendment to agreed order No. 8439 requires King County to
59 undertake and complete all actions required by the final Cleanup Action
60 Plan issued by the Washington state Department of Ecology for the Maury
61 Island Site. The projected remaining cost to complete the cleanup is
62 \$4,500,000. Implementation of the cleanup is expected to be complete in
63 2029. Monitoring and maintenance of the cleanup elements will be
64 ongoing in perpetuity.

65 BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:

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66 SECTION 1. The King County executive is hereby authorized to:
67 A. Enter into an agreed order amendment between King County and the
68 Washington state Department of Ecology, substantially in the form of Attachment A to
69 this ordinance, for the final cleanup of a former mining facility at Maury Island; and


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70 B. Take all actions necessary to complete the cleanup as required by the agreed
71 order amendment.


Ordinance 19644 was introduced on 2/7/2023 and passed by the Metropolitan King County Council on 7/11/2023, by the following vote:

Yes: 9 - Balducci, Dembowski, Dunn, Kohl-Welles, Perry, McDermott, Upthegrove, von Reichbauer and Zahilay

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

DocuSigned by:

E76CE01F07B14EF...
Dave Upthegrove, Chair

ATTEST:

DocuSigned by:

8DE1BB375AD3422...
Melani Pedroza, Clerk of the Council

APPROVED this _____ day of 7/20/2023, _____.

DocuSigned by:

4FBCAB8196AE4C6...
Dow Constantine, County Executive

Attachments: A. State of Washington Department of Ecology Agree Order Amendment No. DE 8439

**STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY**

In the Matter of Remedial Action by:

King County, Washington

AGREED ORDER
AMENDMENT

No. DE 8439

TO: Mr. Dow Constantine, King County Executive
401 5th Avenue, Suite 800
Seattle, WA 98104

EXHIBITS:

EXHIBIT D: Cleanup Action Plan
EXHIBIT E: List of Deliverables and Schedule
EXHIBIT F: List of Required Permits
EXHIBIT G: Applicable Substantive Requirements.

I. INTRODUCTION

Agreed Order No. 8439, entered into by the State of Washington, Department of Ecology (Ecology), and King County, political subdivision of the State of Washington on January 31, 2013, required a remedial investigation (RI), feasibility study (FS), and draft cleanup action plan (DCAP) for a former mining facility on Maury Island (defined as the “Cleanup Unit”), where there has been a release or threatened release of hazardous substances due to aerial emissions from Asarco’s Tacoma smelter. The Cleanup Unit is within and part of the much larger Tacoma Smelter Plume (TSP). Under this Amendment to Agreed Order No. 8439 (Amendment), King County will implement the final cleanup for the Cleanup Unit. Ecology believes the actions required by this Order are in the public interest.

This Amendment does not attempt to recite all the provisions of the Order. Provisions of the Order not specifically changed in this Amendment shall remain in full force and effect.

II. JURISDICTION

This Agreed Order is issued pursuant to the Model Toxics Control Act (MTCA), RCW 70.105D.050(1), now recodified at RCW 70A.305.050(1). References in this Order to MTCA and other state environmental law provisions shall be superseded as necessary by their recodified RCW provisions.

III. AMENDMENTS

Section VII. (Work to Be Performed), is amended to incorporate the following additional subsections:

F. Implementation of Cleanup: King County shall implement the selected remedy for the Cleanup Unit by implementing the Cleanup Action Plan (CAP), attached as Exhibit D. The cleanup action is to take place in phases according to Section 5.3 of the CAP, and shall be performed in accordance with the more detailed and/or modified schedule contained in the List of Deliverables and Schedule (Schedule), attached as Exhibit E, and all other requirements of this Order.

G. In order to implement the CAP, King County will prepare and submit for Ecology's review and approval all documents necessary to conduct the final cleanup action. Any such deliverable, once approved by Ecology, becomes an integral and enforceable part of this Order. The List of Deliverables and Schedule (Exhibit E) details those deliverables that have been identified as of the effective date of this Amendment, plus the schedule by which they must be submitted.

H. King County agrees not to perform any remedial actions outside the scope of the Order unless the Parties agree to modify the CAP to cover these actions. All work conducted by King County shall be performed in accordance with Chapter 173-340 WAC unless otherwise provided herein.

Section VIII (Terms and Conditions of Order), subsection P (Compliance with Applicable Laws) is replaced in its entirety by the following:

P. Compliance with Applicable Laws

1. All actions carried out by King County pursuant to this Order shall be done in accordance with all applicable federal, state, and local requirements, including requirements to obtain necessary permits, except as provided in RCW 70A.305.090.

Amendment to Agreed Order No. DE 8439
Page 3 of 4

The permits that are necessary to obtain to implement the final cleanup for the Cleanup Unit are identified in Exhibit F.

2. Pursuant to RCW 70A.305.090(1), King County is exempt from the procedural requirements of Chapters 70A.15, 70A.205, 70A.300, 77.55, 90.48, and 90.58 and of any laws requiring or authorizing local government permits or approvals. However, King County shall comply with the substantive requirements of such permits or approvals. The substantive requirements of such permits or approvals that have been identified as being applicable but procedurally exempt under this Section are identified in Exhibit G. King County has a continuing obligation to determine whether additional permits or approvals addressed in RCW 70A.305.090(1) would otherwise be required for the remedial action under this Order. In the event either Ecology or King County determines that additional permits or approvals addressed in RCW 70A.305.090(1) would otherwise be required for the remedial action under this Order, it shall promptly notify the other party of its determination. Ecology shall determine whether Ecology or King County shall be responsible to contact the appropriate state and/or local agencies. If Ecology so requires, King County shall promptly consult with the appropriate state and/or local agencies and provide Ecology with written documentation from those agencies of the substantive requirements those agencies believe are applicable to the remedial action. Ecology shall make the final determination on the additional substantive requirements that must be met by King County and on how King County must meet those requirements. Ecology shall inform King County in writing of these requirements. Once established by Ecology, the additional requirements shall be enforceable requirements of this Order. King County shall not begin or continue the remedial action potentially subject to the additional requirements until Ecology makes its final determination.

3. Pursuant to RCW 70A.305.090(2), in the event Ecology determines that the exemption from complying with the procedural requirements of the laws

Amendment to Agreed Order No. DE 8439
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referenced in RCW 70A.305.090(1) would result in the loss of approval from a federal agency that is necessary for the state to administer any federal law, the exemption shall not apply and King County shall comply with both the procedural and substantive requirements of the laws referenced in RCW 70A.305.090(1), including any requirements to obtain permits.

A new section is also added to the Order as follows:

XI. LAND USE RESTRICTIONS

In consultation with Ecology, King County will prepare a draft Environmental (Restrictive) Covenant that is consistent with WAC 173-340-440, RCW 64.70, Section 5.2 of the CAP, Exhibit E, plus the approved Institutional Control Plan for the Site. After approval by Ecology, the County shall record the Restrictive Covenant with the office of the King County Auditor within ten (10) days of the completion of the remedial action. The Restrictive Covenant shall restrict future uses of the Site. King County shall provide Ecology with the original recorded Environmental (Restrictive) Covenant within thirty (30) days of the recording date.

Effective date of this Amendment: _____

KING COUNTY

STATE OF WASHINGTON,
DEPARTMENT OF ECOLOGY

Mr. Dow Constantine
King County Executive
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Seattle, WA 98104
Telephone: 206-263-9600

Robert W. Warren, P.Hg., MBA
Section Manager, *Toxics Cleanup Program*
Northwest Regional Office
Bellevue, WA 98008
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CLEANUP ACTION PLAN

MAURY ISLAND OPEN SPACE PROPERTY

Prepared by:

Washington State Department of Ecology



May 2019

Publication and Contact Information

This report is available on the Department of Ecology's website at <https://ecology.wa.gov/About-us/Online-tools-publications/Publications-forms>

For more information contact:

Toxics Cleanup Program
P.O. Box 47600
Olympia, WA 98504-7600

Phone: (360) 407-7170

Washington State Department of Ecology - www.ecy.wa.gov

- o Headquarters, Olympia 360-407-6000
- o Northwest Regional Office, Bellevue 425-649-7000
- o Southwest Regional Office, Olympia 360-407-6300
- o Central Regional Office, Yakima 509-575-2490
- o Eastern Regional Office, Spokane 509-329-3400

Accommodation Requests: To request ADA accommodation including materials in a format for the visually impaired, call Ecology at (360) 407-7170. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

CLEANUP ACTION PLAN

MAURY ISLAND OPEN SPACE PROPERTY

by:

Parametrix, Inc.
60 Washington Avenue, Suite 390
Bremerton, WA 98337
360-377-0014
Project No. 233-1521-175

Toxics Cleanup Program
Washington State Department of Ecology
Olympia, Washington

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KEY TERMS

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
ARARs	applicable or relevant and appropriate requirements
bgs	below ground surface
BMPs	Best Management Practices
CAP	Cleanup Action Plan
Cleanup Unit	Maury Island Open Space property
COCs	Contaminants of Concern
County	King County
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
DCA	disproportionate cost analysis
DCAP	Draft Cleanup Action Plan
ESLs	ecological screening levels
FS	Feasibility Study
IA	Interim Action
IAP	Interim Action Plan
mg/kg	milligrams per kilogram
MTCA	Model Toxics Control Act
NEBA	Net Environmental Benefit Analysis
NWI	National Wetlands Inventory
O&M	operation and maintenance
PAHs	Polycyclic Aromatic Hydrocarbons
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SCO	Sediment Cleanup Objective
SCUM II	Sediment User's Cleanup Manual II
TEF	toxicity equivalency factors
TSP	Tacoma Smelter Plume
UCL	upper confidence level
WAC	Washington Administrative Code

EXECUTIVE SUMMARY

This Cleanup Action Plan (CAP) describes the cleanup action selected by the Washington State Department of Ecology (Ecology) for the Maury Island Open Space Cleanup Unit, Facility Site #2901216. The Cleanup Unit is located on the southeast side of Maury Island in unincorporated King County (County), Washington (Figure 1), and lies within the larger Tacoma Smelter Plume Site. The CAP is based on a Remedial Investigation (RI) and Feasibility Study (FS) prepared per the requirements of Agreed Order No. DE 8439 (dated January 31, 2013), between Ecology and King County.

The Cleanup Unit is approximately 266 acres in size and is the former location of a sand and gravel mine operated by CalPortland. The mine was located within the central portion of the Cleanup Unit, most of which is steeply sloped and all of which is now sparsely vegetated, primarily with scotch broom and Pacific madrone. The remainder of the Cleanup Unit consists of over 100-year-old forests, younger forests, blackberry patches, and sea bluffs covered in blackberries, poison oak, and Pacific madrone. The public have created a series of footpaths through the forests and utilize these, as well as former graded dirt roads, as casual walking trails (CDM Smith 2014a).

All of Maury Island lies within the plume fallout area from the former ASARCO Tacoma Smelter. The copper ores used by the ASARCO smelter contained high concentrations of arsenic and other metals. Over the years of operation, metals released from the Tacoma Smelter's smokestack, particularly arsenic and lead, were carried by wind, ultimately settling over a 1,000-square-mile area. As a result of this, surface soils within much of the Tacoma Smelter Plume (TSP) fallout area contain arsenic and lead concentrations that are many times greater than natural background concentrations. The soils on Maury Island are among those most significantly impacted from the TSP, and the Cleanup Unit itself lies within an area most greatly impacted by the TSP on Maury Island.

In June of 2014, CDM Smith Inc. (CDM Smith 2014a) completed a RI for the Cleanup Unit. The RI determined that metal concentrations in forest duff and surface soil throughout the Cleanup Unit, with the exception of recently mined areas and the beach, consistently exceed Model Toxics Control Act (MTCA) cleanup levels. Research of the Cleanup Unit's land use history identified one additional source of contamination – an area that had previously been utilized as a private skeet shooting range (Figure 6). The RI confirmed that former skeet shooting activities resulted in an area of relatively greater lead concentrations than found throughout the rest of the Cleanup Unit, as well as an area where surface soils are impacted by Polycyclic Aromatic Hydrocarbons (PAHs) from skeet shards.

In May 2014, CDM Smith completed a Net Environmental Benefit Analysis (NEBA) for the Cleanup Unit (CDM Smith 2014b.). The NEBA concluded that the bluffs and much of the upland areas are eligible for the application of NEBA because these areas contain "especially valuable habitat." Therefore, a cleanup alternative involving removal of soil

would result in greater environmental harm than an alternative of leaving the contaminated topsoil in place. Ecology concurred with the NEBA determination. Therefore, based on the NEBA, remedial alternatives developed for the Cleanup Unit additionally took into account the protection of the environment for those Units that qualify for the NEBA.

Decision units within the Cleanup Unit that did not qualify for the NEBA included three upland areas that have been cleared in the past and are now vegetated primarily with grass, blackberry bushes, and scotch broom (Units 3c, 3e, and 5; Figure 3). In the fall of 2016, Interim Action (IA) efforts were initiated by the County to clean up a 3-acre section of Decision Unit 3c. The Interim Action consisted of stripping existing vegetation and the installation of 3 inches of compost, landscaping fabric, and native shrubs and trees, to serve as a cap and physical barrier to eliminate or reduce access to soil contamination that would remain in this area consistent with the final proposed cleanup. An 8-foot deer fence was installed around the perimeter of the planting area to protect the new plants.

Following the 2014 RI and NEBA, King County conducted an additional investigation of the wetland soils/sediments in Unit 5 to document the nature and extent of impacts to indicator species from arsenic, lead, and PAHs.

In April 2017, Parametrix completed a Feasibility Study (FS) for the Cleanup Unit (Parametrix 2017). The FS developed and assessed five remedial alternatives that implement a combination of cleanup approaches including limited contaminated soil removal, soil capping, and institutional controls. The alternatives are summarized below:

- **Alternative 1** – Closure of selected trail spurs. Capping the entire network of forest footpaths. Excavating soils on roads/trails that exceed cleanup levels. Excavating contaminated surface soils in areas that do not pass the NEBA.
- **Alternative 2** – Same as Alternative 1, except that soils will be contained below grade in two separate areas that did not pass the NEBA, one of which will be capped by a visitor parking lot to be constructed in the portion of the former trap range area that does not pass the NEBA.
- **Alternative 3** – Closure of selected trail spurs. Capping the entire network of forest footpaths. Conducting soil mixing for soils cleanup levels. In the portion of the former trap range area (Unit 5) that does not pass the NEBA, strip off the organic layer and cap with gravel for use as an equestrian parking lot. Soils in the other two areas that do not pass the NEBA (Decision Units 3c and 3e) will be left in place because both of these areas are heavily vegetated with blackberry bushes and virtually impassible by humans.

- **Alternative 4** – Same as Alternative 3, except that capping of the footpaths will be limited to a main thoroughfare.
- **Alternative 5** – Modification of Alternative 4 including revegetation of Units 3c and 3e. Cap graded roads with a minimum of 3 to 4 inches of compacted gravel and a 3-inch-thick layer of mineral soil (or equivalent) to protect a horse's hooves and a dog's feet. In Unit 5, clearing and grubbing will only be performed for an area large enough to construct a 40-to-50-stall gravel parking lot. The cleared area will be graded and a gravel parking lot and driveway will be constructed by placing a minimum of a 6-inch-thick layer of compacted gravel. A post and rail perimeter fence backed by thorny native species will be placed around the perimeter of the gravel parking lot and driveway to discourage visitors from walking into the former skeet range area. Limited remediation in the adjacent wetland will be done where lead exceeds allowed levels.

The result of the FS was selection of Alternative 5 as the preferred alternative. The FS was approved by Ecology on May 18, 2017. This CAP sets out the evaluation and selection of Alternative 5 as the selected cleanup action for the Cleanup Unit, and addresses implementation of the proposed cleanup action, establishing institutional controls, and conducting long-term monitoring to ensure the ongoing effectiveness of the cleanup.

1. INTRODUCTION

This Draft Cleanup Action Plan (CAP) describes the cleanup action selected by the Washington State Department of Ecology (Ecology) for the Maury Island Open Space Cleanup Unit, Facility Site #2901216. The Cleanup Unit is located on the southeast side of Maury Island in unincorporated King County (County), Washington (Figure 1), and lies within the larger Tacoma Smelter Plume Site. The CAP is based on a Remedial Investigation (RI) and Feasibility Study (FS) prepared per the requirements of Agreed Order No. DE 8439 (dated January 31, 2013), between Ecology and King County (CDM Smith 2014a; Parametrix 2016).

1.1 Purpose

This CAP was completed per the Agreed Order and Washington Administrative Code (WAC) 173-340-380, Model Toxics Control Act (MTCA) (Ecology 2007). The purpose of the CAP is to present a general conceptual-level description of the preferred cleanup actions developed under the RI/FS. MTCA requires a CAP to include:

- A summary of RI/FS and IA activities performed at the site.
- Applicable state and federal laws for the proposed cleanup action.
- Cleanup standards for each hazardous substance and each medium of concern.
- A brief summary of the other cleanup alternatives evaluated in the RI/FS.
- A description of the proposed cleanup action.
- A description of the required institutional controls, types and concentration of contaminants left on site, and measures that will be used to prevent contact with these substances.
- A schedule for implementation of the proposed cleanup action.

2. SUMMARY OF CLEANUP UNIT CONDITIONS

2.1 Cleanup Unit Description and History

The Cleanup Unit consists of a 266-acre property located on the southeast side of Maury Island on a sea bluff overlooking Puget Sound. Until 2010 when King County purchased the property, CalPortland operated a sand and gravel mine on the property. The most recent mining operations had been centrally located within the area referred to as the "South Pit." Currently, there are some mine-associated above-and-below-ground conveyor structures existing on the property. A partially reconstructed dock is located at the base of the South Pit. To the northeast of the South Pit is another abandoned gravel pit, referred to as the "North Pit," which had operated in the early 1900s. Most recently mined areas of the South Pit are sparsely vegetated, typically with scotch broom, sparse grasses, seedling Pacific madrone, and blackberry bushes. The North Pit is predominately vegetated with scotch broom, sparse grass, and a few mature trees (Pacific madrone, maple, and Douglas fir).

The majority of the upland areas are undisturbed by mining and covered by mature and semi-mature forest, which includes Pacific madrone, Douglas fir, Red alder, Black cottonwood, Western hemlock, and maple with an understory that includes salal, various ferns, huckleberry, Oceanspray, and Oregon grape. The exceptions to this are an area north of SW 260th Street that was once used as a private skeet range and an area in the northeast corner of the Cleanup Unit; these areas are predominantly covered by blackberry bushes. Large stands of blackberry bushes and scrubby vegetation, such as poison oak, Himalayan blackberries, and scotch broom, cover the sea bluffs. A beach extends along the base of the bluff. The portion of property north of SW 260th Street also contains a wetland that is included in the National Wetlands Inventory (NWI).

A network of trails exists throughout the Cleanup Unit consisting of "footpaths" and "graded roads," which were assessed during the RI. Footpaths consist of the meandering trails throughout the upland forest areas, which were created over time by continued long-term use. The footpaths connect with a larger trail system that extends off the Cleanup Unit. The graded roads are specific to the Cleanup Unit. The roads were originally constructed for mine use and later abandoned. Over time, much of the former graded roads located along the bluff have become narrowed by encroaching vegetation, and in some places are completely overgrown. The graded roads located in the upland area have mostly retained a width suitable for vehicle passage and serve a dual purpose as access for emergency fire suppression. For purposes of the RI and FS discussions, the main access road into the Cleanup Unit from SW 20th Street, which extends down the South Pit to the beach, is not a part of the graded road system.

2.2 Physical Characteristics of the Cleanup Unit

2.2.1 Geologic and Hydrogeologic Conditions

The Cleanup Unit is located within the Puget Sound Lowland underlain primarily by sediments deposited during and between repeated glacial advances and retreats in the Pleistocene Epoch. The upland areas are mantled by Vashon till (a mixture of clay, silt, sand, gravel, and boulders) and recessional outwash (including stratified sand and gravel) ranging from approximately 3 to 12 feet thick. Limited perch water may be present seasonally on a discontinuous basis in areas where till is present.

Groundwater at the site occurs at depths of 20 feet below ground surface with a consistent flow direction towards the Puget Sound. Springs occur at the contact between the Vashon advance outwash and the underlying less-pervious silt and clay of the pre-Vashon unit where exposed near sea level along the beach (AESI 1998). The primary surface water feature is the Puget Sound, which forms the southeastern boundary around the Cleanup Unit at a distance of approximately 4,800 feet.

