FINAL 100% DESIGN REPORT

Georgetown Flume

Prepared for

Seattle City Light

March 2008

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Prepared for

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1.0 Introduction

This Design Report is intended to provide an overview of the Georgetown Flume Removal Project in order to facilitate Agency review and oversight. Specifically, this document is intended to:

- Provide a written description of how the flume project is to be accomplished
- Describe specific means, methods, techniques, and equipment are specified for this project
- In cases where means and methods are left to the contractor, provide a description of how the City will monitor and control the work
- Provide a detailed description of how the project will comply with regulatory requirements.

This report is not a construction document and should not be used as a basis for cost estimating, bidding, or planning to perform the work. The actual work will be governed by the City Standard Plans and Specifications, the Project Manual (including Special Provision specifications, which are attached to this report), and the construction plans (also attached to this report).

The Seattle City Light (SCL) Georgetown Flume Removal Project involves removal of contaminated sediments from within the Georgetown Steam Plant (GTSP) flume and will implement controls so that the flume will no longer serve as a potential conveyance for contamination to reach Slip 4 of the Lower Duwamish Waterway (LDW). The project integrates Seattle Public Utilities (SPU) plans for replacing the storm water drainage function currently being performed by the flume with a fully enclosed piped system. Specifically, the project includes removal of contaminated sediment in and near the flume, removal of a small amount of contaminated soil at two electrical substations adjacent to the flume, demolition of the flume structure, and construction of a replacement stormwater drainage system.

1.1 Background

The LDW was added to the U.S. Environmental Protection Agency (EPA) National Priorities List (Superfund) in September 2001 because of chemical contaminants in sediments. The key parties involved in the Duwamish River Remedial Investigation/Feasibility Study (RI/FS) are the City of Seattle, King County, the Port of Seattle, and The Boeing Company working together for this project as the Lower Duwamish Waterway Group (LDWG), along with EPA and the Washington State Department of Ecology (Ecology). EPA is the lead regulatory agency for the sediment investigation and cleanup work under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Ecology is the lead regulatory agency for source

control work. Slip 4 activities are being conducted as a Non-Time-Critical Removal Action (NTCRA) under the Administrative Settlement Agreement and Order on Consent (ASAOC) and associated scope of work for the removal action in Slip 4 (Integral 2007).

Slip 4, an extension of the LDW, was identified as a candidate early action site by EPA and Ecology based primarily on elevated concentrations of PCBs. EPA determined that Slip 4 meets the criteria for initiating a removal action under CERCLA and that this removal is non-time-critical. The process used by EPA to identify early action sites followed both the National Contingency Plan (NCP), which requires that threats to human or animal populations, sensitive ecosystems, or other significant factors affecting the health or welfare of the public or environment be considered when identifying removal actions (40 CFR §300.415), and EPA guidance for NTCRAs.

EPA Region 10 is the agency with oversight authority over the Lower Duwamish Waterway Superfund site and Slip 4 Early Action Area. Ecology is the agency with authority over source control actions to protect Slip 4 from recontamination. Because the flume removal action involves both source control and cleaning of the outfall to Slip 4, both agencies have authority over portions of the project.

Work performed in the lower 400 feet of the flume will be conducted pursuant to the Slip 4 Early Action Area ASAOC No. 10-2006-0634. This includes any reconstruction of the flume outfall structure, which must be designed so as not to interfere with the Slip 4 sediment cap as described in the Lower Duwamish Water Slip 4 Early Action Area Engineering Evaluation/Cost Analysis (Integral 2006) and the Slip 4 100% Design Analysis Report (Integral 2007). Removal of contaminated sediments within the flume upstream of the bottom 400 feet, as well as the contaminated wooden structure, will also be conducted under EPA oversight because the work is considered to be critical to preventing recontamination of the planned sediment cap in Slip 4.

Elimination of potentially contaminated inputs to the flume will be conducted pursuant to the Ecology Source Control Action Plan for Slip 4. This will include abandoning or re-routing of drain pipes that drain to the flume and redirecting overland stormwater flow on SCL property. Removal of contaminated soil outside of the flume structure will be conducted under the Model Toxics Control Act (MTCA). Ecology is the regulatory authority for such cleanup actions.

1.2 Removal Action Objectives

The overall goal of this removal action is to eliminate the GTSP flume as a potential conveyance for ongoing contamination to Slip 4. Based on site characterization data, this goal can be accomplished through the following removal action objectives:

- Eliminate all unauthorized drains into the flume.
- Remove all sediment in the flume.
- Remove contaminated soil immediately surrounding the flume with PAH concentrations above MTCA industrial properties soil cleanup levels.