2.3 Summary of Previous Site Investigations

2.3.1 Remedial Investigation

As a part of the 2014 RI, CDM Smith researched historical land use and divided the property into various “decision units.” The decision units, or more briefly referred to as “Units,” divide the Cleanup Unit into recent and older mined areas (Units 2a-2c, 3e), older forest (Units 1a, 1b), more recent forests (Units 3a, 3b), a historical dairy farm (Unit 3c), sea bluffs (Units 4a-4c), and an approximately 30-acre forested property that lies north of SW 260th Street that had been utilized as a private skeet shooting range (Unit 5). The RI evaluated the following:

- Metals concentrations in forest duff, surface soil, and subsurface soil across the Cleanup Unit.
- PAH concentrations in forest duff and surface soil associated with the former skeet range.
- Metals concentrations in groundwater and spring water.
- The uptake of metals by various representative plants that grow in the Cleanup Unit.
- The natural environment, including an assessment of anthropogenic changes to the beach and subtidal area as a result of historical mining activities and a terrestrial ecological assessment and wetland survey.

2.3.2 Wetland Investigation

In 2015, King County Department of Natural Resources completed an investigation of sediments from the wetland located near the Former Skeet Range in Decision Unit 5 (King County 2016). Five surface soil samples were collected from the wetland located near the Former Skeet Range. The term “soil” is used because there are no applicable regulations articulating a definition of “wetland sediments.” All soil samples were analyzed for conventional parameters, arsenic, lead, and polycyclic aromatic hydrocarbons. Bioassays were also conducted on all samples.

2.3.3 Interim Action

To coincide with available site funding, an IA was conducted in November and December 2016 to implement a portion of site work consistent with the anticipated final cleanup. During this time, limited soil contamination was removed along with existing vegetation in the 3 acres in Unit 3.

After existing vegetation was cleared, a 3-inch layer of coarse compost was placed on the ground surface to act as a physical barrier similar to a gravel cap, and also to provide nutrients and mulch. Temporary landscaping fabric was placed over the compost for plant establishment. Trees and shrubs were densely planted at 4-foot on center through the fabric and compost. The density of the shrubs and trees was designed specifically to limit access to recreational users, as well as to provide beneficial ecological habitat.

An 8-foot-tall deer fence was constructed using timber posts and galvanized steel mesh fencing to protect the plants during establishment. The fence also discourages human access while the plants mature. Plants will be watered using a pressure fed drip irrigation system until the plants become established and no longer require watering.

Consistent with WAC 173-340-430, the IA reduced a threat to human health or the environment by implementing in advance a portion of the final cleanup proposed in this CAP.

2.4 Summary of Environmental Conditions

2.4.1 Soil

Summary statistics for arsenic, lead, and PAHs by decision units property-wide (excluding trails and roads), on trails, and on roads are provided in Table 1 through Table 4. Contaminants that currently exceed cleanup levels in duff and surface soil samples are described below. See Section 3.1 for a discussion of cleanup levels.

Contaminants Exceeding Cleanup Levels:

- Arsenic: Up to 2,600 mg/kg and 2,550 mg/kg in duff and surface soil, respectively (Table 1),
- Lead: Up to 2,600 mg/kg and 2,520 mg/kg in duff and surface soil respectively (Table 2), and
- PAHs (based on benzo(a)pyrene: Up to 112,617 µg/kg in forest duff (Table 4).

Cadmium did not exceed cleanup levels in surface soil samples.

Overall, metal concentrations decline rapidly with depth. The data suggests that when subsurface soils (i.e., 9 inches and deeper) contain elevated metals concentrations, it is because of physical transport mechanisms other than leaching, such as fill, inexact sampling practices that may have caused cross contamination from surface soils, and/or bioturbation (soil disturbance due to organismal movement) (CDM Smith 2014a.).

The beach sands are not contaminated. This is because of the low cation exchange capacity of sand (the result is that the metals have very little ability to adsorb to the sand), combined with the constant movement of beach sands. Samples were collected at the bluff face at the edge of the beach and from slough accumulations along the base of the bluff. Arsenic concentrations ranged from 1.8 to 27 mg/kg. Lead concentrations ranged from 1.5 to 31 mg/kg.

The skeet range was inspected for the presence of shards and an area of shards were identified just to the north and east of the eastern trap station. Samples were collected from this area, specifically for PAH analysis. Several of the prior sample locations were inspected for the possible presence of shot in forest duff and soil. Shot was confirmed at most of the locations, although sometimes it was difficult to ascertain shot from small gravel due to the discoloration that occurs with weathering. These observations substantiate the premise that the relatively higher lead concentrations in a portion of Unit 5 are the result of historical skeet shooting activities (Parametrix 2017).

2.4.2 Groundwater

The results of spring water sampling conducted for the RI and historical sampling data from seeps and on-site observation wells demonstrate that groundwater and spring water have not been impacted by metals and that ingestion of impacted groundwater is not a potential human exposure pathway at the site (Parametrix 2017). Groundwater was not evaluated for the presence of PAHs during the RI because these hazardous substances were not identified as contaminants of concern (COCs) for groundwater.

2.4.3 Wetland Soil

Arsenic and lead in most of the wetland soil samples exceeded cleanup screening levels and toxicity was observed in some of the bioassays. The bioassay toxicity appeared to be primarily related to elevated lead levels, but not related to arsenic.

2.5 Human Health and Environmental Concerns

2.5.1 Human Health

The potential human exposure pathways at the Cleanup Unit include: direct contact with soil/sediment; ingestion of soil particles; inhalation of soil particles; ingestion of water (groundwater/spring); ingestion of vegetation; and ingestion of marine organisms exposed to COC.

The primary transport pathways of COCs include: leaching of contaminants from soil to groundwater; discharge of groundwater to surface water; erosion of soil as a result of bluff failures; windblown dust; and via physical transport, such as may occur when soil adheres to pet hair and shoes.

Soil: Because the current and future use of the Cleanup Unit is for passive recreation (e.g., primarily open space with walking trails), the primary concern for human health is direct exposure to contaminants in surface soil and duff. This may include skin contact, direct ingestion by hand-to-mouth contact, or inhalation. The COCs have a low risk of being a skin irritant. The primary risk of exposure is through incidental ingestion as a result of hand to mouth contact, such as from soil particles sticking to clothing, body parts, and pet fur. Children (and sometimes adults in instances of pica disorder) frequently ingest soil directly. Inhalation via dust may be significant if motorized off-road vehicles were to use the property. Bikes and horses may also tend to kick up dust, but to a much lesser extent.

Groundwater: Groundwater is not currently used at the site nor is it likely to be under any potential future site use scenario. In addition, as stated previously, groundwater was not found to be impacted by site contaminants.

Vegetation: Plants growing in metals-enriched soils have an uptake of metals that is greater than in areas not impacted by the TSP. The primary concern of metals in vegetation would be from ingestion. While increased metals uptake in blackberries appears to be relatively low, the significance of this would need to be evaluated with regard to the degree of consumption (CDM Smith 2014a).

Surface Water/Sediment: Risks posed as a result of ingestion of marine organisms appears low as the Puget Sound is not being impacted by metals originating from the Cleanup Unit.

2.5.2 Terrestrial Receptors

MTCA requires evaluation of existing or potential threats to terrestrial plants or animals exposed to hazardous substances. During the RI, conservative ecological screening levels (ESLs) for soil and forest duff were developed from MTCA and other sources. The ESLs were then compared to the 95-percent upper confidence level (UCL) calculated for arsenic, lead, cadmium, and PAHs in soils and forest duff. If the 95-percent UCL concentration exceeded the ESL, the hazardous substance is considered a chemical of ecological concern that may result in ecological risk. Based on the screening (CDM Smith 2014a), arsenic and lead remain chemicals of ecological concern across the Cleanup Unit, but cadmium does not. Multiple PAH are chemicals of ecological concern within a portion of Unit 5.

While these results indicate that the COCs at the Cleanup Unit may pose a threat to the terrestrial environment, terrestrial ecological evaluation procedures should not create an incentive to cause harm through destruction of habitat. WAC 173-340-7490(5) states: "The department may require additional measures to evaluate potential threats to terrestrial ecological receptors notwithstanding the provisions in this and the following sections, when based upon a site-specific review, the department determines that such measures are necessary to protect the environment." (Ecology 2007). The NEBA is a procedure of weighing the advantages of an active cleanup versus the impact that the cleanup might have on potentially valuable ecological receptor habitat.

In May 2014, CDM Smith completed a NEBA for the Cleanup Unit (CDM Smith 2014b). The NEBA concluded that the bluffs and much of the upland areas are eligible for the application of NEBA because these areas contain "especially valuable habitat." Therefore, a cleanup alternative involving removal of soil would result in greater environmental harm than an alternative of leaving the contaminated topsoil in place. Decision units within the Cleanup Unit that did not qualify for the NEBA included three upland areas that have been cleared in the past and are now vegetated primarily with grass, blackberry bushes, and scotch broom (Units 3c, 3e, and 5; Figure 3). Ecology concurred with the NEBA determination. Therefore, based on the NEBA, remedial alternatives developed for the Cleanup Unit additionally took into account the protection of the environment for those Units that qualify for the NEBA.

3. CLEANUP REQUIREMENTS

3.1 Cleanup Levels

Applicable cleanup levels were established during the RI/FS and are discussed below.

3.1.1 Human Health

3.1.1.1 Soil

The Final Interim Action Plan (IAP) for the Tacoma Smelter Plume (Ecology 2012) established that the MTCA Method A soil cleanup levels for unrestricted land use are applicable within the TSP. As the Cleanup Unit falls within the TSP, MTCA Method A cleanup levels are applicable. Because forest duff is an integral part of the soil matrix, Method A cleanup levels also apply to forest duff. The IAP also determined that arsenic and lead cleanups driven by TSP will also address all other hazardous substances from the smelter emissions. This is because, while other metals sometimes exceed MTCA cleanup levels, the frequency of this is much less. The Method A unrestricted land use soil cleanup levels are 20 mg/kg for arsenic and 250 mg/kg for lead.

The Method A cleanup level for PAHs is based on the toxic equivalency method with the Method A cleanup level for benzo(a)pyrene (0.1 mg/kg) being the basis for comparison. For this method, toxicity equivalency factors (TEF) are used to calculate the toxicity of individual cPAH on an equivalent basis with benzo(a)pyrene. The adjusted concentrations are then summed and compared to the Method A cleanup level for benzo(a)pyrene.

3.1.1.2 Water

There are various drinking water and marine criteria for metals in addition to Method A, including the National Toxics Rule criteria, state groundwater and drinking water standards. Under MTCA, the cleanup standards are based on the most stringent of all regulatory standards or background, whichever is greater. Since the MTCA Method A standard for arsenic is based on background for Washington State, the groundwater cleanup standard defaults to Method A, which is 5 µg/L. For cadmium, the lowest of the groundwater and marine standards is Method A, which is 5 µg/L. For lead, the lowest value is the chronic marine standard for protection of aquatic life, which is 8.1 µg/L. None of these standards were exceeded for groundwater or spring/seep water, so no remedial actions are required for groundwater or spring/seep water.

3.1.2 Terrestrial Ecological

3.1.2.1 Soil

The NEBA concluded that cleanup alternatives involving removal of soil in Units 1a, 1b, 2c, 3a, 4a, 4b, 4c, and a portion of 5 would result in greater environmental harm than an alternative of leaving the contaminated topsoil in place. Therefore, the remedial alternatives developed for the Cleanup Unit considered the protection of the environment for those Units regardless of the arsenic and lead concentrations.

3.1.2.2 Wetlands

Wetland areas that are inundated for more than six or more consecutive weeks per year are regulated under WAC 173-204 (Sediment Management Standards) and should therefore be assessed for toxicity using the Sediment User's Cleanup Manual II (SCUM II). The bioassay analyses conducted for the wetland located in Decision Unit 5 found elevated lead levels as the primary concern. The NEBA already concluded that the non-inundated areas of Decision Unit 5 are applicable for the application of NEBA because these areas contain "especially valuable habitat". For inundated wetland areas, WAC 173-204-560 establishes initial sediment cleanup levels Sediment Cleanup Objective (SCO) of 360 mg/kg for lead in freshwater. An upward adjustment can be made to the SCO of 360 mg/kg (Pb) if it can be shown that by achieving the SCO there will be a net adverse environmental impact on the aquatic environment. However, the limitation is that the upward adjustment may not exceed the Cleanup Screening Level of >1,300 mg/kg

For this reason, inundated wetland areas under 1,300 mg/kg would not be proposed for remediation because, similarly to the terrestrial habitat, it would do more harm to the habitat than good. For areas over 1,300 mg/kg, some level of remediation is required. The soil and duff samples taken as part of the RI and bioassay analysis show that only a portion of the inundated wetland area exceeds this threshold for lead, and in those areas that do exceed the threshold, the high lead levels are primarily found in the upper forest duff layer, not in the soil.

3.2 Points of Compliance

Under MTCA, (WAC 173-340-740(6)), the standard point of compliance for protection of human health from direct contact is 15 feet below ground surface (bgs). The regulation states that this represents a reasonable estimate of the depth of soil that could be excavated and distributed to the soil surface as a result of redevelopment activities. The standard point of compliance for protection of ecological receptors is 6 feet bgs.

As determined during the RI, the contaminants in the Cleanup Unit typically were within the top 24 inches, unless contaminants occur in fill. Therefore, the standard point of compliance for the Cleanup Unit is the maximum depth of contamination. However, MTCA regulations allow for a conditional point of compliance in instances where

cleanup actions involve containment of contaminants, such as use of soil capping. In these instances, the cleanup action may be determined to comply with MTCA standards provided that:

- Cleanup actions are permanent, to the extent feasible;
- Cleanup actions are protective of human health and terrestrial ecological receptors;
- Institutional controls are implemented to protect the integrity of the cleanup actions;
- Compliance monitoring and periodic reviews occur; and,
- The types, levels, and amount of hazardous substances remaining on-site and the measures that will be used to prevent migration and contact with those substances are specified in the Draft Cleanup Action Plan.

3.3 Applicable Regulatory Requirements

Cleanup actions under MTCA (WAC 173-340-710(1)) require the identification of all applicable or relevant and appropriate requirements (ARARs). These requirements are defined as:

“Applicable” requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a Cleanup Unit.

“Relevant and appropriate” requirements means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not “applicable” to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a Cleanup Unit, address problems or situations sufficiently similar to those encountered at the Cleanup Unit that their use is well suited to the particular Cleanup Unit.

The potential ARARs for the Cleanup Unit include three types: chemical-specific, location-specific, and action-specific. Potential ARARs were identified for each medium of potential concern in Table 7.

4. ALTERNATIVES CONSIDERED AND BASIS FOR REMEDY SELECTION

4.1 Alternatives Development

Five remedial cleanup alternatives were investigated and evaluated as part of the FS (Table 5). Appendix A provides detailed cost estimates for each of the proposed alternatives summarized below.

Alternative 1 - Closure of redundant trail spurs. Capping the entire network of forest footpaths per the US Forest Service guidelines. Excavating soils on the graded road/trail that exceeds 40 mg/kg and regrading the road. Excavating contaminated surface soils in all areas that do not pass the NEBA (Figure 7). All excavated soils to be disposed of off-island in a Resource Conservation and Recovery Act (RCRA) Subtitle D landfill.

- Capital Cost: \$8,422,304
- O&M Cost: \$1,012,053
- **Total Cost: \$9,434,357**

Alternative 2 - Alternative 2 is the same as Alternative 1, except that soils will be contained below grade in two separate areas (which did not pass the NEBA), one of which will be capped by a visitor parking lot to be constructed in the portion of the former trap range area that does not pass the NEBA (Figure 7).

- Capital Cost: \$5,552,168
- O&M Cost: \$1,012,053
- **Total Cost: \$6,564,221**

Alternative 3 - Closure of redundant trail spurs. Capping the entire network of forest footpaths per the US Forest Service guidelines. Conducting soil mixing for soils on the graded road/trail that exceed 20 mg/kg and regrading the road. In the portion of the former trap range area that does not pass the NEBA, the organic layer will be stripped off and disposed of at an off-island landfill and capped with gravel for use as an equestrian parking lot. Soils in the other two areas that do not pass the NEBA will remain because both of these areas are heavily vegetated with blackberry bushes and virtually impassible by humans (Figure 8).

- Capital Cost: \$2,137,495
- O&M Cost: \$187,607
- **Total Cost: \$2,325,102**

Alternative 4 – Alternative 4 is the same as Alternative 3, except that capping of the footpaths will be limited to a main thoroughfare (Figure 9).

- Capital Cost: \$1,600,844
- O&M Cost: \$149,835
- Total Cost: **\$1,750,679**

Alternative 5 – Modification of Alternative 4 including revegetation of Units 3c and 3e including limited wetland remediation in Unit 5. Graded roads will be capped with a minimum of 3 to 4 inches of compacted gravel and a 3-inch-thick layer of mineral soil (or equivalent). In Unit 5, clearing and grubbing will only be performed for an area large enough to construct a 40-to-50-stall gravel parking lot. The cleared area will be graded and a gravel parking lot and driveway will be constructed by placing a minimum of a 6-inch-thick layer of compacted gravel with a perimeter fence (Figure 10).

- Capital Cost: \$4,324,182
- O&M Cost: \$1,244,767
- Total Cost: **\$5,568,949**

4.2 Evaluation of Alternatives

The five remedial cleanup alternatives were evaluated according to the process described in WAC 173-340-360 in order to determine if the alternatives met the minimum requirements for cleanup actions. The results of the evaluation are provided below.

4.2.1 Threshold Requirements

MTCA's threshold requirements for cleanup actions are described in WAC 173-340-360, which states that all cleanup actions shall:

- Protect human health and the environment.
- Comply with cleanup standards.
- Comply with applicable state and federal laws.
- Provide for compliance monitoring.
- Use permanent solutions to the maximum extent practical.
- Provide for a reasonable restoration time frame.
- Consider public concerns.

4.2.1.1 Protection of Human Health and the Environment

Overall protectiveness of human health and the environment includes the degree to which existing risks are reduced, time required to reduce risk at the site and attain

cleanup standards, and improvement of the overall environmental quality. Each of the remedial alternatives was developed to strike a balance between protection of human health and the environment. Currently, there are no viable technologies that will remove the metals that exist in the surface soil and duff layer (which is the most biologically active zone in the soil profile) without causing irreparable harm to the existing forest biological system. However, the NEBA demonstrated that, in spite of the high concentrations of metals in the surface soil and duff layer, the site ecology is functioning well with no apparent adverse effects. The following provides an evaluation of the alternatives by the various Cleanup Unit features addressed:

- *Forest Footpaths* – Alternatives 4 and 5 differ from Alternatives 1 through 3 (which are the same) in that a main thoroughfare is capped as opposed to the entire trail system. Having a main thoroughfare tends to encourage the majority of trail users to utilize a specific trail system. The main thoroughfare will be particularly appealing to users with young children (the most sensitive population) for its ease of use. People who frequent a site routinely (e.g., daily jogs or dog walks) tend to be habitual and will follow the same route – the main thoroughfare makes it convenient. With one main thoroughfare, the Parks personnel can focus their maintenance efforts more effectively. Between a capped main thoroughfare for the forest footpath system and the remediation of the graded roads, the additional protectiveness afforded by capping all the forest footpaths versus a main thoroughfare is minimal.
- *Graded Roads* – All of the alternatives will ultimately provide the same level of protection. The only differences are in how the cleanup levels are achieved. It is likely the relatively minor and sporadic cleanup level exceedances found on the graded roads are mainly caused by contaminated soil being conveyed onto the roads from adjacent areas. Since these cleanup level exceedances are sporadic and fairly minor, this does not appear to be occurring on a significant scale. For Alternatives 1 through 4, continued maintenance of these roads through regrading should keep arsenic concentrations below the cleanup level. For Alternative 5, protectiveness is maintained by long-term maintenance of the gravel cap.
- *Former Range Area* – Alternatives 1 through 4 ultimately provide the same level of protection by ultimately achieving Method A cleanup levels at the ground surface where there is a potential for exposure. Alternative 5 provides a similar level of protection by providing a physical barrier (the perimeter fence) between the gravel capped parking lot and the remainder of the former skeet range area.
- *Units 3c and 3e* – While Alternatives 1 and 2 provide for the removal of contaminants and provide for off-site disposal or on-site containment, these units are already covered by blackberry bushes, which provide an effective deterrent for human encroachment. People may pick the blackberries (which were determined not to uptake arsenic and lead to any significant degree), but they do

so from the edges of the graded roads. The brambles are much too dense for people to forage into. In addition, the institutional controls imposed on the Cleanup Unit would ensure that these areas are not disturbed in the future for purposes other than long-term restoration of natural habitat (Alternative 5), which could eventually transform these areas into more productive wildlife habitat and inclusion under the NEBA. Finally, these areas do not contain features that would encourage off-trail excursion, even in the absence of blackberry bushes. For this reason, removal of contaminants in these areas is not, in all practicality, any more protective than simply leaving it as is (Alternatives 3 and 4) or revegetating the units with native plants (Alternative 5). Alternative 2 is the only one that provides for on-site containment of excavated soil. The plan to inter this soil below grade virtually eliminates any potential human health and environmental exposure. For the reasons described above, none of the alternatives afford a strongly greater or lesser overall protection of human health and the environment.

4.2.1.2 Compliance with Cleanup Standards

There is only one type of remedial action that would result in full compliance with cleanup levels across the Cleanup Unit, and that would be to remove all vegetation and scrape off the forest duff and surface soil layer and dispose of it. Obviously, this is not only impractical, it is also inconsistent with the NEBA. Therefore, the primary objective of the remedial alternatives is to reduce park users' exposures to metals to acceptable risk levels.

Each of the alternatives includes actions that will reduce the potential for human exposures in areas that are frequented by park users (i.e., the trail system of footpaths, graded roads, the former trap range area) either by capping or soil mixing (with or without some soil removal). These methods are all consistent with the TSP Model Remedy, where proposed, soil mixing is used only minimally, in that it applies only to small sections of the graded roads where it is likely that the layer of contaminated soil is very thin, and in the former trap range area to further reduce contaminant concentrations following removal of the bulk of contaminated material, which is the organic zone.

Alternatives 1 and 2 result in the greatest amount of land that will meet Method A cleanup levels because these two remedial alternatives include cleanup of all areas that do not pass the NEBA. However, for Units 3c and 3e, practically speaking, there is no significant reduction in potential human exposure by the removal of surface soils in these areas because of the thick blackberry brambles cover, which effectively discourages human trespass, particularly when there is nothing in these blackberry-covered areas that would cause people to wander off trail.

4.2.1.3 Compliance with State and Federal Laws

All of the laws discussed in Section 3.4 that need to be satisfied during implementation (e.g., grading permits, dust control, stormwater discharge Best Management Practices [BMPs] during construction, soil profiling before off-site disposal) can and will be satisfied for all of the remedial alternatives.

4.2.1.4 Compliance Monitoring

Compliance monitoring must be performed such that protection of human health and the environment can be confirmed during implementation of the remedial alternative and that cleanup levels or remediation levels have been attained at completion of the cleanup action, as may be applicable, and that the engineering design specifications are being met. All of the alternatives will include several forms of compliance monitoring appropriate to the individual technologies being applied. Confirmation sampling will be conducted as a part of any of the remedial actions that involve excavation and/or soil mixing to ensure that cleanup levels are being met. Health and safety compliance monitoring includes monitoring during excavation activities to ensure that any necessary actions to control discharges of dust are taken before it poses a potential health/environmental issue. Finally, compliance monitoring will be conducted to ensure that the constructed portions of the remedial alternatives will meet design specifications (e.g., gravel caps).

A compliance monitoring plan will govern activities necessary to ensure continued environmental performance after the cleanup. The plan will address sampling requirements and appropriate intervals necessary to maintain compliance with cleanup standards. For example, on a regular basis, organics will be blown off the trail cap regularly and its condition inspected. Monitoring for and removal of any new-hoc social trails will continue. All necessary repairs to the trail cap will be made promptly.

4.2.1.5 Permanence

None of the remedial alternatives can offer a full cleanup, and contaminants will remain throughout much of the upland areas and bluffs for every alternative. Soil excavation and disposal, while it is the only permanent method of cleaning up metals in any given area of the Cleanup Unit, does not in any way reduce toxicity, mobility, or volume of the hazardous substance. It simply moves the contaminant from one place to another, but to an area where the potential for human health and ecological exposure is no longer a consideration. Even so, there is no guarantee that, once any individual area has been cleaned up to Method A cleanup levels, whether by capping or excavation, it will remain completely free of contaminants. Natural processes, including the shedding of foliage (i.e., Douglas fir needles), burrowing and migratory animals, human traffic, and windblown dust will tend to move top soils. Some soils containing high concentrations of metals, are likely to end up in areas that have been previously excavated and capped.

4.2.1.6 Restoration Time Frame

Alternative 4 will require the least amount of time to implement, with Alternatives 3, 5, 2, and 1 requiring successively greater amounts of time to implement. The construction phase of Alternative 1 is estimated to require 10 months to complete due to the inefficiency of trucking soil off island for disposal. Alternatives 1, 2, and 5 will require many years in order to re-establish vegetation in Units 3c and 3e.

4.2.1.7 Consideration of Public Concerns

This criterion includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site. While the potential public concerns are difficult to predict, it is known that the public has a strong interest in maintaining this property as a natural park. The public have been using the Cleanup Unit as a park for decades, well before King County purchased the property, and have been educated regarding the presence of arsenic and lead in surface soils as a result of the TSP. It was due to the vehement objections of the public over the proposed mine expansion that King County ultimately decided to purchase the property. Based on this, it is evident that: a) the public is not overly concerned about possible adverse health impacts, and b) would object vehemently about any actions that would interrupt their continued enjoyment of the property.

4.3 Disproportionate Cost Analysis

MTCA specifies that preference be given to cleanup actions that use permanent solutions to the maximum extent practicable. Identifying an alternative that is permanent to the maximum extent practicable requires weighing the costs and benefits of each, which under MTCA is known as a disproportionate cost analysis (DCA). According to MTCA, "costs are disproportionate to benefits if the incremental costs of the alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by the alternative over that of the other lower cost alternative" (WAC 173-340-360(3)(e)(i)). The following factors are used in the disproportionate cost analysis:

- Protectiveness.
- Permanence.
- Long-term effectiveness.
- Management of short-term risks.
- Technical and administrative implementability.
- Consideration of public concerns.
- Cost.

Table 6 lists the evaluation criteria described above and provides a numeric ranking from 1 to 6 for each criterion for each alternative. Scores range from 1 to 6. In general, a score of 1 represents poor performance and a score of 6 represents optimal performance for that metric. The alternatives do not necessarily cover the full range of numbers. The scoring of the benefit of each metric for each remedial alternative is somewhat subjective and based on best professional judgment. Each of the criteria were also weighted using percentages between 5 percent and 30 percent to emphasize the core purpose of protecting human health and the environment. The justification provided for each of the weighting values are as follows:

- “Protectiveness” represents the ultimate objective of implementing the remedial alternative, so it was weighted relatively high at 25 percent.
- “Permanence” was weighted as 20 percent. MTCA focuses on the degree that the toxicity, mobility, or volume of hazardous substances is reduced and considers the extent to which contamination is removed, rather than leaving it in place.
- “Effectiveness over the long term” addresses how well the remedy reduces risk; for example, whether the contamination is removed or left in place to be managed over the long term and whether controls are adequate to maintain protection against exposures to contamination left in place. Because of its importance, this criterion was weighted at 30 percent.
- “Management of short-term risks” considers risks incurred during the implementation of the remedial action. For most sites, this is a finite period. However, for the Cleanup Unit short-term risks are, in reality, in perpetuity due to the ongoing maintenance of the trail caps. A weighting factor of 15 percent was assigned for this criterion.
- “Technical and administrative implementability” was assigned a weighting factor of 5 percent to reflect the fact that implementability is less associated with environmental concerns than with the relative difficulty and uncertainty of implementing the project.
- “Consideration of public concerns” was assigned a weighting factor of 5 percent to reflect that most public concerns are embodied by the other criteria.

Cost was not weighted, but was used in the DCA to evaluate the benefit of each alternative relative to its cost.

Table 6, presents weighted benefit scores for the five alternatives ranging from 3.4 (Alternative 4) to 4.3 (Alternative 1). Alternatives 2 and 5 received the same score of 4.1. In accordance with the MTCA DCA procedure, the weighted benefit scores were used to rank the alternatives from most permanent (Alternative 1) to least permanent (Alternative 4). As most permanent, Alternative 1 was the baseline against which the other alternatives were compared. Alternatives 3 and 4 are the least permanent alternatives, do not provide a similar benefit as the other alternatives, and were not

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considered further in the DCA. Alternative 2 scored the same as Alternative 5 but its cost is much higher and it was eliminated from further consideration under the DCA. A benefit versus cost comparison for Alternatives 1 and 5 and selection of the preferred alternative is provided below.

Alternative 1 received a slightly higher score than Alternative 5 in the evaluation of benefits shown in Table 6. However, protection of human health and reduction in health risks under each alternative are essentially the same. The much higher costs for Alternative 1 (\$9,434,357) as compared to Alternative 5 (\$5,568,949) are disproportionate to the marginal, if any, increase in benefit. Therefore, Alternative 5 was selected as the preferred alternative.

5. CLEANUP ACTION

5.1 Proposed Cleanup Action

The proposed cleanup action (Alternative 5) involves limited soil and vegetation removal, capping contamination that remains with compost or gravel, and revegetation to limit access.

Limited soil removal will occur in Units 3c and 3e, along with the clearing of invasive plants. The area will then be covered with 3 inches of a compost cap, and revegetated with native plants in phases every 2 to 3 years. The density of the mature native plantings will provide a physical barrier that will discourage foot traffic, and also provide especially valuable habitat through these units. The compost layer will provide a physical barrier that will reduce the potential for direct contact with underlying soils.

The work will include removal of non-historic obstructions including a chain link fence along SW 260th Street. Other structures, such as the old mining apparatus, may be completely or partially removed if it is deemed necessary for safety reasons. Any removal of structures will only be done after an appropriate health and safety plan is developed and after required data is gathered for historical documentation of the structure.

For graded roads and existing trails, instead of using soil mixing to reduce concentrations, these areas will be capped with a minimum of 3 to 4 inches of compacted gravel. A 3-inch-thick layer of mineral soil (or equivalent) will be placed on the gravel to protect a horse's hooves and a dog's feet. Temporary erosion control methods may be added over the soil, on an as needed basis, until it is compact enough to be erosion resistant.

At King County's request, the proposed cleanup involves capping all the existing maintained trails and maintenance access roads for park-use related benefits:

- It encourages trail users to utilize a specific trail system.
- It is appealing to users with young children (the most sensitive population) for its ease of use.
- It may be observed from the above that Alternative 5 provided a relatively high benefit to cost ratio as compared to other alternatives.

Institutional controls in the form of signage will be placed at trail junctions and main trail access points informing park users to stay on the maintained capped trails due to high levels of arsenic and lead in uncapped forest areas.

Benches, picnic tables, picnic shelters, signage, and kiosks will be located adjacent to the capped trails at several locations. Historical markers or signage may be added in this

area to document the farm. These amenities will be located on pads constructed of 3 to 4 inches of the same compacted gravel used for the trail cap.

In Unit 5, clearing and grubbing will only be performed for an area large enough to construct a 40-to-50-stall gravel parking lot which will accommodate both cars and equestrian trailers. Vegetation, duff, and organic topsoil removed during this operation will be disposed of at an off-site landfill. The cleared area will be graded and a gravel parking lot and driveway will be constructed by placing a cap that will be a minimum of a 6-inch-thick layer of compacted gravel.

A barrier fence will be placed around the perimeter of the gravel parking lot and driveway to discourage visitors from walking through the former skeet range area. Additional planting will be done to create a vegetated buffer for stormwater management. Some additional trails may be constructed to connect the parking lot to the existing trail network. New trails would be constructed using the same treatment described above for the capped trails. Existing trails to be maintained in Unit 5 will also receive the same cap treatment.

Additional testing will be done in the inundated areas of the Area 5 wetland to determine where lead levels exceed the Cleanup Screening Level of >1,300 mg/kg. Remediation would be done in these areas to bring lead levels below 1,300 mg/kg. Based on existing data, this remediation can likely be achieved by removing the duff layer and surface soil in select locations only. Any remediation performed would be the minimum necessary to meet cleanup requirements while protecting the existing habitat. This remediation would be coordinated with the phased revegetation of Units 3c and 3e.

Reclamation activities specific to the gravel mining may be required by King County Department of Permitting and Environmental Review; however, because such activities would be required in areas actively worked as part of the gravel mining operation, it is not expected that contamination levels in these areas would exceed cleanup standards. The old mining apparatus may be completely or partially removed for safety reasons, but that work would also be outside the contaminated area. Additional shoreline or planting restoration activities also may occur on the property, but these activities are also not expected to occur in areas where contamination levels would exceed cleanup standards.

5.2 Institutional Controls Plans and Environmental Covenant

The County anticipates that future work for the Cleanup Unit includes providing the following submittals:

- An Institutional Control Plan to help ensure protection of human health and the environment.

- An environmental covenant to limit activities and land use of the site.

Each of these elements is described in further detail below.

WAC 173-340-360(2)(e) requires cleanup actions to use institutional controls to limit or prohibit activities that may interfere with the integrity of a cleanup action or that may result in exposure of hazardous substances at a Cleanup Unit. These cleanup actions are required to ensure the continued protection of human health and the environment and the integrity of the cleanup. Institutional controls may include physical measures (such as fences), restrictions on the use of the property, maintenance requirements for engineering controls (e.g., maintenance of caps), education programs, and financial assurances. These measures, along with future planning and development, will be described in an Institutional Controls Plan developed by the County.

The following institutional controls are proposed for the Cleanup Unit:

- Institutional Control Measures:
 - **Physical Measures:** Dense vegetation will be planted and maintained to discourage access to off-trail areas in Units 3c and 3e. A barrier fence will be installed to discourage access to Unit 5 from the gravel parking lot.
 - **Educational Measures:** Warning signs will be posted and maintained to educate users to potential exposure risk.
 - **Land Use Restrictions:** A restrictive covenant will be executed and recorded with the register of deeds for King County. At a minimum, the restrictive covenant will describe procedures to be followed during any future Cleanup Unit excavation activities that could result in worker exposure or the transfer of contaminated soils to the ground surface. Such procedures shall include worker health and safety training requirements and contaminated soil management procedures. Future Cleanup Units use shall be restricted to that of an outdoor recreation area. The restrictive covenant will also require that Ecology be notified of the County's intent to convey any interest in the Cleanup Unit or to change land use from an outdoor recreational park to some other use. Final requirements for the restrictive covenant (or equivalent) will be negotiated by Ecology and the County.

5.3 Schedule

The Cleanup Acton Plan will be implemented in phases as follows:

- Phase 1A: Trail/maintaince road capping throughout site.
- Phase 1B: Capping to create a parking area over the former skeet range area in Unit 5. Clearing 5 more acres of invasive vegetation in Area 3C.
- Phase 2: Revegetation of 5 more acres of Area 3C and wetland remediation in Unit 5.

- Phase 3: Revegetation of 4 more acres of Area 3C.
- Phase 4: Revegetation of Area 3E.

Implementation in phases is necessary because it is not practicable to revegetate more than a few acres at a time. Performing revegetation of all acres simultaneously could potentially cause erosion and stormwater runoff impacts. In addition, active maintenance of the revegetated areas is necessary for the first few years until plants are established. Trying to maintain more than a few acres at a time potentially reduces successful establishment of the plants. Construction/implementation of Phase 1 is estimated to begin Q3 of 2019. Phase 4 would be completed in 2028. A detailed project schedule is provided in Table 8.

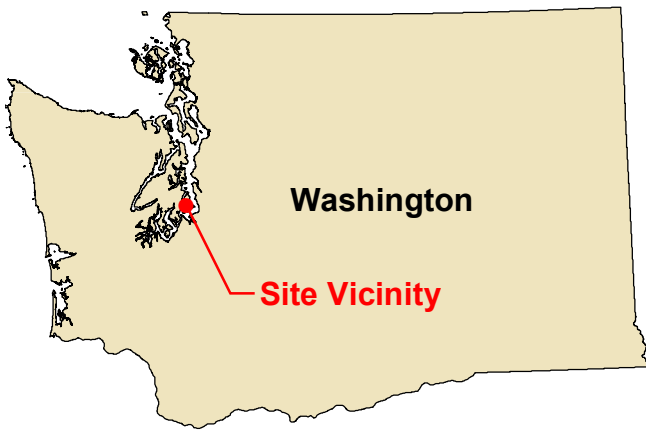
5.4 Five-Year Review

Due to the implementation of land use restrictions as part of the CAP, it is anticipated that the Cleanup Unit will be entered in to Ecology's Environmental Covenant registry; this registry consists of Cleanup Units with land use restrictions that are subject to review by Ecology every 5 years. The purpose of the review here would be to verify the effectiveness of soil containment and land use restrictions. Cleanup Units remain on the registry as long as the land use restrictions are required to protect human health and the environment.

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Figures



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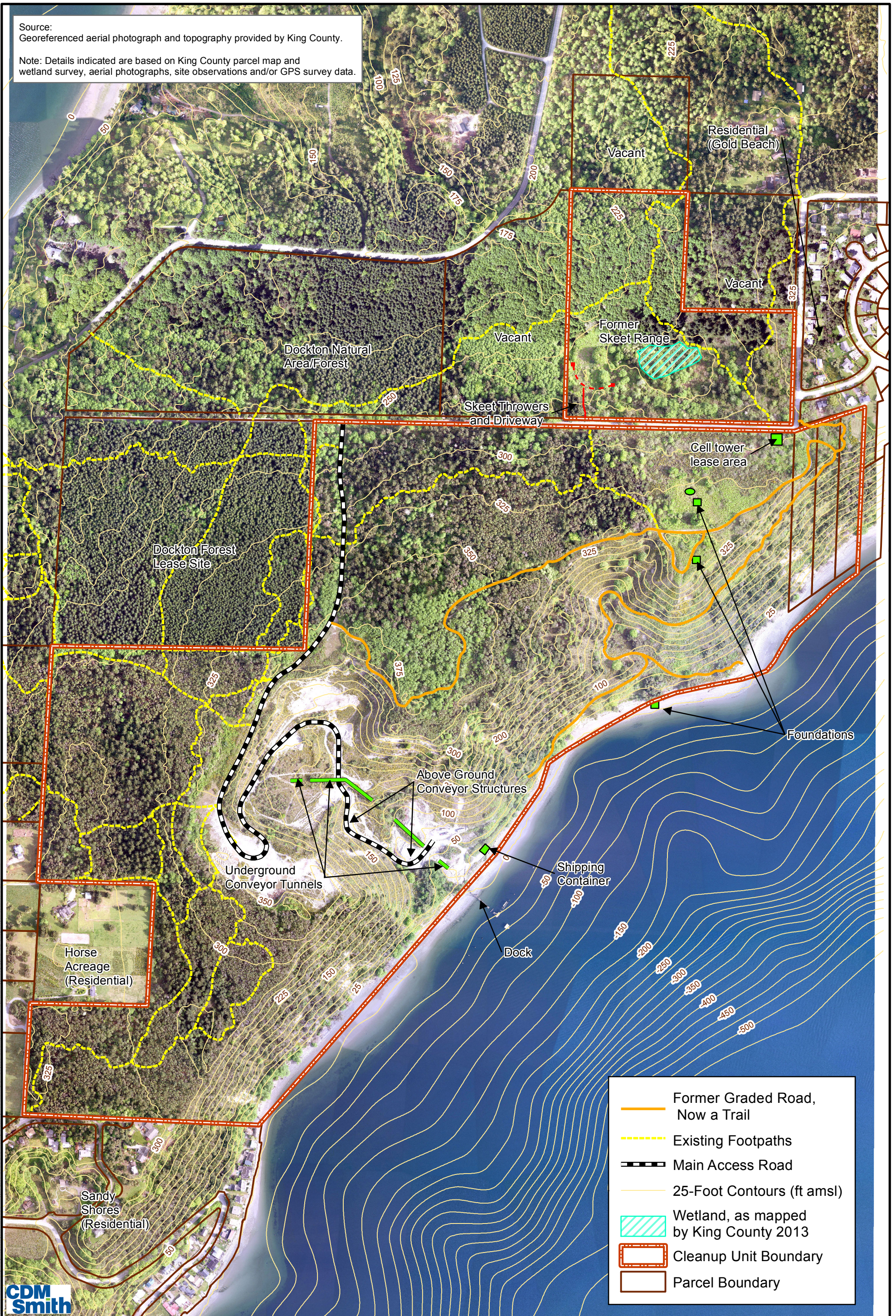
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FIGURE 1
VICINITY AND
LOCATION MAP
 Maury Island Open
 Space Property DCAP

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Source:
Georeferenced aerial photograph and topography provided by King County.

Note: Details indicated are based on King County parcel map and wetland survey, aerial photographs, site observations and/or GPS survey data.