- Remove PCB-contaminated soils above MTCA method A unrestricted land use soil cleanup levels at Willow Street and Ellis electrical substation sites (although the property qualifies for industrial cleanup levels, SCL has made a policy decision to remove PCBs to a more stringent standard due to concerns about PCBs in Slip 4).

- Provide for stormwater conveyance for the GTSP property and the South Myrtle Street right of way.

- Do not interfere with effectiveness of the planned Slip 4 removal action.

1.3 Site Description

The Georgetown flume site is located on property owned by SCL that extends from the north end of King County International Airport to East Marginal Way South in Seattle, Washington (Figure 1-1). Areas adjacent to the northwest, north, northeast, east and southeast of the flume are occupied by The Boeing Company (Boeing) and the Washington Air National Guard (WANG). Adjacent commercial properties include a motel and distribution business to the southwest of South Myrtle Street and a City of Seattle storage yard to the west. The flume runs roughly parallel to Ellis Street until it goes under East Marginal Way South, and out to Slip 4. South Willow Street and South Myrtle Street both dead end at the flume. Approximately 50 percent of the flume is located within the North Boeing Field security fence.

The flume has been divided into six segments (A through F) based on structural characteristics identified during the characterization process (Table 1-1). Demolition options also were developed based on these characteristics. Although the plans and specifications do not call out these segment labels, this document describes actions to be performed along each segment to be consistent with earlier documents. The segment designations do not imply a certain construction sequence. The construction sequence will be determined by the contractor; however, a suggested sequence is provided in the design documents and is the basis of the engineer's estimate. The suggested work sequence is presented in Section 2.1.

Table 1-1. Georgetown flume segment summary descriptions.

Segment A	Segment B	Segment C	Segment D	Segment E	Segment F
Slip 4 to Manhole M100	Manhole M100 to Wood-Lined Open Channel	Wood-Lined and Concrete-Lined Open Channel	Twin 42-inch Concrete Pipes	Concrete-Lined Open Channel	Steam Plant Tunnel and Condenser Pit
205 feet of buried 72-inch CMP culvert	165 feet of buried 72-inch CMP culvert	1,126 feet of wood-lined open channel, 100 feet of culvert, and 38 feet of concrete-lined open channel	365 feet of buried pipe	120 feet of concrete-lined open channel	250 feet of buried 10-foot diameter concrete tunnel

CMP – corrugated metal pipe
Note: Segment designations do not imply a certain construction sequence.