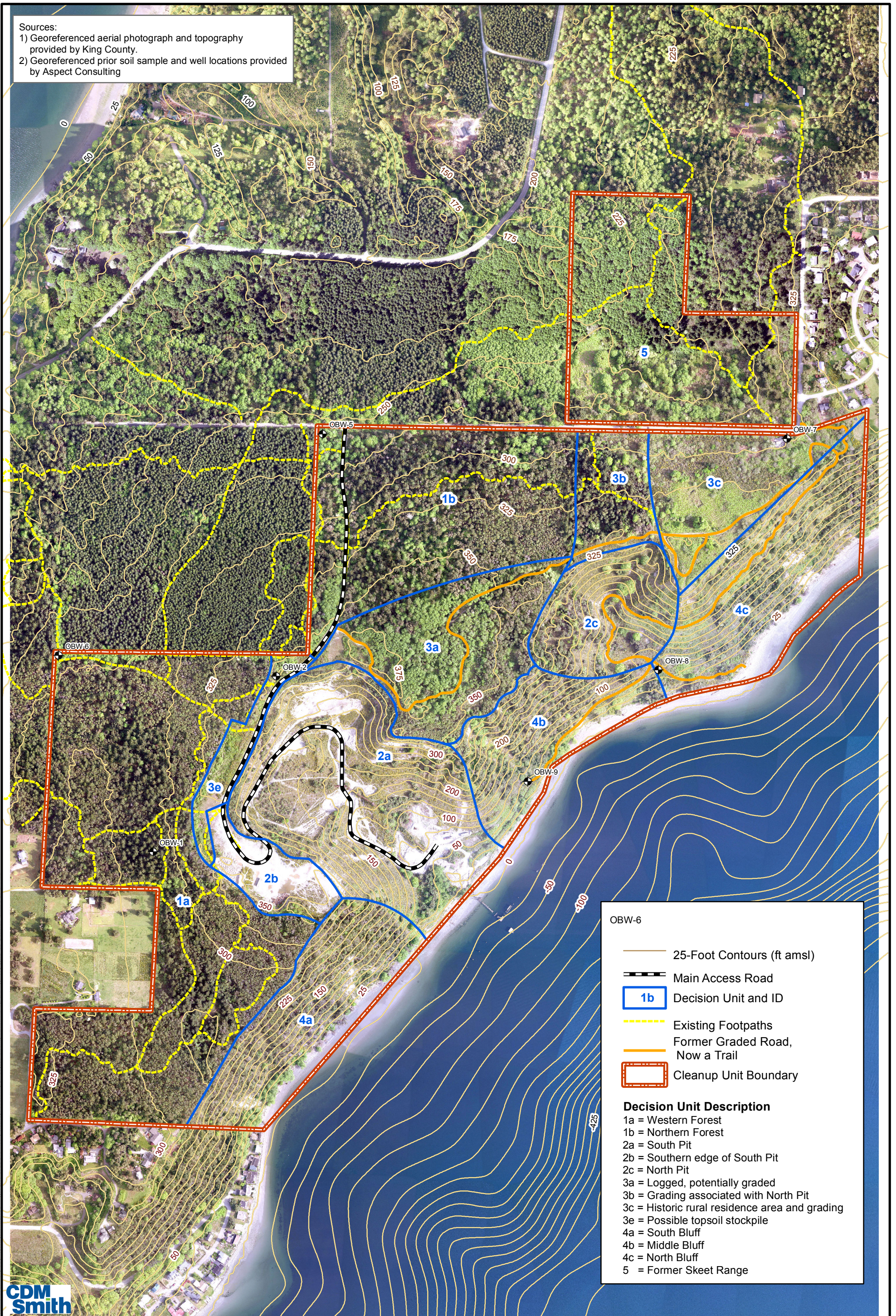
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0 250 500 1,000 Feet

FIGURE 2
CLEANUP UNIT AND VICINITY FEATURES
Maury Island Open Space Property DCAP

Sources:
 1) Georeferenced aerial photograph and topography provided by King County.
 2) Georeferenced prior soil sample and well locations provided by Aspect Consulting



OBW-6

- 25-Foot Contours (ft amsl)
- Main Access Road
- Decision Unit and ID
- Existing Footpaths
- Former Graded Road, Now a Trail
- Cleanup Unit Boundary

Decision Unit Description

- 1a = Western Forest
- 1b = Northern Forest
- 2a = South Pit
- 2b = Southern edge of South Pit
- 2c = North Pit
- 3a = Logged, potentially graded
- 3b = Grading associated with North Pit
- 3c = Historic rural residence area and grading
- 3e = Possible topsoil stockpile
- 4a = South Bluff
- 4b = Middle Bluff
- 4c = North Bluff
- 5 = Former Skeet Range

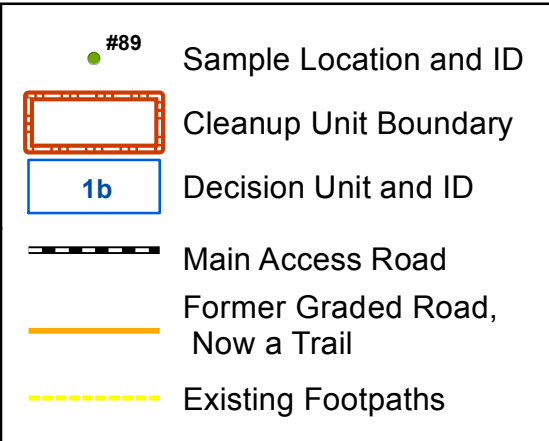
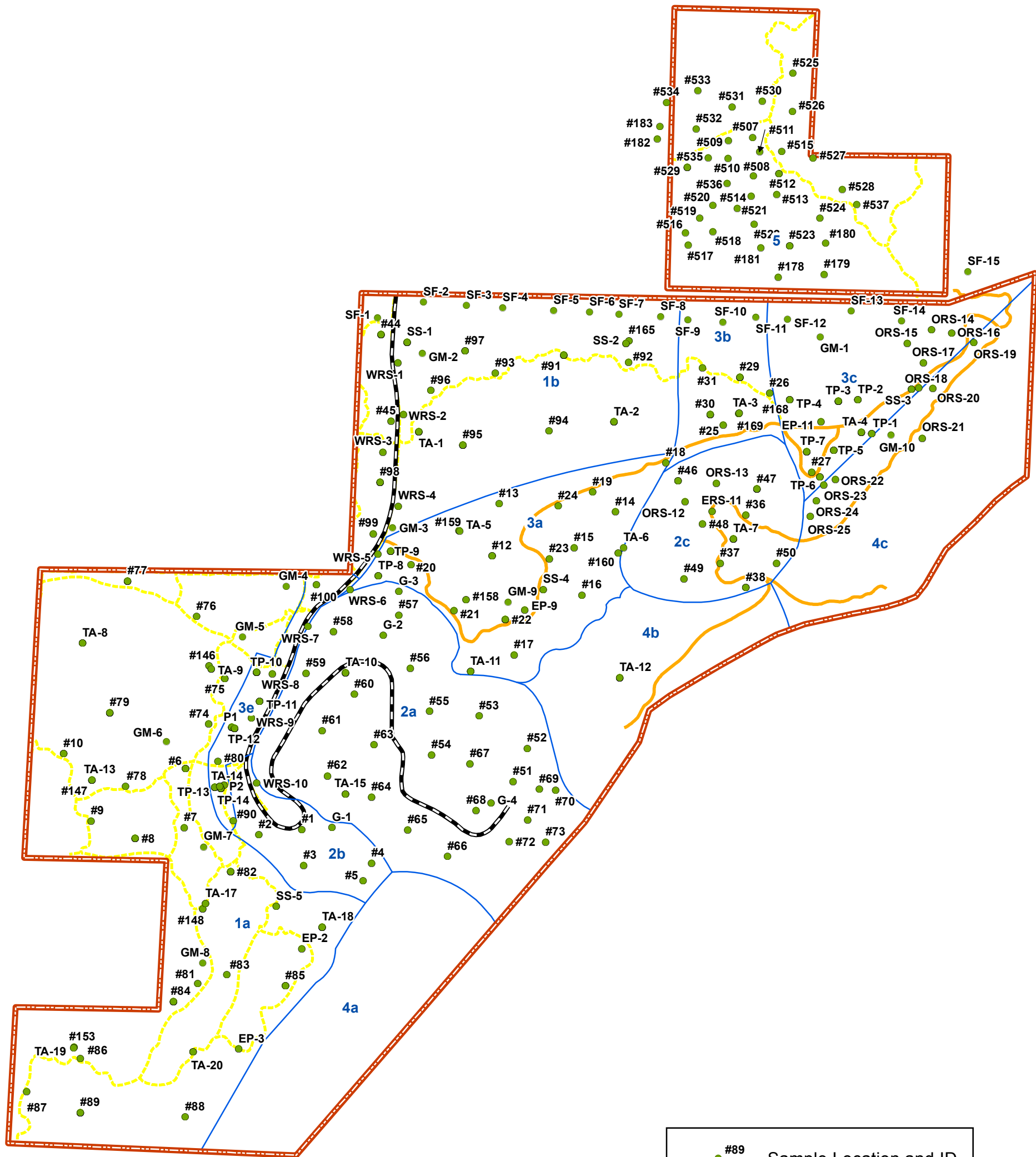


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FIGURE 3
DECISION UNITS
AND MONITORING
WELL LOCATIONS
 Maury Island Open
 Space Property DCAP



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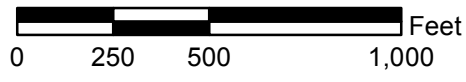
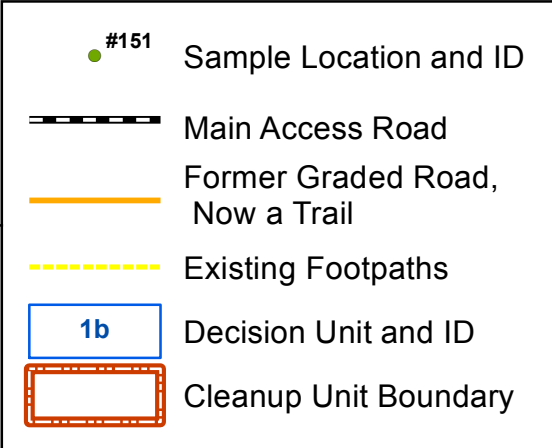
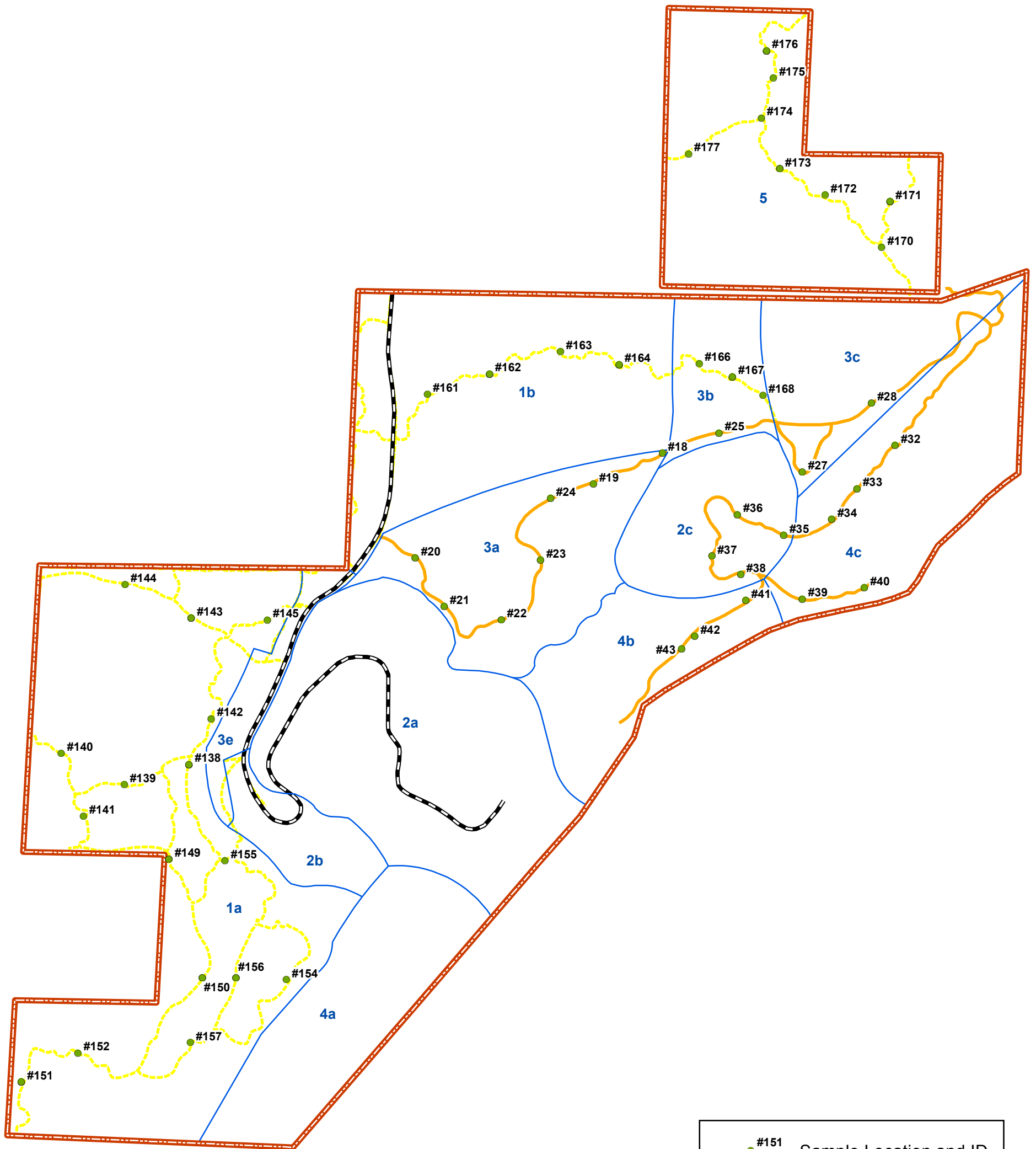


FIGURE 4
PROPERTY-WIDE
SOIL SAMPLE LOCATIONS
 Maury Island Open
 Space Property DCAP

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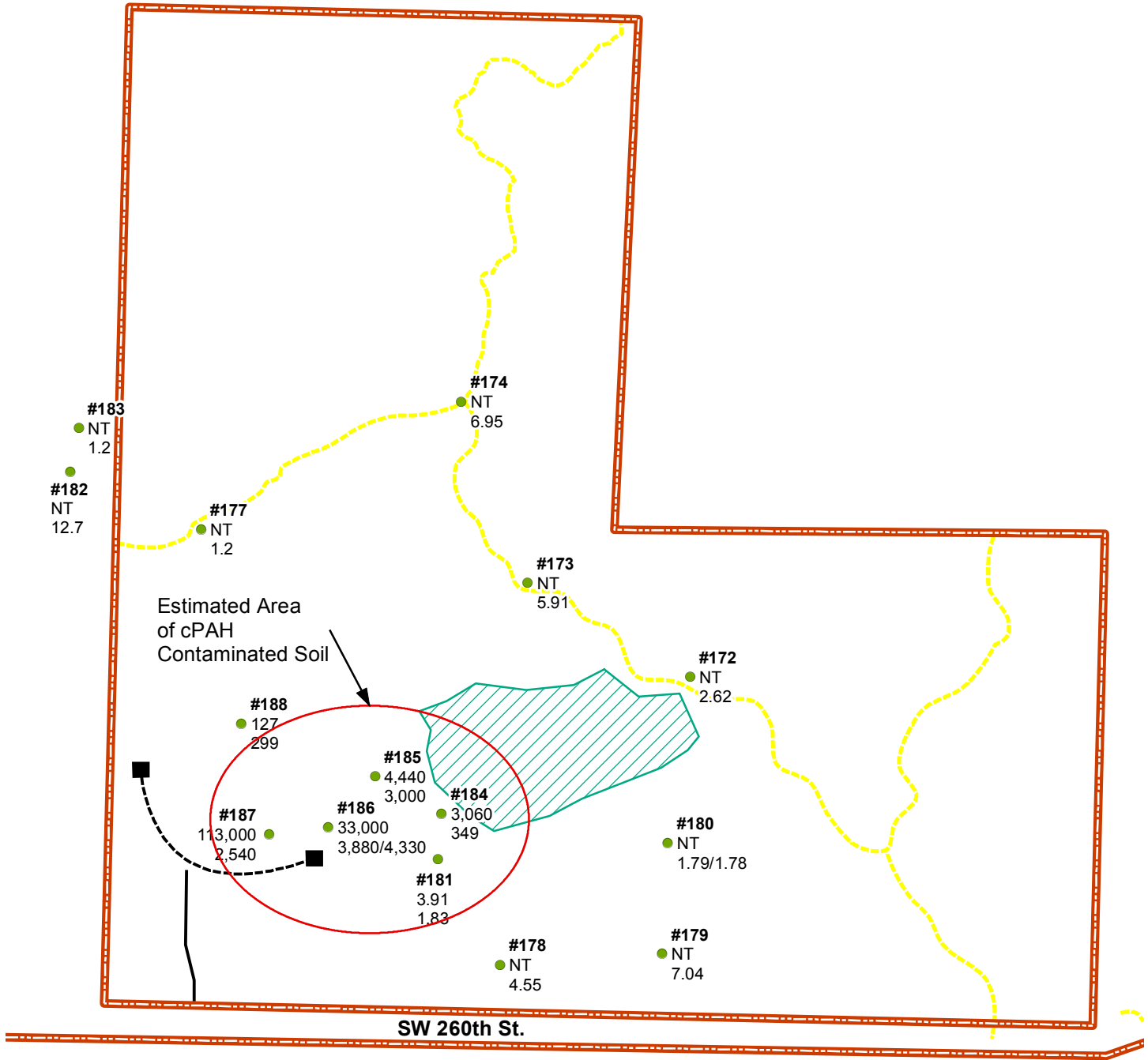
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0 250 500 1,000 Feet

FIGURE 5
SAMPLE LOCATIONS
 ON TRAIL AND ROADS
 Maury Island Open
 Space Property DCAP

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Sample Key:

- #186 Sample ID
- 33,000 cPAH TEQ concentration in forest duff
- 3,880 cPAH TEQ concentration in soil at 0-2" depth

Notes:

- 1) Data presented below sample ID number is in descending order of depth. Only sampled depths shown unless a preceding depth was not sampled; then NT (Not Tested) was used as a place holder.
- 2) Concentration in micrograms per kilogram adjusted for dry weight basis and TEQ.
- 3) Concentrations may differ slightly from the summary tables due to rounding.