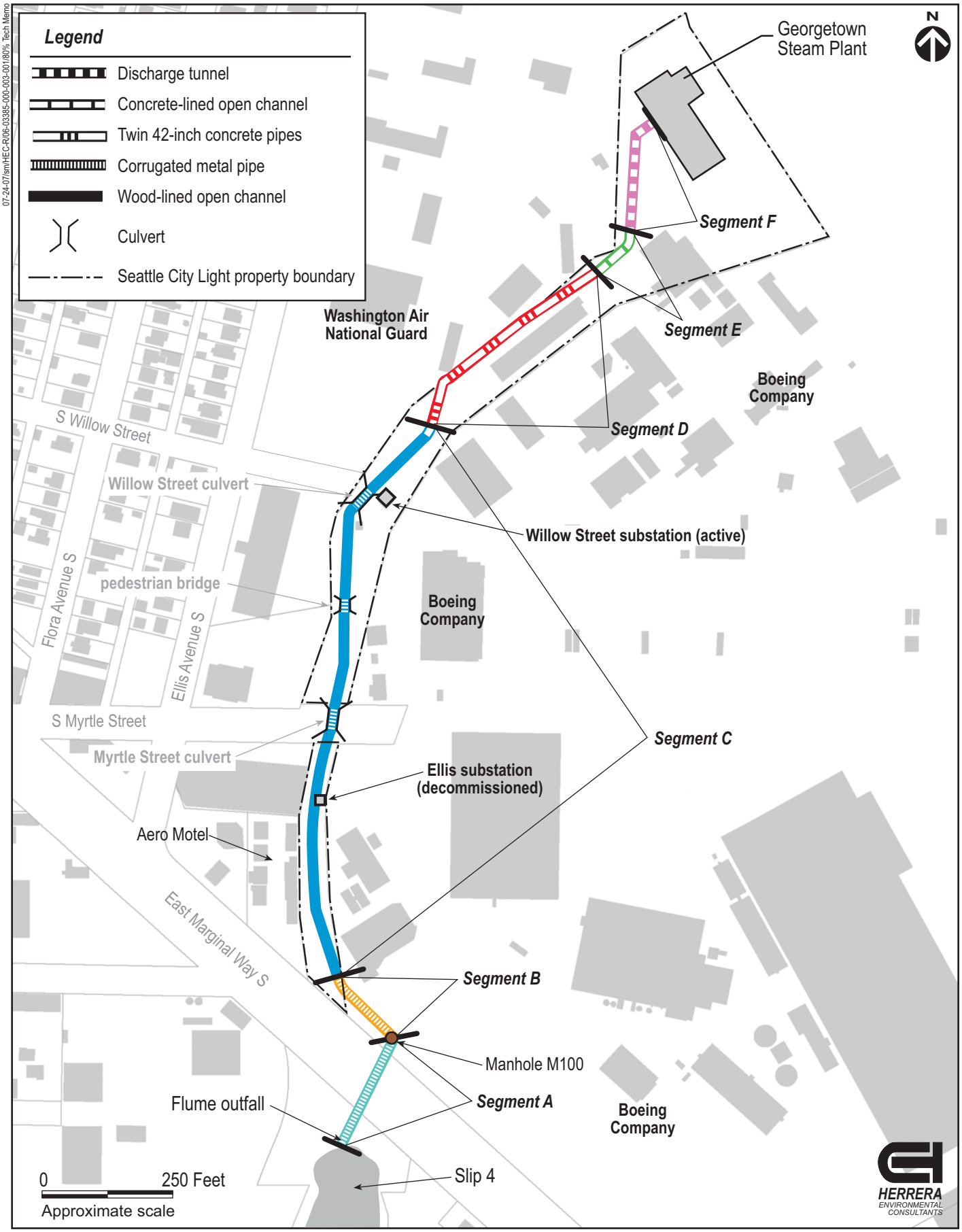


Figure 1-1. Georgetown flume.

Currently, the flume directs water that collects from the GTSP roof drains, as overland flow from surrounding land, and from pipes associated with neighboring property operations for discharge to Slip 4 on the Duwamish Waterway. Historically, inputs to the flume have not been strictly controlled; eight pipes have been identified as entering the flume along much of its length. This project involves demolition of the entire flume and providing an alternate delivery system for stormwater sources identified as acceptable by the City, including the GTSP roof drains, surface drainage near South Myrtle Street, and the eight existing pipes (described further in Section 2.0).

1.4 Property Ownership and Land Use

The flume is located on property owned by SCL until it reaches East Marginal Way South. The flume discharges to Slip 4, which is currently owned by Crowley Marine Services. The upper half of the flume property is leased to Boeing for its North Boeing Field operations. With the exception of four parcels, all land adjacent to the flume property is owned by King County. All land immediately adjacent to the flume property is paved.

The nearest residential area is approximately 300 feet to the west of the flume property, across Ellis Street South.

2.0 Construction Strategy

The Georgetown Flume Removal Project involves removal of all sediment in the flume, removal or abandonment of the existing flume structure, installation of a replacement drainpipe connecting the GTSP to Slip 4, and installation of a tide valve to block tidewater from entering the new drain system. Sediment in the flume and soil surrounding the flume have been characterized and found to contain contaminants regulated by the Toxic Substances Control Act (TSCA) and MTCA. The project will be conducted to comply with both sets of regulations regarding control and management of contaminated materials. This section first identifies planned activities that apply to work across all flume segments and then those that apply to each segment individually. Figures 2-1 and 2-2 provide a detailed representation of the flume; Sheet references pertain to design plan sheets that have been provided separately from this report.

Removal of the existing flume structure will include abandonment of eight existing pipe inputs identified during investigations conducted in 2005 and 2006. Abandonment of these pipes serves as a contaminant source control measure for the project. Each pipe is described and an explanation provided for how drainage from each will be managed following flume reconfiguration. Sheet references and station locations are provided for each pipe; however, not all pipes are indicated on the drawings. This is due to one of three reasons: 1) Boeing was not able to provide adequate information, 2) the pipe has already been capped or rerouted and therefore is not part of the project, or 3) the pipe was inadvertently missed during our survey and base-mapping effort.

- 24-inch vitrified clay pipe that enters Manhole M100 and drains portions of North Boeing Field – Boeing will redirect this drainage to the North Boeing Field system (Sheet C205, Station 22+12).

- 18-inch wood stave pipe that enters Manhole M100 and drains portions of North Boeing Field – Boeing will redirect this drainage to the North Boeing Field system (Sheet C205, Station 22+12).