/ # - Results of duplicate analyses
 TEQ - Toxic equivalency
 cPAH - Carcinogenic polycyclic aromatic hydrocarbons

#186 Sample Location and ID

Existing Footpaths

Cleanup Unit Boundary

Wetland, as mapped by King County 2013



Parametrix

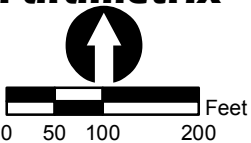
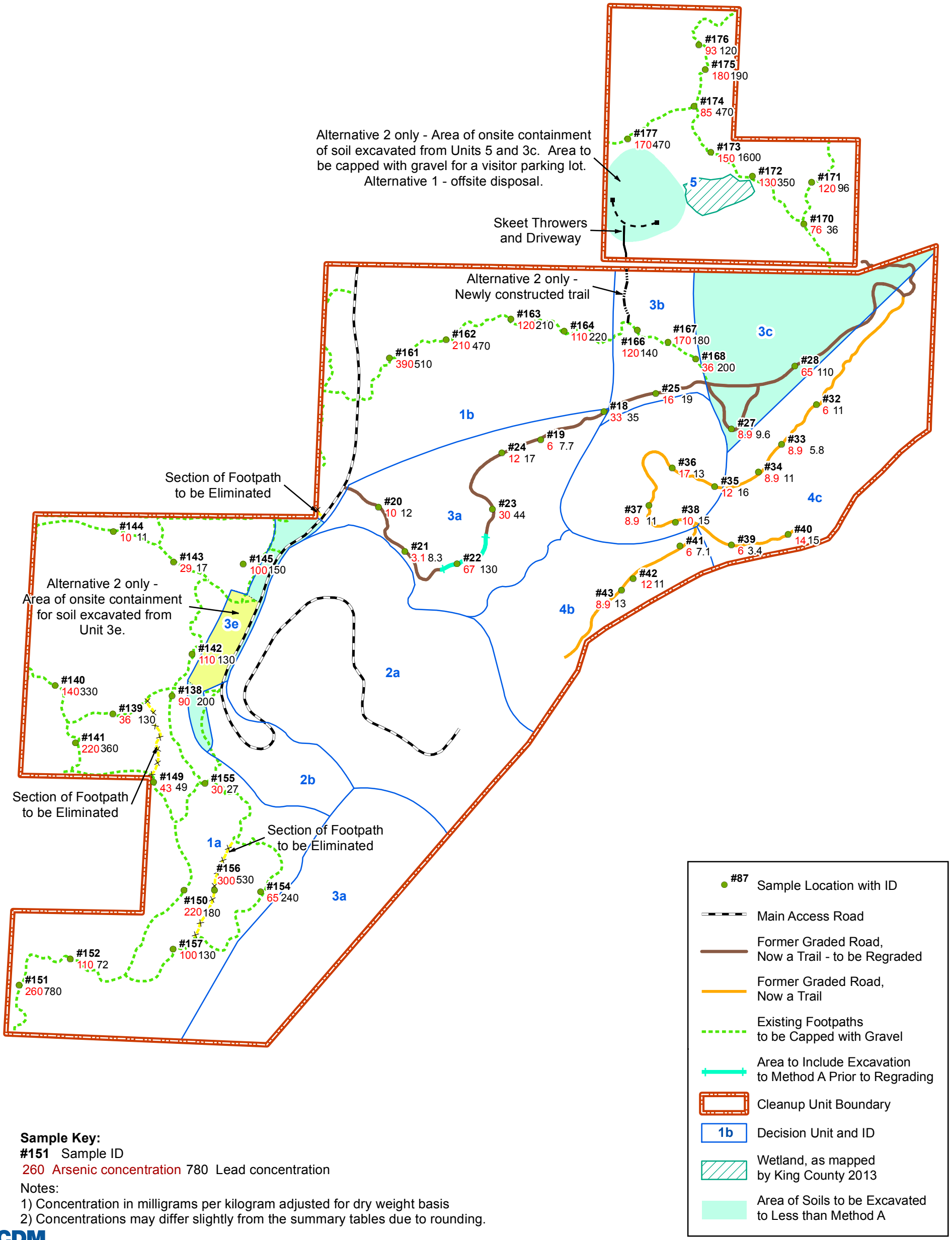
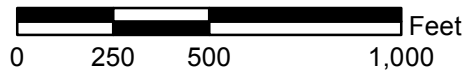


FIGURE 6
CPAH IN FOREST DUFF AND SOIL
 Maury Island Open Space Property DCAP

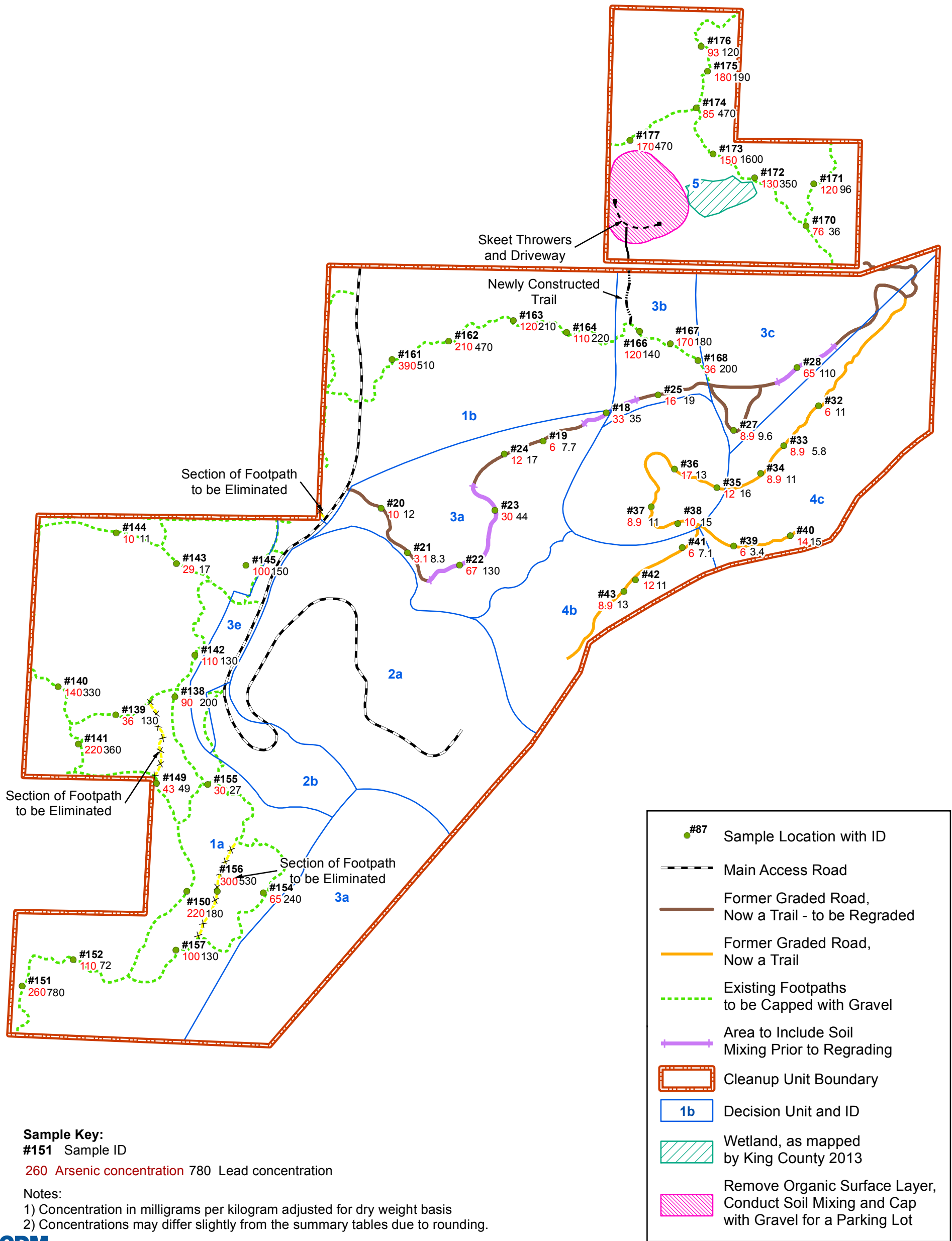
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**FIGURE 7
 REMEDIAL
 ALTERNATIVES 1 AND 2**
 Maury Island Open
 Space Property DCAP



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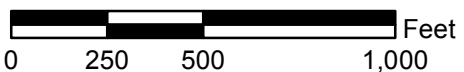
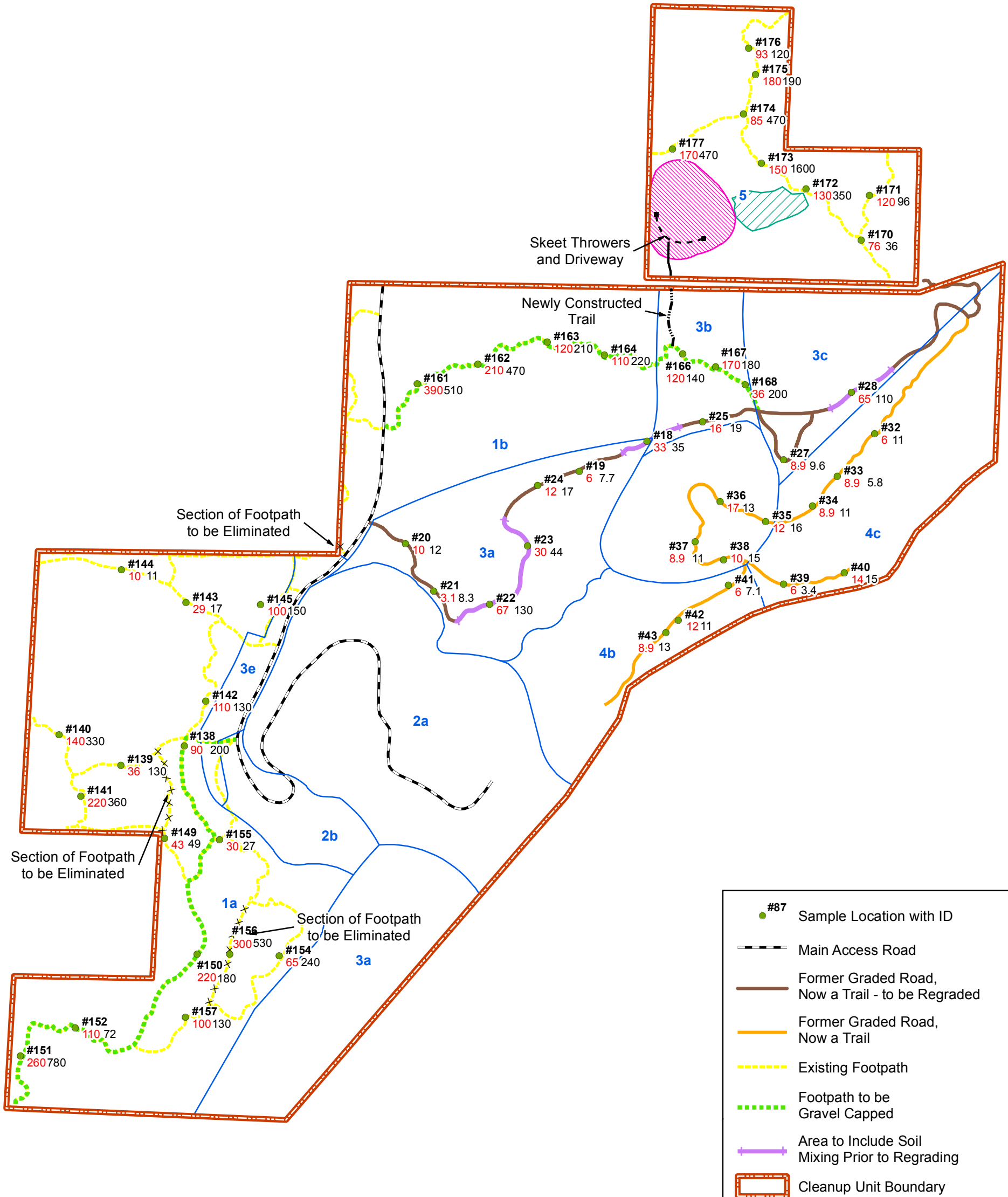


FIGURE 8
REMEDIAL ALTERNATIVE 3
 Maury Island Open Space Property DCAP



Sample Key:
 #151 Sample ID
 260 Arsenic concentration 780 Lead concentration

Notes:
 1) Concentration in milligrams per kilogram adjusted for dry weight basis
 2) Concentrations may differ slightly from the summary tables due to rounding.

	#87 Sample Location with ID
	Main Access Road
	Former Graded Road, Now a Trail - to be Regraded
	Former Graded Road, Now a Trail
	Existing Footpath
	Footpath to be Gravel Capped
	Area to Include Soil Mixing Prior to Regrading
	Cleanup Unit Boundary
	1b Decision Unit and ID
	Wetland, as mapped by King County 2013
	Remove Organic Surface Layer, Conduct Soil Mixing and Cap with Gravel for a Parking Lot



Parametrix

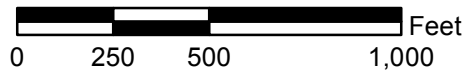
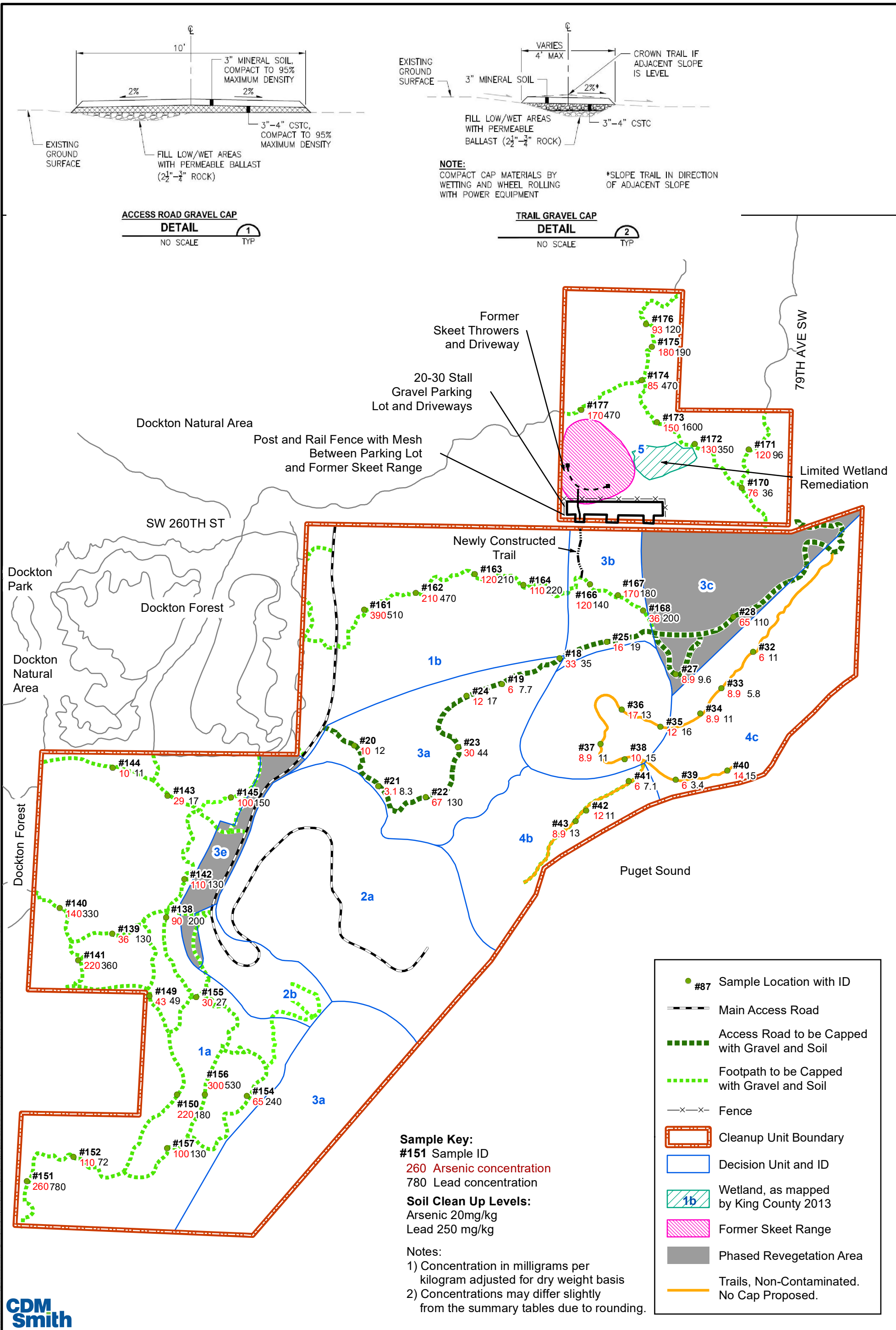


FIGURE 9
REMEDIAL ALTERNATIVE 4
 Maury Island Open Space Property DCAP



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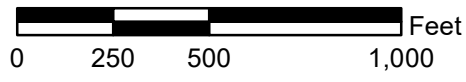


FIGURE 10
REMEDIAL ALTERNATIVE 5
 Maury Island Open Space Property DCAP

Tables

Table 1. Summary Statistics for Arsenic in Forest Duff and Soil

	Unit and Media (Forest Duff or Soil at Specified Depth)												
	1a				1b				2a/2b	Unit 2c/4b/4c			
	Forest Duff	0-2"	9"	18"	Forest Duff	0-2"	9"	18"	0-2"	0-2"	9"	18"	
Count (n)	20	32	19	16	10	30	9	9	35	21	5	5	
Count (nd)	0	0	0	0	0	0	1	2	2	0	0	0	
Min	10	11	5.8	4.5	13	19	<0.8	<0.8	<0.8	1.8	6.2	5.7	
Max	170	477	119	19	163	379	48	43	19	148	111	29	
Mean	84	164	34	8	73	105	26	11	5.9	37	43	14	
Median	93	151	19	8	65	88	22	7	6.0	18	19	13	
Standard Dev	50	95	34	4	45	85	15	1β	3.6	44	45	10	
UCL95	112	203	53	10	111	142	40	23	7.4	61	114	29	

	Unit and Media (Forest Duff or Soil at Specified Depth)															
	3a				3b			3c				3e	5			
	Forest Duff	0-2"	9"	18"	Forest Duff	0-2"	9&18"	Forest Duff	0-2"	9"	18"	24"	All Depths	Forest Duff	0-2"	
Count (n)	13	22	9	5	5	9	6	5	20	10	9	4	40	31	37	
Count (nd)	0	0	1	1	0	0	0	0	1	1	1	1	1	0	0	
Min	9	1.9	<0.8	<0.8	23	53	4.5	70	<0.8	<0.8	<0.8	<0.8	<0.8	11	12	
Max	154	280	75	22	82	190	19	148	199	19	10	4.5	138	310	200	
Mean	40	63	22	9.9	43	123	9.2	97	70	8.3	5.1	2.7	36	123	87	
Median	26	57	8.7	4.5	34	111	8.0	82	69	6.0	4.6	2.8	29	110	90	
Standard Dev	41	58	27	9.6	24	54	5.1	31	55	5.7	2.7	1.5	30	75	52	
UCL95	69	92	47	25	80	173	16	146	100	13	7.6	5.9	47	155	107	

	Location/Unit and Media (Forest Duff or Soil at Specified Depth)						
	Trails					Roads	Units 1a,1b,3a, 3b, 5
	All Trail	1a	1b/3b	5	9" (all)		Property-Wide
	0-2"	0-2"	0-2"	0-2"	9"	0-2"	Forest Duff and 0-2"
Count (n)	31	16	7	8	12	22	209
Count (nd)	0	0	0	0	0	0	0
Min	10	10	36	76	2.8	3.1	1.9
Max	394	297	394	182	26	67	477
Mean	130	117	165	125	8.5	17	101
Median	114	102	122	121	6.7	10	82
Standard Dev	85	88	114	40	6.7	17	76
UCL95	166	171	293	165	13	26	113

Notes:

Concentrations are in milligrams per kilogram

Count (n) - Number of samples

Count (nd) - Number of samples nondetect for arsenic

UCL95 - Upper 95% confidence limit

Draft Cleanup Action Plan Maury Island Open Space Property
 King County Parks & Recreation Division

Table 2. Summary Statistics for Lead in Forest Duff and Soil

	Unit and Media (Forest Duff or Soil at Specified Depth)											
	1a				1b				2a/2b	Unit 2c/4b/4c		
	Forest Duff	0-2"	9"	18"	Forest Duff	0-2"	9"	18"	0-2"	0-2"	9"	
Count (n)	20	27	19	16	10	20	9	9	35	20	5	
Count (nd)	0	0	1	1	0	0	0	1	6	0	1	
Min	33	7.1	<0.5	<0.5	9.6	1.0	8.3	<0.5	<0.5	2.0	<0.5	
Max	817	710	102	12	576	930	87.4	23	17	423	112	
Mean	364	220	19	6.6	220	195	26	11	5.8	55	42	
Median	377	167	11	7.1	230	54	19	9.6	5.8	13	18	
Standard Dev	218	185	23	2.7	158	268	25	6.3	3.9	98	48	
UCL95	483	305	31	8.3	354	341	48	17	7.4	108	117	

	Unit and Media (Forest Duff or Soil at Specified Depth)												
	3a				3b			3c					3e
	Forest Duff	0-2"	9"	18"	Forest Duff	0-2"	9&18"	Forest Duff	0-2"	9"	18"	24"	All Depths
Count (n)	13	21	9	5	5	6	6	5	15	10	9	4	40
Count (nd)	0	1	1	1	0	0	0	0	0	0	1	1	0
Min	11	<0.5	<0.5	<0.5	67	83	7.1	161	9.0	4.6	<0.5	<0.5	3.0
Max	636	330	110	45	196	224	25	487	450	40	37	8	403
Mean	119	68	35	18	102	173	11	309	118	14	9	5	61
Median	51	45	7.1	12	89	201	8.3	323	90	10	5	5	38
Standard Dev	182	68	45	18	54	60	7.1	127	123	11	11	3	81
UCL95	249	104	77	45	186	251	20	507	198	24	19	12	90

	Location/Unit and Media (Forest Duff or Soil at Specified Depth)										
	Unit 5		Trails 0-2"				Trails 9"	On Road	Units 1a,1b,3a, 3b, 5		Units 1a,1b,3a, 3b
	Forest Duff	0-2"	All Trail	1a	1b and 3b	5			Property-Wide Forest Duff and 0-2"	Property-Wide Forest Duff and 0-2"	
Count (n)	31	37	31	16	7	8	12	22	190	122	
Count (nd)	0	0	0	0	0	0	0	0	1	1	
Min	48	13	11	11	135	36	2.7	3.4	0.5	0.5	
Max	2,600	2,520	1,590	776	510	1,590	17	130	2,600	930	
Mean	898	312	277	208	275	415	7.8	24	333	196	
Median	620	150	193	142	215	271	7.1	13	186	103	
Standard Dev	762	472	304	206	148	503	4.3	33	475	202	
UCL95	1,221	493	405	336	442	921	11	41	411	237	

Notes:

Concentrations are in milligrams per kilogram
 Count (nd) – Number of samples nondetect for lead