- 4-inch plastic pipe discharging water from a laundry facility at the Aero Motel at the bottom of Segment C – this pipe was capped at the edge of the flume in 2005 and the discharge was connected to the existing drain field (Sheet C204, Drainfield Area).

- 8-inch drain from the Aero Motel parking lot near the laundry connection – this pipe will be connected to new drainage system (Sheet C204, Station 19+26).

- 4-inch drain from an area inlet that collects runoff from behind the Aero Motel was previously capped at the flume wall – this pipe will be connected to new drainage system (Sheet C204, Station 17+14).

- 8-inch concrete pipe near South Myrtle Street discharges street runoff from the southern shoulder of the road right-of-way – this runoff will discharge to the new drainage system (Sheet C204, Station 16+62).

- 4-inch clay pipe located near South Willow Street was determined to be an abandoned drainage pipe – this pipe will be removed to the limits of the demolition project (Sheet C103, Station 10+60, not shown on drawing).

- 12-inch connection inside the southern barrel of the twin 42-inch pipes connects to a Boeing catch basin and will be disconnected from the flume – Boeing will redirect this drainage to the North Boeing Field system (Sheet C101, Station 3+80).

2.1 Overall Construction Approach

Detailed construction requirements are provided in the Project Manual, which consists of City of Seattle Standard Specifications and Special Provisions, as well as the project plans and attachments. The following sections address project roles and responsibilities, contractor submittals, construction records, and management of contaminated media.

2.1.1 Roles and Responsibilities during Construction

The Georgetown Flume Removal project is being funded and managed jointly by SCL and SPU. Contracting and construction management services will be provided by SPU. An SPU inspector (Resident Engineer) will be assigned to do full time construction oversight and will be responsible for ensuring that the contractor's work activities follow the contract document requirements.

SCL will provide third party construction management support for issues related to contaminated media through a separate contract, to include:

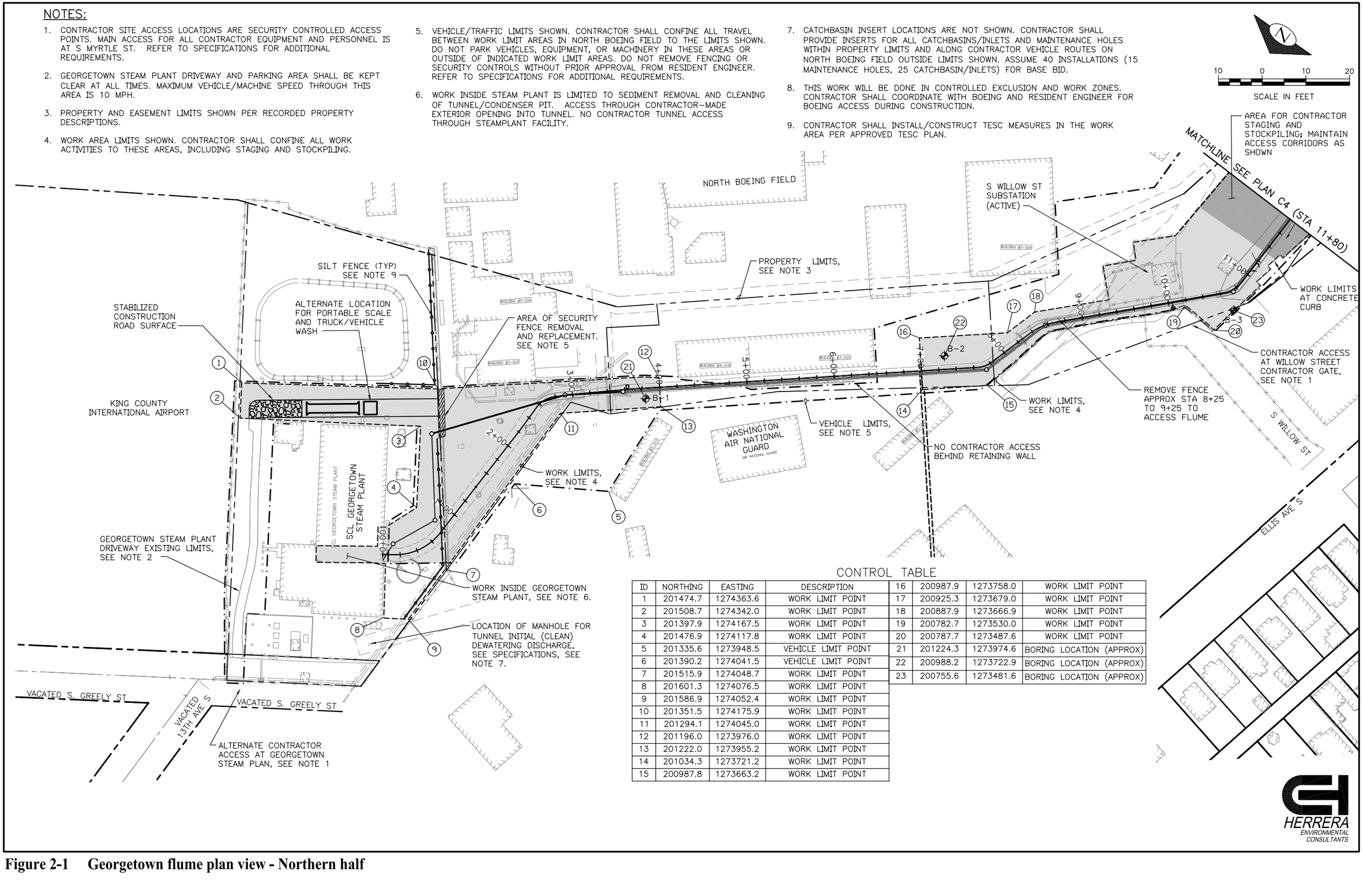
- Review of submittals that pertain to the contaminated media removal and disposal.

- Oversight of contractor work practices as they relate to the removal and disposal of contaminated media.

- Sampling of soil and concrete to determine residual contamination levels during and following the cleanup process (a separate Confirmation Sampling Plan will be submitted to Ecology for approval prior to construction).

NOTES:

1. CONTRACTOR SITE ACCESS LOCATIONS ARE SECURITY CONTROLLED ACCESS POINTS. MAIN ACCESS FOR ALL CONTRACTOR EQUIPMENT AND PERSONNEL IS AT S MYRTLE ST. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. GEORGETOWN STEAM PLANT DRIVEWAY AND PARKING AREA SHALL BE KEPT CLEAR AT ALL TIMES. MAXIMUM VEHICLE/MACHINE SPEED THROUGH THIS AREA IS 10 MPH.
3. PROPERTY AND EASEMENT LIMITS SHOWN PER RECORDED PROPERTY DESCRIPTIONS.
4. WORK AREA LIMITS SHOWN. CONTRACTOR SHALL CONFINE ALL WORK ACTIVITIES TO THESE AREAS, INCLUDING STAGING AND STOCKPILING.
5. VEHICLE/TRAFFIC LIMITS SHOWN. CONTRACTOR SHALL CONFINE ALL TRAVEL BETWEEN WORK LIMIT AREAS IN NORTH BOEING FIELD TO THE LIMITS SHOWN. DO NOT PARK VEHICLES, EQUIPMENT, OR MACHINERY IN THESE AREAS OR OUTSIDE OF INDICATED WORK LIMIT AREAS. DO NOT REMOVE FENCING OR SECURITY CONTROLS WITHOUT PRIOR APPROVAL FROM RESIDENT ENGINEER. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
6. WORK INSIDE STEAM PLANT IS LIMITED TO SEDIMENT REMOVAL AND CLEANING OF TUNNEL/CONDENSER PIT. ACCESS THROUGH CONTRACTOR-MADE EXTERIOR OPENING INTO TUNNEL. NO CONTRACTOR TUNNEL ACCESS THROUGH STEAMPLANT FACILITY.
7. CATCHBASIN INSERT LOCATIONS ARE NOT SHOWN. CONTRACTOR SHALL PROVIDE INSERTS FOR ALL CATCHBASINS/INLETS AND MAINTENANCE HOLES WITHIN PROPERTY LIMITS AND ALONG CONTRACTOR VEHICLE ROUTES ON NORTH BOEING FIELD OUTSIDE LIMITS SHOWN. ASSUME 40 INSTALLATIONS (15 MAINTENANCE HOLES, 25 CATCHBASIN/INLETS) FOR BASE BID.
8. THIS WORK WILL BE DONE IN CONTROLLED EXCLUSION AND WORK ZONES. CONTRACTOR SHALL COORDINATE WITH BOEING AND RESIDENT ENGINEER FOR BOEING ACCESS DURING CONSTRUCTION.
9. CONTRACTOR SHALL INSTALL/CONSTRUCT TESC MEASURES IN THE WORK AREA PER APPROVED TESC PLAN.