Count (n) – Number of samples
 UCL95 – Upper 95% confidence limit

Table 3. Summary Statistics for Cadmium in Forest Duff and Soil

	Unit and Media (Forest Duff or Soil at Specified Depth)						
	Unit 1a, 1b, 2c, 3a	Unit 1a, 1b	Unit 3a,3b,3c	Unit 3e	Unit 2a, 4b,4c	All (1a, 1b, 2a, 2c, 3a, 3c, 3e, 4b)	All (1a, 1b, 2a, 2c, 3a, 3b, 3c, 3e, 4b)
	Forest Duff	0-2"	0-2"	(all)	0-2"	9"	18"
Count (n)	9	26	14	29	13	16	22
Count (nd)	0	7	5	16	12	7	14
Min	1.2	<0.281	<0.281	<0.281	<0.2	<0.281	<0.19
Max	5.4	11	9.3	7.9	0.28	2.2	1.5
Mean	3.3	3.3	1.7	1.7	0.27	0.80	0.52
Median	3.6	2.3	0.89	0.93	0.28	0.78	0.28
Standard Dev	1.4	3.1	2.5	1.7	0.02	0.58	0.37
UCL95	4.6	4.8	3.4	2.4	0.29	1.2	0.71

Notes:

Concentrations are in milligrams per kilogram

Count (nd) – Number of samples nondetect for cadmium

Count (n) – Number of samples

UCL95 – Upper 95% confidence limit

Draft Cleanup Action Plan Maury Island Open Space Property
King County Parks & Recreation Division

Table 4. PAHs in Soil - Unit 5 (page 1 of 4)

Compound	PEF	Sample Location, Media, Sample ID, and Units					
		#172	#173	#174	#177	#178	
		Soil, 0-2" 5-S-172-0 ^a µg/kg	Soil, 0-2" 5-S-173-0 ^a µg/kg	Soil, 0-2" 5-S-174-0 ^a µg/kg	Soil, 0-2" 5-S-177-0 ^a µg/kg	Forest Duff 5-FD-178-0 ^a µg/kg	Soil, 0-2" 5-S-178-0 ^a µg/kg
1-Methylnaphthalene	0.1	<7.3	<7.3	<8.9	<6.4	<8.4	<7.2
2-Methylnaphthalene		<7.3	<7.3	<8.9	<6.4	<8.4	<7.2
Acenaphthene		<7.3	<7.3	<8.9	<6.4	<8.4	<7.2
Acenaphthylene		<7.3	<7.3	<8.9	<6.4	<8.4	<7.2
Anthracene		<7.3	<7.3	<8.9	<6.4	<8.4	<7.2
Benzo(a)anthracene*		<7.3	<7.3	<8.9	<6.4	<8.4	7.4
Benzo(a)pyrene*	1	<7.3	<7.3	<8.9	<6.4	<8.4	<7.2
Benzo(b,j,k)fluoranthene*	0.1	26.2	59.1	69.5	12	<8.4	36.4
Benzo(g,h,i)perylene		<7.3	<7.3	<8.9	<6.4	<8.4	<7.2
Chrysene*	0.01	<7.3	<7.3	<8.9	<6.4	<8.4	16.8
Dibenzo(a,h)anthracene*	0.4	<7.3	<7.3	<8.9	<6.4	<8.4	<7.2
Fluoranthene		17.7	27.7	36.7	<6.4	22	19.2
Fluorene		<7.3	<7.3	<8.9	<6.4	<8.4	<7.2
Indeno(1,2,3-cd)Pyrene*	0.1	<7.3	<7.3	<8.9	<6.4	<8.4	<7.2
Naphthalene		<7.3	<7.3	<8.9	<6.4	<8.4	<7.2
Phenanthrene		<7.3	10	15	<6.4	13	7.5
Pyrene		11	16.5	18.5	<6.4	20	15
TEQ cPAH		2.62	5.91	6.95	1.20	N/A	4.55

Notes:

* Carcinogenic PAHs

J Estimated concentration

PAHs - polycyclic aromatic hydrocarbons

PEF - potency equivalency factor

Sample Locations shown on Figure 30.

a Sample extracted out of holding time

N/A - not applicable - no cPAHs detected

cPAHs - carcinogenic PAHs

< - analyte not detected at or greater than listed concentration

Shaded value exceeds the Model Toxics Control Act Method A Cleanup Level of 100 µg/kg.

b Duplicate sample

µg/kg - micrograms per kilogram

TEQ - toxic equivalency

Table 4. PAHs in Soil - Unit 5 (page 2 of 4)

Compound	PEF	Sample Location, Media, Sample ID, and Units						
		#179		#180			#181	
		Forest Duff 5-FD-179-0 ^a µg/kg	Soil, 0-2" 5-S-179-0 ^a µg/kg	Forest Duff 5-FD-180-0 ^a µg/kg	Soil, 0-2" 5-S-180-0 ^a µg/kg	Soil, 0-2" 5-S-180-D6 ^{a,b} µg/kg	Forest Duff 5-FD-181-0 ^a µg/kg	Soil, 0-2" 5-S-181-0 ^a µg/kg
1-Methylnaphthalene	0.1	<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
2-Methylnaphthalene		<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
Acenaphthene		<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
Acenaphthylene		<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
Anthracene		<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
Benzo(a)anthracene*		<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
Benzo(a)pyrene*	1	<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
Benzo(b,j,k)fluoranthene*	0.1	<12	70.4	<11	17.9	17.8	39.1	17.5
Benzo(g,h,i)perylene		<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
Chrysene*	0.01	<12	<7.2	<11	<6.8	<6.7	33.6	7.9
Dibenzo(a,h)anthracene*	0.4	<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
Fluoranthene		19	24.6	16	<6.8	<6.7	19	8.5
Fluorene		<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
Indeno(1,2,3-cd)Pyrene*	0.1	<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
Naphthalene		<12	<7.2	<11	<6.8	<6.7	<9.8	<6.6
Phenanthrene		<12	8.4	<11	<6.8	<6.7	<9.8	<6.6
Pyrene		<12	16.2	11	<6.8	<6.7	13	7.1
TEQ cPAH		N/A	7.04	N/A	1.79	1.78	3.91	1.83

Notes:

* Carcinogenic PAHs

J Estimated concentration

PAHs - polycyclic aromatic hydrocarbons

PEF - potency equivalency factor

Sample Locations shown on Figure 30.

a Sample extracted out of holding time

N/A - not applicable - no cPAH detected

cPAHs - carcinogenic PAHs

< - analyte not detected at or greater than listed concentration

Shaded value exceeds the Model Toxics Control Act Method A Cleanup Level of 100 µg/kg.

b Duplicate sample

µg/kg - micrograms per kilogram

TEQ - toxic equivalency

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Table 4. PAHs in Soil - Unit 5 (page 3 of 4)

Compound	PEF	Sample Location, Media, Sample ID, and Units					
		#182		#183		#184	
		Forest Duff 5-FD-182-0 ^a µg/kg	Soil, 0-2" 5-S-182-0 ^a µg/kg	Forest Duff 5-FD-183-0 ^a µg/kg	Soil, 0-2" 5-S-183-0 ^a µg/kg	Forest Duff 5-FD-184-0 µg/kg	Soil, 0-2" 5-S-184-0 µg/kg
1-Methylnaphthalene	0.1	<18	<12	<12	<7.7	<7.6	<6.7
2-Methylnaphthalene		<18	<12	<12	<7.7	9.6 ^j	<6.7
Acenaphthene		<18	<12	<12	<7.7	64.9	6.8 ^j
Acenaphthylene		<18	<12	<12	<7.7	<7.6	<6.7
Anthracene		<18	<12	<12	<7.7	125	12 ^j
Benzo(a)anthracene*		<18	<12	<12	<7.7	1,410	160
Benzo(a)pyrene*	1	<18	<12	<12	<7.7	2,210	252
Benzo(b,j,k)fluoranthene*	0.1	<18	127	<12	12	4,050	488
Benzo(g,h,i)perylene		<18	<12	<12	<7.7	1,270	137
Chrysene*	0.01	<18	<12	<12	<7.7	1,820	209
Dibenzo(a,h)anthracene*	0.4	<18	<12	<12	<7.7	328	33.2
Fluoranthene		<18	28.7	<12	<7.7	2,000	232
Fluorene		<18	<12	<12	<7.7	80.9	7.5 ^j
Indeno(1,2,3-cd)Pyrene*	0.1	<18	<12	<12	<7.7	1,520	166
Naphthalene		<18	<12	<12	<7.7	26.6	<6.7
Phenanthrene		<18	<12	<12	<7.7	694	74.7
Pyrene		<18	24.5	<12	<7.7	2,180	240
TEQ cPAH		N/A	12.70	N/A	1.20	3,057	349

Notes:

* Carcinogenic PAHs

J Estimated concentration

PAHs - polycyclic aromatic hydrocarbons

PEF - potency equivalency factor

Sample Locations shown on Figure 30.

a Sample extracted out of holding time

N/A - not applicable - no cPAH detected

cPAHs - carcinogenic PAHs

< - analyte not detected at or greater than listed concentration

Shaded value exceeds the Model Toxics Control Act Method A Cleanup Level of 100 µg/kg.

b Duplicate sample

µg/kg - micrograms per kilogram

TEQ - toxic equivalency

Table 4. PAHs in Soil - Unit 5 (page 4 of 4)

Compound	PEF	Sample Location, Media, Sample ID, and Units	
		#188	
		Forest Duff 5-FD-188-0 µg/kg	Soil, 0-2" 5-S-188-0 µg/kg
1-Methylnaphthalene	0.1	<6.6	<6.3
2-Methylnaphthalene		<6.6	<6.3
Acenaphthene		<6.6	11 J
Acenaphthylene		<6.6	6.3
Anthracene		<6.6	16.7
Benzo(a)anthracene*		52.7	138
Benzo(a)pyrene*	1	97.8	223
Benzo(b,j,k)fluoranthene*	0.1	165	353
Benzo(g,h,i)perylene		29.3	99
Chrysene*	0.01	78.3	179
Dibenzo(a,h)anthracene*	0.4	6.7 J	29.5
Fluoranthene		77.8	211
Fluorene		<6.6	<6.3
Indeno(1,2,3-cd)Pyrene*	0.1	39.9	130
Naphthalene		<6.6	<6.3
Phenanthrene		21.5	82.5
Pyrene		88.1	233
TEQ cPAH		N/A	127

Notes:

* Carcinogenic PAHs

J Estimated concentration

PAHs - polycyclic aromatic hydrocarbons

PEF - potency equivalency factor

Sample Locations shown on Figure 30.

a Sample extracted out of holding time

N/A - not applicable - no cPAHs detected

cPAH - carcinogenic PAHs

< - analyte not detected at or greater than listed concentration

Shaded value exceeds the Model Toxics Control Act Method A Cleanup Level of 100 µg/kg.

b Duplicate sample

µg/kg - micrograms per kilogram

TEQ - toxic equivalency

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Table 5. Remedial Alternatives

Applicable Decision Units	Area Addressed	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
All	Cleanup Unit in General	Signage, public notices, public meetings, hygiene stations, ongoing maintenance of trail system, land use covenant	Signage, public notices, public meetings, hygiene stations, ongoing maintenance of trail system, land use covenant	Signage, public notices, public meetings, hygiene stations, ongoing maintenance of trail system, land use covenant	Signage, public notices, public meetings, hygiene stations, ongoing maintenance of trail system, land use covenant	Signage, public notices, public meetings, hygiene stations, ongoing maintenance of trail system, land use covenant
1a, 1b, 3a, 3b, 5	Forest Footpaths	Close redundant trail spurs in Unit 1a. Cap remaining trail system with the U.S. Forest Service-type cap.	Close redundant trail spurs in Unit 1a. Cap remaining trail system with the U.S. Forest Service-type cap. Construct short spur of trail to connect the visitor parking lot with the trail in Unit 3b (contaminated soils to be excavated prior to placement of gravel cap).	Close redundant trail spurs in Unit 1a. Cap remaining trail system with the U.S. Forest Service-type cap. Construct short spur of trail to connect the visitor parking lot with the trail in Unit 3b (trail to be capped the same as the existing trail system, no soil excavation prior to capping).	Close redundant trail spurs. Cap a main thoroughfare with a U.S. Forest Service-type cap. Construct short spur of trail to connect the visitor parking lot with the trail in Unit 3b (trail to be capped with gravel, no soil excavation prior to capping).	Decommission side trails. Cap a main thoroughfare with a U.S. Forest Service-type cap. Construct short spur of trail to connect the visitor parking lot with the trail in Unit 3b (trail to be capped with gravel, no soil excavation prior to capping).
3a, 3b, 3c	Graded Roads	Excavate soils exceeding 40 mg/kg arsenic and regrade the road. (Note - the graded road in Unit 3c will already fall within the area of excavation described below)	Excavate soils exceeding 40 mg/kg arsenic and regrade the road. (Note - the graded road in Unit 3c will already fall within the area of excavation described below)	Conduct soil mixing in areas exceeding 20 mg/kg arsenic and regrade.	Conduct soil mixing in areas exceeding 20 mg/kg arsenic and regrade.	Cap with gravel and mineral soil similar to trails.
5	Former Range Area - portion that fails NEBA. Wetland	Excavate contaminated soils to meet MTCA Method A cleanup levels for arsenic, lead and cPAH.	Excavate contaminated soils to meet MTCA Method A cleanup levels for arsenic, lead and cPAH. Contain excavated soils from Units 5 and 3c and the graded road in a below grade cell. Cap with gravel for future use as a parking area.	Strip off organics. Conduct soil mixing and regrading. Cap a portion of the area with crushed gravel for future use as a parking area. Revegetate the remainder of the area.	Strip off organics. Conduct soil mixing and regrading. Cap a portion of the area with crushed gravel for future use as a parking area. Revegetate the remainder of the area.	Strip off organics in a limited area for a new parking lot. Cap parking lot area with crushed gravel. Place a 6-foot chain link fence between parking lot and remainder of Unit 5. Remediate wetland areas with lead concentrations >1,300 mg/kg.
3c, 3e	Formerly disturbed areas, primarily covered in blackberries - failing NEBA	Excavate contaminated soils to meet MTCA Method A cleanup levels for arsenic and lead. Unit 3c to be reforested. Unit 3e to be hydroseeded.	Excavate contaminated soils to meet MTCA Method A cleanup levels for arsenic and lead. Unit 3c to be reforested. Unit 3e to be hydroseeded.	Area to remain covered in blackberries.	Area to remain covered in blackberries.	Clear and grub, place 3-inches of compost and revegetate with native species.
Soil Disposal →		Offsite Landfill	Contain soils in a below grade cell, covered with geotextile and a 2 foot soil cap.	Offsite Landfill	Offsite Landfill	Offsite Landfill

Notes:

Cells with the same colors are the same technology.

Table 6. Evaluation of Remedial Action Alternatives for Disproportionate Cost Analysis

Alternative	Description	Weighting Criteria	Disproportionate Cost Analysis Criteria							Total Weighted Benefit	Cost (in millions)	Ranking (1 = most permanent, 4 = least permanent)	Overall Recommendation
			25%	20%	30%	15%	5%	5%	5%				
1	Close redundant trail spurs in Unit 1a. Cap remaining trails per USFS guidelines. Excavate soils exceeding 40 mg/kg arsenic on dirt roads and regrade. In the area that fails the NEBA in Unit 5 excavate contaminated soils to Meet MTCA Method A cleanup levels for arsenic, lead and cPAH. In Units 3c and 3e excavate soil to meet MTCA Method A cleanup levels for arsenic and lead. Revegetate the area. Implement institutional controls.		5	4	5	2.5	3	4	4.3	8.8	1	No	
2	The same as Alternative 1, except that all excavated soils would be contained by direct burial in a subsurface cell onsite.		4.5	3.5	5	3.5	2	3	4.1	5.9	2	No	
3	Close redundant trail spurs in Unit 1a. Cap remaining trails per USFS guidelines. Conduct soil mixing in areas on dirt roads that exceed 20 mg/kg and regrade. In the area that fails the NEBA in Unit 5 strip off organics. Conduct soil mixing and regrading. Cap a portion of the area with crushed gravel for future use as a parking area. Revegetate the remainder of the area. Leave Units 3 and 3e as is, as contaminated soils are covered in blackberry bushes, which act as a barrier for direct human exposure. All excavated soils to be disposed of at an offsite landfill. Implement institutional controls.		3	3	4	4	4	5	3.6	2.3	3	No	
4	Close redundant trail spurs in Unit 1a. Cap a main thoroughfare per USFS guidelines. Conduct soil mixing in areas on dirt roads that exceed 20 mg/kg and regrade. In the area that fails the NEBA in Unit 5 strip off organics. Conduct soil mixing and regrading. Cap a portion of the area with crushed gravel for future use as a parking area. Revegetate the remainder of the area. Leave Units 3 and 3e as is, as contaminated soils are covered in blackberry bushes, which act as a barrier for direct human exposure. All excavated soils to be disposed of at an offsite landfill. Implement institutional controls.		2	3	3	6	5	5	3.4	1.8	4	No	
5	Decommission side trails and install warning signs and hygiene stations. Cap main thoroughfare trails per USFS guidelines. Cap dirt roads that exceed 20 mg/kg with gravel. In a portion of the area that fails the NEBA in Unit 5, strip off duff and organic soils and cap the area with crushed gravel for use as a parking area. Install 6-foot chain link fence between parking area and remainder of Unit 5. Remediate wetland. Remove chain link fence along SW 260th Street. Revegetate Units 3c and 3e with 3-inches of compost and native vegetation. All excavated soils to be disposed of at an offsite landfill. Implement institutional controls.		4	3.5	4.5	4	3.5	4.5	4.1	4.4	2	Yes	

Disproportionate Cost Analysis Scoring Criteria

- 6 Ideal/excellent favorability
- 5 High benefit/very favorable
- 4 Reasonable benefit/favorable
- 3 Some benefit/moderate favorability
- 2 Slight benefit/low favorability
- 1 Virtually no benefit/not favorable

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Table 7. Potential Applicable or Relevant and Appropriate Requirements (ARARs)

Table 5. Potential Applicable or Relevant and Appropriate Requirements (ARARs)

ARAR	Description	Applicability
Soil		
Model Toxics Control Act (WAC 173-340-740, -747)	MTCA regulates the investigation and cleanup of releases to the environment that may pose a threat to human health or the environment. Establishes cleanup levels for soil, including derivation of soil concentrations protective of groundwater.	MTCA cleanup levels are applicable to site soil.
Groundwater		
Safe Drinking Water Act, Primary Drinking Water Regulations (40 Code of Federal Regulations [CFR] 141.50 and 141.61[a])	These regulations protect the quality of public drinking water supplies through regulation of chemical parameters and constituent concentrations as maximum concentration limits (MCLs).	MCLs are potentially relevant and appropriate where groundwater is a potential source of drinking water.
Model Toxics Control Act (WAC 173-340-720)	MTCA regulates the investigation and cleanup of releases to the environment that may pose a threat to human health or the environment. Establishes cleanup levels for groundwater.	MTCA cleanup levels are applicable to site groundwater.
Surface Water		
Clean Water Act, Section 304, National Recommended Water Quality Criteria, EPA Office of Science and Technology (4304T, 2004).	Establishes ambient water quality criteria for surface water.	Surface water quality criteria are potentially applicable to site surface water.
Clean Water Act's National Toxics Rule (NTR) (40 CFR 131.36)	Establishes ambient water quality criteria for surface water.	Surface water quality criteria are potentially applicable to site surface water.
Washington State Water Quality Standards for Surface Waters (WAC 173-201A)	Establishes ambient water quality criteria for surface water.	Surface water quality criteria are potentially applicable to site surface water.
Model Toxics Control Act (WAC 173-340-730)	MTCA regulates the investigation and cleanup of releases to the environment that may pose a threat to human health or the environment. Establishes cleanup levels for surface water.	MTCA cleanup levels may be applicable to the site.
Air		
National Emission Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR Part 261)	Establishes specific emissions levels allowed for toxic air pollutants.	Applicable to treatment alternatives that may emit toxic pollutants to the air.
Model Toxics Control Act (WAC 173-340-750)	MTCA regulates the investigation and cleanup of releases to the environment that may pose a threat to human health or the environment. Establishes cleanup levels for air.	MTCA cleanup levels may be applicable to the site.
Miscellaneous		
State Environmental Policy Act (SEPA) Chapter 43.21C RCW.	The SEPA requires all governmental agencies to consider the environmental effects of a proposal (such as a remedial action) before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse effects on the quality of the environment.	At minimum, a SEPA checklist is required for site act activities requiring a grading permit.
Native American Graves Protection and Repatriation Act (43 CFR Part 10)	Native American Graves Protection and Repatriation Act regulations protect Native American burials from desecration through the removal and trafficking of human remains and "cultural items," including funerary and sacred objects.	This Act is potentially applicable to remedial actions at the site because it is possible that the disturbance of Native American materials could occur as a result of excavation activities.
Washington Hazardous Waste Management Act (WAC 173-303)	Establishes standards for the generation, transport, treatment, storage, or disposal of designated dangerous waste in the state.	This regulation is potentially applicable to alternatives that would involve handling of contaminated media at the site. The area of contamination policy allows contaminated media to be consolidated within the same area of a site without triggering Resource Conservation and Recovery Act or Washington dangerous waste regulations.
Department of Transportation Hazardous Wastes Rules (49 CFR 105-180)	Establishes specific U.S. Department of Transportation rules and technical guidelines for the off-site transport of hazardous materials.	Applicable to remedial activities that involve the off-site transportation of hazardous waste.
Washington Solid Waste Handling Standards (WAC 173-350)	Establishes standards for handling and disposal of solid non-hazardous waste in Washington.	These regulations are potentially applicable to solid nonhazardous wastes and are potentially relevant and appropriate to on-site remedial actions governing contaminated media management.
Washington Water Well Construction Act Regulations (WAC 173-160)	Provides requirements for water well construction.	These regulations are potentially applicable to the installation, operation, or closure of monitoring and treatment wells at the Site.