CONTROL TABLE

ID	NORTHING	EASTING	DESCRIPTION
1	201474.7	1274363.6	WORK LIMIT POINT
2	201508.7	1274342.0	WORK LIMIT POINT
3	201397.9	1274167.5	WORK LIMIT POINT
4	201476.9	1274117.8	WORK LIMIT POINT
5	201335.6	1273948.5	VEHICLE LIMIT POINT
6	201390.2	1274041.5	VEHICLE LIMIT POINT
7	201515.9	1274048.7	WORK LIMIT POINT
8	201601.3	1274076.5	WORK LIMIT POINT
9	201586.9	1274052.4	WORK LIMIT POINT
10	201351.5	1274175.9	WORK LIMIT POINT
11	201294.1	1274045.0	WORK LIMIT POINT
12	201196.0	1273976.0	WORK LIMIT POINT
13	201222.0	1273955.2	WORK LIMIT POINT
14	201034.3	1273721.2	WORK LIMIT POINT
15	200987.8	1273663.2	WORK LIMIT POINT
16	200987.9	1273758.0	WORK LIMIT POINT
17	200925.3	1273679.0	WORK LIMIT POINT
18	200887.9	1273666.9	WORK LIMIT POINT
19	200782.7	1273530.0	WORK LIMIT POINT
20	200787.7	1273487.6	WORK LIMIT POINT
21	201224.3	1273974.6	BORING LOCATION (APPROX)
22	200988.2	1273722.9	BORING LOCATION (APPROX)
23	200755.6	1273481.6	BORING LOCATION (APPROX)

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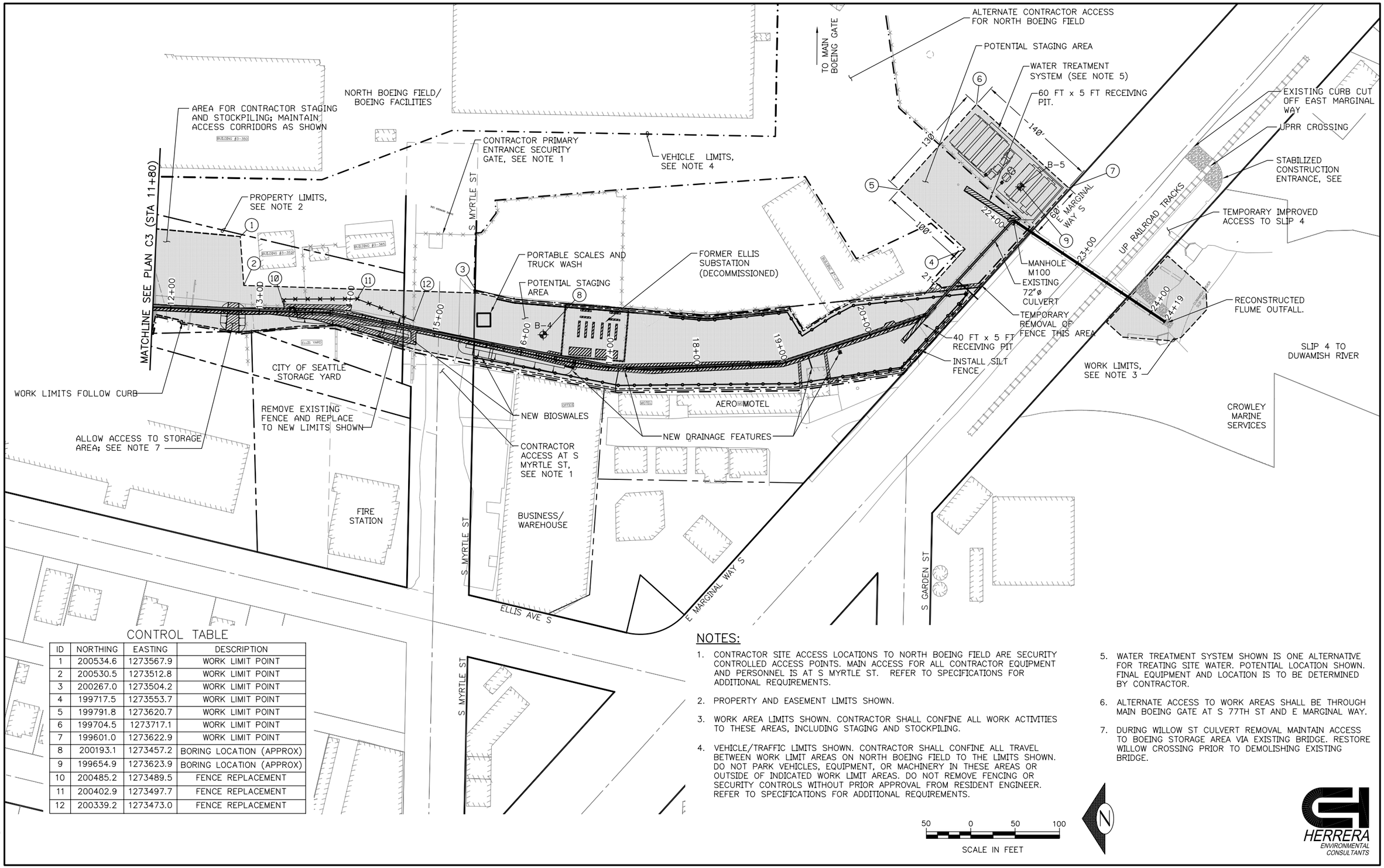
Figure 2-1 Georgetown flume plan view - Northern half



CONTROL TABLE

ID	NORTHING	EASTING	DESCRIPTION
1	200534.6	1273567.9	WORK LIMIT POINT
2	200530.5	1273512.8	WORK LIMIT POINT
3	200267.0	1273504.2	WORK LIMIT POINT
4	199717.5	1273553.7	WORK LIMIT POINT
5	199791.8	1273620.7	WORK LIMIT POINT
6	199704.5	1273717.1	WORK LIMIT POINT
7	199601.0	1273622.9	WORK LIMIT POINT
8	200193.1	1273457.2	BORING LOCATION (APPROX)
9	199654.9	1273623.9	BORING LOCATION (APPROX)
10	200485.2	1273489.5	FENCE REPLACEMENT
11	200402.9	1273497.7	FENCE REPLACEMENT
12	200339.2	1273473.0	FENCE REPLACEMENT

NOTES:

1. CONTRACTOR SITE ACCESS LOCATIONS TO NORTH BOEING FIELD ARE SECURITY CONTROLLED ACCESS POINTS. MAIN ACCESS FOR ALL CONTRACTOR EQUIPMENT AND PERSONNEL IS AT S MYRTLE ST. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. PROPERTY AND EASEMENT LIMITS SHOWN.
3. WORK AREA LIMITS SHOWN. CONTRACTOR SHALL CONFINE ALL WORK ACTIVITIES TO THESE AREAS, INCLUDING STAGING AND STOCKPILING.
4. VEHICLE/TRAFFIC LIMITS SHOWN. CONTRACTOR SHALL CONFINE ALL TRAVEL BETWEEN WORK LIMIT AREAS ON NORTH BOEING FIELD TO THE LIMITS SHOWN. DO NOT PARK VEHICLES, EQUIPMENT, OR MACHINERY IN THESE AREAS OR OUTSIDE OF INDICATED WORK LIMIT AREAS. DO NOT REMOVE FENCING OR SECURITY CONTROLS WITHOUT PRIOR APPROVAL FROM RESIDENT ENGINEER. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
5. WATER TREATMENT SYSTEM SHOWN IS ONE ALTERNATIVE FOR TREATING SITE WATER. POTENTIAL LOCATION SHOWN. FINAL EQUIPMENT AND LOCATION IS TO BE DETERMINED BY CONTRACTOR.
6. ALTERNATE ACCESS TO WORK AREAS SHALL BE THROUGH MAIN BOEING GATE AT S 77TH ST AND E MARGINAL WAY.
7. DURING WILLOW ST CULVERT REMOVAL MAINTAIN ACCESS TO BOEING STORAGE AREA VIA EXISTING BRIDGE. RESTORE WILLOW CROSSING PRIOR TO DEMOLISHING EXISTING BRIDGE.

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Figure 2-2 Georgetown flume plan view - Southern half

- Sampling of water, if deemed necessary, to provide a check on contractor performance.
- Review of daily reports.
- Support to the Resident Engineer, as needed.

The contractor will be responsible for completion of the work, as stipulated in the Project Manual. This may require the use of subcontractors, including one that provides environmental support to produce submittals, implement controls in the field, and document activities.

The contractor will be responsible for testing related to waste disposal; however, all lab data will be reviewed by the City prior to signing off on waste shipping papers.

2.1.2 Use of Submittals to Control Work

The Project Manual stipulates a list of plans and specific submittals that the contractor will submit to the Resident Engineer for approval. These submittals include the following:

- Submittal Control Document
- Critical Path Schedule
- Work Plan (includes dewatering, water testing and treatment, waste testing and disposal)
- Site Control Plan
- Temporary Erosion and Sediment Control Plan (TESC Plan)
- Traffic Control Plan
- Spill Prevention Control and Countermeasures Plan (SPCC Plan)
- Health and Safety Plan
- Copy of all permits required by the contractor (including street use)
- Materials Catalog Cuts and shop drawings.