Table 8. Proposed Schedule*

Work Element	Period or Completed By
Draft Final DCAP Public Comment Period	Q3 2018
DCAP Approved By Ecology	Q2 2019
Phase 1 Construction Contract Documents Ready to Advertise	Q2 2019
Compliance Monitoring	Q2 2019
Phase 1 Implementation/Construction	Q3 2019 – Q3 2020
Phase 2 Construction Contract Documents Ready to Advertise	2022
Phase 2 Implementation/Construction	2023
Phase 3 Implementation/Construction	2025
First 5-Year Summary Monitoring Report	Q3 2023
First 5-Year Review	Q4 2023
Phase 4 Implementation/Construction	2028

- * Phase 1 includes trail/road capping and parking lot construction
Phase 2 includes revegetation of 5 acres cleared in Phase 1 of Area 3C and Wetland Remediation. Clear and cover 4 more acres in 3C.
Phase 3 includes revegetation of 4 more acres of Area 3C. Clear and cover Area 3E.
Phase 4 includes revegetation of Area 3E.

Appendix A

Cost Estimates

Table A-1**Alternative 1 - Construction Estimate**Maury Island Open Space Property FS
Maury Island, Washington

Estimated field duration:	3 months active site; 7 months hauling and trails
Project Name:	Maury Island Cleanup - Engineers Estimate
Location:	Maury Island, Washington
Date:	4/10/2017
Contractor:	
Prepared By:	David Dinkuhn, P.E.
Approved By:	

Rev: 2

Item #	Item Description	Quantity	Unit	Unit Price	Total
Engineering					
1	Work Plans	1	LS	\$ 100,000	\$ 100,000
2	Design Engineering for KC and Ecology Review, Stamped	1	LS	\$ 125,000	\$ 125,000
3	Engineering and oversight during Construction	1	LS	\$ 126,300	\$ 126,300
4	Project management support	1	LS	\$ 50,000	\$ 50,000
Engineering Subtotal					\$ 401,300
General					
5	General Conditions/Permits	1	EA	\$ 150,000	\$ 150,000
6	Mobilization/Demobilization	1	LS	\$ 25,000	\$ 25,000
7	Decontamination Facilities, Equipment	1	EA	\$ 15,000	\$ 15,000
8	Decontamination Facilities, Personnel	1	EA	\$ 8,000	\$ 8,000
9	Surveying	1	EA	\$ 25,000	\$ 25,000
10	TESC	1	EA	\$ 35,000	\$ 35,000
11	Hazwoper Training/Medical Monitoring	4	staff	\$ 2,500	\$ 10,000
General Subtotal					\$ 268,000
Trail Work					
12	Close redundant spurs	3	ea	\$ 1,000.00	\$ 3,000
13	Gravel trails	151,811	sf	\$ 2.39	\$ 362,829
14	Excavate soil from one section	39	ton	\$ 20.00	\$ 770
15	Grade section of trail	12,721	sf	\$ 0.82	\$ 10,415
Trail Subtotal					\$ 377,015
Units 3c, 3e and 5					
16	Clear and grub 3c and 3e	16.5	Acre	\$ 1,000	\$ 16,480
17	Clear 5 - light vegetation	3.9	Acre	\$ 500	\$ 1,950
18	Soil excavation, stockpile, and load Units 3c, 3e, 5	28,831	CY	\$ 12	\$ 345,972
19	Off-site Transport of affected soil	40,617	Ton	\$ 32	\$ 1,294,660
20	Off-site Disposal of affected soil at Subtitle D	40,617	Ton	\$ 42	\$ 1,705,905
21	Place 6-in layer of topsoil at Unit 3c	10,003	CY	\$ 40	\$ 400,107
22	Gravel at Unit 5	7,786	Ton	\$ 15	\$ 116,795
23	Place and compact gravel at Unit 5	5,191	CY	\$ 5	\$ 25,955
24	Regrade Units 3c and 3e	16.5	Acre	\$ 1,000	\$ 16,480
25	Water truck for dust control, operator and truck	6.0	month	\$ 15,000	\$ 90,000
26	Revegetate 3c	12.4	Acre	\$ 10,000	\$ 124,000
27	Hydroseed 3e	4.1	AC	\$ 2,000	\$ 8,160
					\$ -
Subtotal, Unit 3c, 3e and Unit 5					\$ 4,146,464
Testing					
28	Total Metals	200	EA	\$ 60	\$ 12,000
29	TCLP Metals	20	EA	\$ 160	\$ 3,200
30	XRF Field Testing	1	LS	\$ 30,000	\$ 30,000
Subtotal Testing					\$ 45,200

Table A-1
Alternative 1 - Construction Estimate
 Maury Island Open Space Property FS
 Maury Island, Washington

Estimated field duration:	3 months active site; 7 months hauling and trails
Project Name:	Maury Island Cleanup - Engineers Estimate
Location:	Maury Island, Washington
Date:	4/10/2017
Contractor:	
Prepared By:	David Dinkuhn, P.E.
Approved By:	

Rev: 2

Item #	Item Description	Quantity	Unit	Unit Price	Total
	Reports				
31	Closure report	1	LS	\$ 30,000	\$ 30,000
	Subtotal, Reports				\$ 30,000
	Subtotal				\$ 5,267,979
32	Contingency 25%	1	LS	\$ 1,316,995	\$ 1,316,995
	Subtotal, with contingency	1	LS		\$ 6,584,973
	Misc				
33	Contractor markup 15%	1	LS	\$ 987,746	\$ 987,746
34	Insurance 1.5%	1	LS	\$ 98,775	\$ 98,775
35	B&O Tax .65%	1	LS	\$ 42,802	\$ 42,802
36	Ecology Costs	1	LS	\$ 10,000	\$ 10,000
37	Bond 2%	1	LS	\$ 131,699	\$ 131,699
38	Tax 8.6%	1	LS	\$ 566,308	\$ 566,308
	Grand Total				\$ 8,422,304

Table A-2**Alternative 2 - Construction Estimate**

Maury Island Open Space Property FS

Maury Island, Washington

Estimated field duration: 6 months - 4 months active at site for cell construction, hauling; extra 2 mo for concurrent trails and restoration

Project Name:	Maury Island Cleanup - Engineers Estimate
Location:	Maury Island, Washington
Date:	4/10/2017
Contractor:	
Prepared By:	David Dinkuhn, P.E.
Approved By:	

Rev: 2

Item #	Item Description	Quantity	Unit	Unit Price	Total
Engineering					
1	Work Plans	1	LS	\$ 100,000	\$ 100,000
2	Design Engineering for KC and Ecology Review, Stamped	1	LS	\$ 125,000	\$ 125,000
3	Engineering and oversight during Construction	1	LS	\$ 132,000	\$ 132,000
4	Project management support	1	LS	\$ 50,000	\$ 50,000
Engineering Subtotal					\$ 407,000
General					
5	General Conditions/Permits	1	EA	\$ 150,000	\$ 150,000
6	Mobilization/Demobilization	1	LS	\$ 25,000	\$ 25,000
7	Decontamination Facilities, Equipment	1	EA	\$ 15,000	\$ 15,000
8	Decontamination Facilities, Personnel	1	EA	\$ 8,000	\$ 8,000
9	Surveying	1	EA	\$ 30,000	\$ 30,000
10	TESC	1	EA	\$ 35,000	\$ 35,000
11	Hazwoper Training/Medical Monitoring	4	staff	\$ 2,500	\$ 10,000
General Subtotal					\$ 273,000
Trail Work					
12	Close redundant spurs	3	ea	\$ 1,000.00	\$ 3,000
13	Gravel trails	151,811	sf	\$ 2.39	\$ 362,829
14	Excavate soil from one section	39	ton	\$ 20.00	\$ 770
15	Grade section of trail	12,721	sf	\$ 0.82	\$ 10,415
16	New trail construction	1,443	sf	\$ 7.36	\$ 10,623
Trail Subtotal					\$ 387,637
Units 3c and 5					
17	Clear and grub 3c	12.4	Acre	\$ 1,000	\$ 12,400
18	Clear 5 - light vegetation	3.9	Acre	\$ 500	\$ 1,950
19	Soil excavation and stockpile affected soil at Unit 5	4,719	CY	\$ 5	\$ 23,595
20	Create containment cell at Unit 5 location (cover soil and volume for 3c soil)	28,846	CY	\$ 10	\$ 288,464
21	Soil excavation from Unit 3c, haul to Unit 5, bury and compact at Unit 5	15,004	CY	\$ 16	\$ 240,064
22	Fill/compact Unit 5 cell with affected soil from 5 (stockpile built earlier)	4,719	CY	\$ 10	\$ 47,190
23	Geofabric Unit 5 cell	186,872	sf	\$ 0.10	\$ 18,687
24	Cover Unit 5 cell with clean soil	13,842	CY	\$ 10	\$ 138,424
25	Gravel at Unit 5	7786	Ton	\$ 15	\$ 116,795
26	Place and compact gravel at Unit 5	5,190.9	CY	\$ 5	\$ 25,955
27	Backfill Unit 3c with clean spoils from Unit 5 (load, haul, place/compact)	15,004	CY	\$ 16	\$ 240,064
28	Place 6-in layer of topsoil at Unit 3c	10,003	CY	\$ 40	\$ 400,107
29	Water truck for dust control, operator and truck	4.0	month	\$ 15,000	\$ 60,000
30	Revegetation/restoration Unit 3c	12.4	AC	\$ 10,000	\$ 124,000

Table A-2**Alternative 2 - Construction Estimate**

Maury Island Open Space Property FS

Maury Island, Washington

Estimated field duration: 6 months - 4 months active at site for cell construction, hauling; extra 2 mo for concurrent trails and restoration

Project Name:	Maury Island Cleanup - Engineers Estimate
Location:	Maury Island, Washington
Date:	4/10/2017
Contractor:	
Prepared By:	David Dinkuhn, P.E.
Approved By:	

Rev: 2

Item #	Item Description	Quantity	Unit	Unit Price	Total
Unit 3e					
31	Clear and grub 3e (blackberries)	4.1	Acre	\$ 500	\$ 2,040
32	Excavate, stockpile, and cover mound material	2,500.0	CY	\$ 15	\$ 37,500
33	Manage presumed debris	400.0	Ton	\$ 100	\$ 40,000
34	Test and excavate additional affected soil	6,582	CY	\$ 11	\$ 72,406
35	Create containment cell at Unit 3e location (cover soil)	14,481	CY	\$ 10	\$ 144,811
36	Fill/compact Unit 3e cell with affected soil from 3e and mounds (stockpile built earlier)	9,082	CY	\$ 10	\$ 90,823
37	Geofabric Unit 3e cell	195,495	sf	\$ 0.10	\$ 19,550
38	Cover Unit 3e cell with clean soil	14,481	CY	\$ 10	\$ 144,811
39	Water truck for dust control, operator and truck	2.0	month	\$ 15,000	\$ 30,000
40	Hydroseed Unit 3e	4.1	AC	\$ 2,000	\$ 8,160
				\$ -	\$ -
Subtotal, Unit 3c and Unit 5					\$ 2,327,796
Testing					
41	Total Metals	200	EA	\$ 60	\$ 12,000
42	TCLP Metals	20	EA	\$ 160	\$ 3,200
43	XRF Field Testing	1	LS	\$ 30,000	\$ 30,000
Subtotal Testing					\$ 45,200
Reports					
44	Closure report	1	LS	\$ 30,000	\$ 30,000
Subtotal, Reports					\$ 30,000
Subtotal					\$ 3,470,634
45	Contingency 25%	1	LS	\$ 867,658	\$ 867,658
Subtotal, with contingency					\$ 4,338,292
Misc					
46	Contractor markup 15%	1	LS	\$ 650,744	\$ 650,744
47	Insurance 1.5%	1	LS	\$ 65,074	\$ 65,074
48	B&O Tax .65%	1	LS	\$ 28,199	\$ 28,199
49	Ecology Costs	1	LS	\$ 10,000	\$ 10,000
50	Bond 2%	1	LS	\$ 86,766	\$ 86,766
51	Tax 8.6%	1	LS	\$ 373,093	\$ 373,093
Grand Total					\$ 5,552,168

Table A-3**Alternative 3 - Construction Estimate**

Maury Island Open Space Property FS

Maury Island, Washington

Estimated field duration: 2 months for soil excavation and disposal; 4 more months for trail work

Project Name:	Maury Island Cleanup - Engineers Estimate
Location:	Maury Island, Washington
Date:	4/10/2017
Contractor:	
Prepared By:	David Dinkuhn, P.E.
Approved By:	

Rev: 2

Item #	Item Description	Quantity	Unit	Unit Price	Total
Engineering					
1	Work Plans	1	LS	\$ 75,000	\$ 75,000
2	Design Engineering for KC and Ecology Review, Stamped	1	LS	\$ 75,000	\$ 75,000
3	Engineering and oversight during Construction	1	LS	\$ 78,600	\$ 78,600
4	Project management support	1	LS	\$ 40,000	\$ 40,000
Engineering Subtotal					\$ 268,600
General					
5	General Conditions/Permits	1	EA	\$ 100,000	\$ 100,000
6	Mobilization/Demobilization	1	LS	\$ 15,000	\$ 15,000
7	Decontamination Facilities, Equipment	1	EA	\$ 10,000	\$ 10,000
8	Decontamination Facilities, Personnel	1	EA	\$ 4,000	\$ 4,000
9	Surveying	1	EA	\$ 15,000	\$ 15,000
10	TESC	1	EA	\$ 15,000	\$ 15,000
11	Hazwoper Training/Medical Monitoring	4	staff	\$ 2,500	\$ 10,000
General Subtotal					\$ 169,000
Trail Work					
12	Close redundant spurs	3	ea	\$ 1,000.00	\$ 3,000
13	Gravel trails	155,479	sf	\$ 2.39	\$ 371,595
14	Soil Mix section of trail	6,008	sf	\$ 1.31	\$ 7,870
15	Grade section of trail	14,771	sf	\$ 0.33	\$ 4,838
16	New Trail	1,443	sf	\$ 7.36	\$ 10,623
Subtotal, Trails					\$ 397,926
Unit 5					
17	Clear 5 - light vegetation	3.9	Acre	\$ 500	\$ 1,950
18	Soil excavation and stockpile, and stockpile top 6 inches of Unit 5	3,135	CY	\$ 12	\$ 37,618
19	Off-site Transport of affected soil	3,448	Ton	\$ 32	\$ 109,916
20	Off-site Disposal of affected soil at Subtitle D	3,448	Ton	\$ 42	\$ 144,831
21	Gravel at Unit 5	7759	Ton	\$ 15	\$ 116,382
22	Place and compact gravel at Unit 5	5,172.5	CY	\$ 5	\$ 25,863
23	Water truck for dust control, operator and truck	2.0	month	\$ 15,000	\$ 30,000
					\$ -
Subtotal, Unit 5					\$ 466,561
Testing					
24	Total Metals	50	EA	\$ 60	\$ 3,000
25	TCLP Metals	20	EA	\$ 160	\$ 3,200
26	XRF Field Testing	1	LS	\$ 4,000	\$ 4,000
Subtotal Testing					\$ 10,200

Table A-3

Alternative 3 - Construction Estimate
 Maury Island Open Space Property FS
 Maury Island, Washington

Estimated field duration: 2 months for soil excavation and disposal; 4 more months for trail work

Project Name:	Maury Island Cleanup - Engineers Estimate
Location:	Maury Island, Washington
Date:	4/10/2017
Contractor:	
Prepared By:	David Dinkuhn, P.E.
Approved By:	

Rev: 2

Item #	Item Description	Quantity	Unit	Unit Price	Total
	Reports				
27	Closure report	1	LS	\$ 20,000	\$ 20,000
	Subtotal, Reports				\$ 20,000
	Subtotal				\$ 1,332,286
28	Contingency 25%	1	LS	\$ 333,072	\$ 333,072
	Subtotal, with contingency	1	LS		\$ 1,665,358
	Misc				
29	Contractor markup 15%	1	LS	\$ 249,804	\$ 249,804
30	Insurance 1.5%	1	LS	\$ 24,980	\$ 24,980
31	B&O Tax .65%	1	LS	\$ 10,825	\$ 10,825
32	Ecology Costs	1	LS	\$ 10,000	\$ 10,000
33	Bond 2%	1	LS	\$ 33,307	\$ 33,307
34	Tax 8.6%	1	LS	\$ 143,221	\$ 143,221
	Grand Total				\$ 2,137,495

Table A-4**Alternative 4 - Construction Estimate**

Maury Island Open Space Property FS

Maury Island, Washington

Estimated field duration: 2 months excavation and disposal; 2 months for trail work

Project Name:	Maury Island Cleanup - Engineers Estimate
Location:	Maury Island, Washington
Date:	4/10/2017
Contractor:	
Prepared By:	Matthew Schultz
Approved By:	

Rev: 2

Item #	Item Description	Quantity	Unit	Unit Price	Total
Engineering					
1	Work Plans	1	LS	\$ 75,000	\$ 75,000
2	Design Engineering for KC and Ecology Review, Stamped	1	LS	\$ 75,000	\$ 75,000
3	Engineering and oversight during Construction	1	LS	\$ 61,800	\$ 61,800
4	Project management support	1	LS	\$ 40,000	\$ 40,000
Engineering Subtotal					\$ 251,800
General					
5	General Conditions/Permits	1	EA	\$ 100,000	\$ 100,000
6	Mobilization/Demobilization	1	LS	\$ 15,000	\$ 15,000
7	Decontamination Facilities, Equipment	1	EA	\$ 10,000	\$ 10,000
8	Decontamination Facilities, Personnel	1	EA	\$ 4,000	\$ 4,000
9	Surveying	1	EA	\$ 15,000	\$ 15,000
10	TESC	1	EA	\$ 15,000	\$ 15,000
11	Hazwoper Training/Medical Monitoring	4	staff	\$ 2,500	\$ 10,000
General Subtotal					\$ 169,000
Trail Work					
12	Close redundant spurs	3	ea	\$ 1,000	\$ 3,000
13	Gravel trails	21,896	sf	\$ 2.39	\$ 52,332
14	Soil Mix section of trail	6,008	sf	\$ 1.31	\$ 7,870
15	Grade section of trail	14,771	sf	\$ 0.33	\$ 4,838
16	New Trail	1,443	sf	\$ 7.36	\$ 10,623
17					
Subtotal, Trails					\$ 78,662
Unit 5					
18	Clear 5 - light vegetation	3.9	Acre	\$ 500	\$ 1,950
19	Soil excavation and stockpile top 6 inches of Unit 5	3,135	CY	\$ 12	\$ 37,618
20	Off-site Transport of affected soil	3,448	Ton	\$ 32	\$ 109,916
21	Off-site Disposal of affected soil at Subtitle D	3,448	Ton	\$ 42	\$ 144,831
22	Gravel at Unit 5	7759	Ton	\$ 15	\$ 116,382
23	Place and compact gravel at Unit 5	5,173	CY	\$ 5	\$ 25,863
24	Water truck for dust control, operator and truck	2.0	month	\$ 15,000	\$ 30,000
				\$ -	\$ -
Subtotal, Unit 5					\$ 466,561
Testing					
25	Total Metals	50	EA	\$ 60	\$ 3,000
26	TCLP Metals	20	EA	\$ 160	\$ 3,200
27	XRF Field Testing	1	LS	\$ 4,000	\$ 4,000
Subtotal Testing					\$ 10,200

Table A-4

Alternative 4 - Construction Estimate
 Maury Island Open Space Property FS
 Maury Island, Washington

Estimated field duration: 2 months excavation and disposal; 2 months for trail work

Project Name:	Maury Island Cleanup - Engineers Estimate
Location:	Maury Island, Washington
Date:	4/10/2017
Contractor:	
Prepared By:	Matthew Schultz
Approved By:	

Rev: 2

Item #	Item Description	Quantity	Unit	Unit Price	Total
	Reports				
28	Closure report	1	LS	\$ 20,000	\$ 20,000
	Subtotal, Reports				\$ 20,000
	Subtotal				\$ 996,223
29	Contingency 25%	1	LS	\$ 249,056	\$ 249,056
	Subtotal, with contingency	1	LS		\$ 1,245,279
	Misc				
30	Contractor markup 15%	1	LS	\$ 186,792	\$ 186,792
31	Insurance 1.5%	1	LS	\$ 18,679	\$ 18,679
32	B&O Tax .65%	1	LS	\$ 8,094	\$ 8,094
33	Ecology Costs	1	LS	\$ 10,000	\$ 10,000
34	Bond 2%	1	LS	\$ 24,906	\$ 24,906
35	Tax 8.6%	1	LS	\$ 107,094	\$ 107,094
	Grand Total				\$ 1,600,844

Table A-5**Alternative 5 - Construction Estimate**

Maury Island Open Space Property FS

Maury Island, Washington

Estimated field duration: 8 months

Project Name:	Maury Island Cleanup - Engineers Estimate
Location:	Maury Island, Washington
Date:	4/6/2017
Contractor:	
Prepared By:	David Dinkuhn
Approved By:	

Rev: 1

Item #	Item Description	Quantity	Unit	Unit Price	Total
Engineering					
1	Work Plans	1	LS	\$ 75,000	\$ 75,000
2	Design Engineering for KC and Ecology Review, Stamped	1	LS	\$ 75,000	\$ 75,000
3	Engineering and oversight during Construction	1	LS	\$ 100,000	\$ 100,000
4	Project management support	1	LS	\$ 45,000	\$ 45,000
Engineering Subtotal					\$ 295,000
General					
5	General Conditions/Permits	1	EA	\$ 100,000	\$ 100,000
6	Mobilization/Demobilization	1	LS	\$ 15,000	\$ 15,000
7	Decontamination Facilities, Equipment	1	EA	\$ 10,000	\$ 10,000
8	Decontamination Facilities, Personnel	1	EA	\$ 4,000	\$ 4,000
9	Surveying	1	EA	\$ 15,000	\$ 15,000
10	TESC	1	EA	\$ 15,000	\$ 15,000
11	Hazwoper Training/Medical Monitoring	4	staff	\$ 2,500	\$ 10,000
General Subtotal					\$ 169,000
Trail and Graded Road Work					
12	Signs and hygiene stations	1	LS	\$ 10,000	\$ 10,000
13	Gravel trails	23,500	sf	\$ 2.39	\$ 56,165
14	Gravel graded road	52,000	sf	\$ 0.55	\$ 28,600
15	3-inches mineral soil trails and graded road	75,500	sf	\$ 1.00	\$ 75,500
16	New Trail	1,443	sf	\$ 7.36	\$ 10,620
Subtotal, Trails and Graded Road					\$ 180,885
Units 3c, 3e, and 5					
17	Clear and grub 3c and 3e	16.5	Acre	\$ 1,000	\$ 16,500
18	Area 3c remove obstructions including chain link fence	1	LS	\$ 10,000	\$ 10,000
19	Clear 5 - light vegetation	1.0	Acre	\$ 5,000	\$ 5,000
20	Removed Cont. Soil/Duff Wetland	200	Ton	\$ 200	\$ 40,000
21	Off-site transport of mixed vegetation/soil (17 Acre)	3,400	Ton	\$ 32	\$ 108,375
22	Off-site disposal of mixed vegetation/soil (17 Acre)	3,400	Ton	\$ 42	\$ 142,800
23	Gravel for parking lot and driveway	5810	Ton	\$ 15	\$ 87,150
24	6-foot chain link fence	725	lf	\$ 50.00	\$ 36,250
25	Place and compact gravel at Unit 5	3,140	CY	\$ 5	\$ 15,700
26	Regrade Units 3c and 3e	16.5	Acre	\$ 1,000	\$ 16,480
27	3-inches compost 3c and 3e	6,655	CY	\$ 60	\$ 399,300
28	Revegetate 3c and 3e	16.5	Acre	\$ 66,000	\$ 1,089,000
29	Water truck for dust control, operator and truck	4.0	month	\$ 15,000	\$ 60,000
Subtotal, Units 3c, 3e, and 5					\$ 2,026,555
Testing					
30	Total Metals	50	EA	\$ 60	\$ 3,000
31	TCLP Metals	20	EA	\$ 160	\$ 3,200
32	XRF Field Testing	1	LS	\$ 4,000	\$ 4,000

Table A-5

Alternative 5 - Construction Estimate
 Maury Island Open Space Property FS
 Maury Island, Washington

Estimated field duration: 8 months

Project Name:	Maury Island Cleanup - Engineers Estimate
Location:	Maury Island, Washington
Date:	4/6/2017
Contractor:	
Prepared By:	David Dinkuhn
Approved By:	

Rev: 1

Item #	Item Description	Quantity	Unit	Unit Price	Total
	Subtotal Testing				\$ 10,200

	Reports				
33	Closure report	1	LS	\$ 20,000	\$ 20,000
	Subtotal, Reports				\$ 20,000
	Subtotal				\$ 2,701,640
34	Contingency 25%	1	LS	\$ 675,410	\$ 675,410
	Subtotal, with contingency	1	LS		\$ 3,377,051
	Misc				
35	Contractor markup 15%	1	LS	\$ 506,558	\$ 506,558
36	Insurance 1.5%	1	LS	\$ 50,656	\$ 50,656
37	B&O Tax .65%	1	LS	\$ 21,951	\$ 21,951
38	Ecology Costs	1	LS	\$ 10,000	\$ 10,000
39	Bond 2%	1	LS	\$ 67,541	\$ 67,541
40	Tax 8.6%	1	LS	\$ 290,426	\$ 290,426
	Grand Total				\$ 4,324,182

EXHIBIT E

List and Schedule of Deliverables

Date	Deliverable
2019	
June 15, 2019	Compliance Monitoring and Institutional Controls Plan
July 1, 2019	Phase 1A (Trail Capping) Engineering Plans and Specifications with Engineering Design Report
September 2019 – May 2020	Phase 1A Construction
Within 90 days of project physical completion	Phase 1A Final Report
Start submitting annually 1 year after physical completion of Phase 1A (May 2021)	Annual Monitoring Report for work done to-date
October 1, 2020	Phase 1B (Skeet Range Cleanup and Invasive Vegetation Removal Acres 4 - 6) Engineering Plans and Specifications with Engineering Design Report
April 2021 – August 2021	Phase 1B Construction
Within 90 days of project physical completion	Phase 1B Final Report
December 2021	Phase 2 Landscaping Plan and Specifications Complete
February 2022 – March 2022	Phase 2 (Plant Acres 4-6)
Within 90 days of project physical completion	Phase 2 Final Report
June 1, 2023	Phase 3 (Clear and Plant Acres 7 – 10, Wetland Remediation) Landscaping Plans and Specifications Complete
October 2023 – December 2023	Phase 3 Construction
Within 90 days of project physical completion	Phase 3 Final Report
Start submitting 1 year after	Five Year Report

submission of first annual report (Est. Q2 2025)	
June 1, 2026	Phase 4 (Clear and Plant Acres 11-13) Landscaping Plans and Specifications Complete
October 2026–December 2026	Phase 4 Construction
Within 90 days of project physical completion	Phase 4 Final Report
June 1, 2029	Phase 5 (Clear and Plant Acres 14-16) Landscaping Plans and Specifications Complete
October 2029–December 2029	Phase 5 Construction
Within 90 days of project physical completion	Phase 5 Final Report
Within 10 days of Completion of the Remedial Action	Record the Ecology-approved Restrictive Covenant with the office of the King County Auditor

Note:

The original CAP schedule concluded project work with Phase 4 in 2028. King County has revised and extended this schedule and added a Phase 5 to finish project work in 2029. Ecology hereby approves this extension of the original schedule as set out in the CAP and previously approved by Ecology.

EXHIBIT F

All cleanup actions at the Site, except for Phase 1A, require the following permits:

- Construction Stormwater General Permit for discharge of stormwater associated with construction activities to surface and groundwater under the authority of the Federal Water Pollution Control Act (U.S.C.S. 1251) and Chapter 90.48 RCW.

Phase 3, depending on the scale of wetland remediation required, may also require the following:

- Permit for the discharge of dredged, excavated or fill material to waters of United States pursuant to Section 404 of the Clean Water Act, 33 U.S.C. § 1344 (which may be incorporated in a U.S. Army Corps of Engineers (USCOE) Nationwide permit).

Exact permits will be more particularly identified as necessary during each phase of the cleanup.

EXHIBIT G

King County will meet the substantive requirements identified below by the King County Permitting Division for the following exempt permit to the extent the substantive requirements are applicable to this project. Where considerations (as opposed to requirements) are noted or recommended, the County will consider the same. For any mention of the potential need to obtain variances or approvals, King County would also be exempt from needing to obtain those local variances or approvals, but would consult further with the King County Permitting Division as necessary to meet the requirements of Agreed Order Section VII.P.

- King County Department of Local Services Permitting, Clearing and Grading Permit including compliance with the following:

Clearing and Grading

General Conditions

1) CA Review Comments

1. Wetland Report needs to include current rating system and buffer widths. Verify wetland boundary and confirm buffer widths to determine if parking area is proposed within buffer. If so buffer averaging would be required.

2) Zoning General Notes

1. Landscaping is not required for this use but discouraging parking along the shoulder is recommended.
2. Recommend evaluating safe crossing options for pedestrians and equestrians.

3) Plan Review Comments

1. Show/provide topography elevations, if not shown/provided on existing and proposed elevations.
2. Show/provide Temporary Erosion Sedimentation Control (TESC) plans if not shown/provided.
3. Show/provide geotechnical analysis/report/recommendations if not shown/provided for proposed grading for parking lot and 2:1 side slopes. Construction recommendations should be provided for guidance during construction.
4. Head in and perpendicular parking are proposed. Site plan does not show traffic direction or signage for direction.
5. Handicap parking and landing are proposed with paved surface. No route of travel from handicap parking to trails is shown.
6. If planting is proposed for weed removal area, show/provide planting plan and detail. If no planting is proposed, ensure area is stabilized after weed removal.

Engineering

Site

1) Noxious Weed Removal

The project is proposing to clear and remove the weeds of a certain area. The proposal will create a land disturbance of 7,000 Sf or greater. Per the 2016 KCSWDM, it states that land disturbance of 7,000 SF or more needs to address the full drainage review requirement of the drainage manual in a TIR. The engineer would need to provide a TIR showing how each of the Core and Special Requirement of the drainage manual is being mitigated/addressed for this proposed land disturbance. The engineer also needs to show how the proposed clearing of the area is mitigating

and addressing the erosion control requirements of the drainage manual.

2) Off-Site Analysis

The TIR for the parking area states that no off-site analysis was conducted because all runoff is infiltrated. Normally, all project that are required to address Core Requirement #2 requires providing an off-site analysis per the drainage manual. The 2016 KCSWDM requires addressing the concern of the system failing. It needs to examine that no downstream issues will be created, or existing problem will not be affected. Also, as part of the off-site analysis, examine the DOE 303 (D) listing for contaminant issue and address it in the TIR appropriately per the 2006 KCSWDM guidelines.

3) Parking Flow Control

The proposed parking surface is utilized as an infiltration system in addressing the flow control requirement of the 2016 KCSWDM for the parking area. But, the proposed infiltration system does not conform to any of the standard specified in the 2016 KCSWDM as an infiltration system. Normally, any non-standard flow control system is reviewed and approved through a SWM Variance Adjustment process as described in the 2016 KCSWDM.

4) Parking Surface

The paving surface for parking area is usually required to meet the standard off-street parking surface of the zoning code or the 2016 King County Road standard. The proposed paving for the parking under this project is not per the standard. The non-standard proposal will have to be examined on what would be the appropriate procedure in approving the paving surface being proposed.

5) Right-of-Way Frontage

As a standard, KCDLS would examine existing frontage right-of-way on the property to determine if the existing right -of-way is constructed to the standard classification of the road and does it warrant it.

6) Right-of-Way Shoulder

Proposing gravel shoulder within the road ROW has potential to invite people to park along the side of the road. This would have to be examined. Normally, the shoulder within the road ROW would need to comply with the King County Road Standard.

7) Sight Distance

As part of the road improvement, the SSD and Entering and exiting sight distance of the project may need to be examined for safety issues.

The two-driveway entrance to the parking area must meet the standard of the King County Road Standard.

8) Traffic

The proposed improvements to the site area with the proposed parking could increase the flow of traffic into the site area. We would normally examine the potential of impact of traffic flow to the area. We would examine if roadway improvements are warranted for the proposed site improvement. It should be examined if roadway improvement is necessary to accommodate additional traffic volume.

9) Trail Conditions

The trails are considered as new/replaced impervious surface. The engineer would need to address the full drainage review requirement of the 2016 KCSWDM for the proposed trails. The TIR for the trails would need to address each of the Core and Special requirements of the drainage manual, including but not limited to flow control requirements for the trail, examining how flow control BMPs are being mitigated with the proposal, and documenting how the proposed construction is mitigating the requirement for erosion control.

10) Water Quality

The proposed water quality treatment for the pollution generating aspect of the parking area was the water quality treatment process of the soils on-site. There are guidelines in the drainage manual for this type of treatment, but it has to meet all the criteria of the requirement for this type of water quality treatment.

Planning

Zoning

1) Accessibility and Circulation

For parking areas providing between 1 and 25 spaces, at least one accessible stall shall be provided. This space shall be van accessible and it shall be paved. An accessible route of travel shall be provided between the accessible spaces and the entrance to any buildings (max 100' traveled distance). ARTs shall be paved, 36" min width, and with a slope no greater than 1:20. Accessible connectivity should be provided to the trailhead. See KCC 21A.18.060 and IBC 2015.

Pedestrian circulation on the site shall be designed to minimize conflict. Bicycle and pedestrian access shall be provided within and onto the site. See KCC 21A.18.100.

2) Allowed Uses and Dimensional Standards

A park is an allowed use in the RA zones per KCC 21A.08.040.A, see development conditions under KCC 21A.08.040.B.1.

Per KCC 21A.12.220, non-residential structures shall maintain a 30' setback from all property lines. If the restroom is a permanent installation (vault toilet/CXT), this setback must be met. Parking areas may be located in the setback. Perimeter landscaping is not required for this use.

3) Parking Dimensional Standards & Circulation

See the table in KCC 21A.18.110.B. Ninety degree stalls should feature a drive aisle measuring 24' in width.

Note: Suggest modeling turning radii for trailered vehicles to ensure that drive aisles and parking space dimensions are adequate. County Code does not contain standards for equestrian or trailer parking.

4) Parking Levels

Required parking levels for this use are determined by the director, typically in conjunction with a parking demand study. If at least 6 vehicle spaces are proposed, bicycle parking in the form of a rack or lockers is required. One additional bicycle parking space for every 12 vehicle spaces shall be provided. The director may increase the required level of bicycle parking for uses such as parks that may attract additional bicycle traffic. See KCC 21A.18.030.

5) Parking Surface & Marking

Gravel is not an approved surfacing for parking areas in use for more than 5 days per week. Parking spaces shall be marked. See KCC 21A.18.120.

Site Development

Site Development

1) Boundaries of Clearing Limits

The boundaries of the clearing limits shown on this plan shall be clearly flagged in the field prior to construction. During the construction period, no disturbance beyond the flagged clearing limits shall

be permitted. The flagging shall be maintained by the permittee for the duration of construction.

2) Construction Entrances

Stabilized construction entrances and wash pads shall be installed at the beginning of construction and maintained for the duration of the project. Additional measures may be required to ensure that all paved areas are kept clean for the duration of the project. (RCW 46.61.655)

3) Contaminated Soils

All persons collecting or transporting contaminated soils shall take appropriate measures to avoid spillage during loading and transporting.

4) Contaminated Soils Stockpiled

Any contaminated soils stockpiled and stored on site for ANY length of time (but not to exceed 60 days) shall be placed on plastic sheeting (minimum 10 mil) and be entirely covered with plastic sheeting immediately after excavation. Berms shall be constructed around the contaminated soils to prevent run off of free liquids. These berms can be straw bales, mounded sand, concrete, or any other material which will form a barrier for contaminants or run-off. Run-off controls shall be checked on a daily basis and more often, if necessary, to ensure that they are working properly, especially during and after storm events.

5) Cut-Fill Slopes

Cut/fill slopes shall be no steeper than is safe for the intended use and shall not exceed 2 foot horizontal to 1 foot vertical unless otherwise approved by DDES.

6) Daily ESC Inspections

Permittee shall inspect the TE/SCP facilities at the end of each working day to assure himself that they are in good condition. If TE/SCP facilities require repair or maintenance, it shall be performed prior to the end of the working day. All disturbed areas shall be promptly and thoroughly stabilized against erosion during periods of wet weather when work is not being performed at the site.

7) Detailed Accounting

The permittee shall maintain an accounting of off site disposal activities. The accounting shall include date, number of trips, quantity, type of material, and destination.

8) De-watering Plan

In the event that the permittee encounters areas needing de-watering that have not been indicated on the approved plans, work, except for erosion control as needed to remedy unforeseen water quality problems, shall not commence nor continue until a de-watering plan, approved by King County DDES, is obtained.

9) Disposal in Sensitive Areas

The permittee shall not dispose of waste generated from construction activities or workers in a sensitive area and/or buffer or a Shoreline environment.

10) Disposed or Recycled

All uncontaminated, unsuitable, or surplus excavated soils, construction, demolition, or land clearing (CDL) debris to be removed from the site shall be disposed of or recycled in an approved, legal disposal or recycling site. It will be the permittee's responsibility to locate acceptable disposal or recycling sites and to assure that all surplus material and CDL debris is disposed of in those sites.

11) Disturbed Areas 48 hours

Any areas of exposed soils, including roadway embankments, that will not be disturbed for two days during the wet season (October 1 to March 31) or seven days during the dry season (April 1 to

September 30) shall be immediately stabilized with approved TESC measures (e.g., seeding, mulching, plastic covering, etc.) If a King County Community Plan and/or Basin Plan or the Department of Ecology Stormwater Manual have more conservative timelines for implementation of erosion control measures, the more stringent timelines shall apply.

12) Dust

Dust, dirt, and fly ash or airborne solids from any source shall not be emitted in quantities as to adversely affect adjacent property. (KCC 21A.22.070)

13) ESC Minimum

The ESC facilities shown on this plan are the minimum requirements for anticipated site conditions. During the construction period, these ESC facilities shall be upgraded (e.g. additional sumps, relocation of ditches and silt fences, etc.) as needed for unexpected storm events.

14) Geotechnical Inspection

Geotechnical consultant of record shall provide special inspections for all grading work proposed for parking areas and 2:1 slopes proposed. Written documentation shall be provided to applicant to verify site stabilization.

15) Hours of Operation

Permittee shall comply with the Hours of Operation as set forth in K.C.C. 12.86:

For heavy equipment used on construction sites, including crawlers, tractors, bulldozers, rotary drills and augers, loaders, power shovels, cranes, derricks, graders, off-highway trucks, ditchers, trenchers, compactors, compressors and other similar equipment, operating hours are between 7:00 a.m. and 7:00 p.m. weekdays and between 9:00 a.m. and 7:00 p.m. weekends;

For impact types of construction equipment, including pavement breakers, pile drivers, jackhammers, sandblasting tools or other types of equipment or devised that create impulse noise or impact noise, operating hours are between 8:00 a.m. and 5:00 p.m. on weekdays and 9:00 a.m. and 5:00 p.m. on weekends; and

For all other construction activities, operating hours are between 7:00 a.m. and 10:00 p.m. on weekdays and between 9:00 a.m. and 8:00 p.m. on weekends.

This condition does not apply to sound created by mineral extraction or materials processing operations, which are governed by K.C.C. chapter 21A.22.

16) Secure Stockpiles from Public

If stockpiling of contaminated soils occurs on site, the site must be secured to prevent public access.

17) Straw Mulch

Where straw mulch for temporary erosion control is required, it shall be applied at a minimum thickness of 2 inches.

18) Sweepers

Permittee shall be responsible for implementing all appropriate measures needed (i.e. paving, sweepers, and/or other techniques) to keep streets and roads used as haul routes for export or import of material clean and free from debris, mud, etc.

19) Temporary Erosion Sedimentation Control (TESC)

TESC best management practices shall be implemented on site prior to any clearing and grading activities. Standards per Appendix "D" of the King County Surface Water Design Manual for TESC

shall be used for reference.

20) Traffic Signs

Warning signs must also be installed prior to hauling and must conform to the Manual on Uniform Traffic Control Devices.

21) Turbidity

Turbidity caused by construction activities from this project shall not exceed Washington State water quality standards. Sediment larger than 0.075 mm shall not leave the site or enter on site wetlands, streams, lakes or other natural drainage features or existing constructed drainage systems which outlet to natural drainage features.

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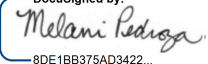
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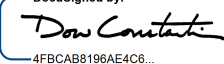
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