2.1.3 Construction Records

Once submittals have been successfully reviewed and approved for compliance with the Project Manual, the Resident Engineer will use detailed construction record keeping to monitor the progress of the contractor.

Daily reports will be completed to provide an accurate record of work completed day to day and allow the Resident Engineer to accurately predict special inspection dates, delivery dates for equipment, dates for off-site shipment, etc.

Photos will be taken by the Resident Engineer to document existing and final conditions, as well as the manner and quality in which work is completed. Progress reports and meeting minutes will allow for the Resident Engineer to monitor the financial level of completion based on the actual work completed to date and correct the contractor if necessary to ensure compliance with the project manual or completion within the specified work windows.

During the course of the work the contractor will be required by the specifications to document the locations of contaminated material removal, material replacement, and the newly constructed drainage system through hand-marked contract drawings and surveying (as-builts). The Resident Engineer will verify the accuracy of these drawings through field checks during the course of the work. Final as-built drawings will be certified by the engineer-of-record or the Resident Engineer and will be archived by SCL and SPU.

2.1.4 Management of Contaminated Material

Site characterization efforts and removal design planning have identified the following types of contaminated or potentially contaminated media that require management during this project:

- TSCA-regulated sediment and soil (PCB concentrations equal to or greater than 50 parts per million [ppm])
- CERCLA regulated sediment (low-level PCB, PAH, and metals concentrations)
- MTCA regulated soil (low-level PCB, PAH, and metals concentrations)
- Water from stockpile drainage, flume (pipe) cleaning operations, and excavation dewatering
- Creosote-treated wood from demolition of the flume
- Concrete flume surfaces
- Metal from piping, fencing, and miscellaneous structures.

All sediment in the flume will be considered as contaminated; most will be removed and disposed of at a permitted Subtitle D landfill, with a small quantity that exceeds 50 ppm PCBs disposed at a RCRA Subtitle C landfill.

Site characterization efforts have determined that soil adjacent to the flume contains PAHs, metals, and PCBs (one location) at concentrations between MTCA method A cleanup levels for unrestricted land use and the cleanup levels for industrial sites. Because the flume project area

qualifies as an industrial site according to MTCA (Herrera 2007), soil removal will be limited to that required to meet cleanup levels for industrial sites. However, SCL has made a policy decision to remove all soil containing PCBs at concentrations exceeding the MTCA method A unrestricted land use level of 1 ppm (the same criterion will be applied to concrete, as determined by destructive testing). Based on current data, PCB-contaminated soil is limited to the two substations bordering the flume and at one location immediately beneath the flume.

2.1.4.1 TSCA-regulated Sediment and Soil

PCBs at concentrations greater than 50 ppm have been identified in sediment within Segment E (estimated 4 cubic yards) and in soil at the Willow Street electrical substation (estimated 3 cubic yards). This TSCA-regulated material will be managed separately from other sediment and soil removed as part of the project to allow for proper documentation associated with transport and disposal. At Willow Substation, confirmation sampling conducted by SCL will be used to determine the limits of the TSCA regulated soil. All TSCA-regulated material will be disposed of at a Subtitle C landfill, as required.

2.1.4.2 CERCLA-regulated Sediment

With the exception of the TSCA-regulated sediments discussed above, flume and outfall sediments are contaminated with low levels of PCBs, PAHs, and some metals. All non TSCA sediment in the flume and outfall will be removed and disposed of in a permitted, Agency approved subtitle D landfill. Sediment removed from the flume (200 cubic yards) will contain varying amounts of water, depending on site conditions and the removal technique employed. The selected disposal facility will determine the amount of water allowed based on their established waste acceptance criteria, as determined by their operations permit. Sediment will be loaded directly into water-tight containers for transport offsite if possible. If dewatering is necessary prior to transport offsite, stockpile controls will be employed to limit wind and rain exposure, as stipulated in the Project Manual. Water that drains from stockpiles will be captured, collected, and tested prior to discharge to the sewer system (discussed below).

MTCA-regulated Soil

Soil removal will be conducted as part of two different activities:

- Removal required to meet Remedial Action Objectives (400 cubic yards). This includes removal of soil above MTCA industrial cleanup levels plus additional removal of PCB-contaminated soil above the MTCA unrestricted land use cleanup level. All soil that does not exceed TSCA limits will be disposed of in a Subtitle D landfill.

- Removal required to install the new drainage system (1600 cubic yards).

    - Soil must be removed to keep the excavation from sloughing into the void left after the structure is removed and to prepare the trench for pipe bedding material. Shoring systems that would eliminate

the need for this soil removal were evaluated, but were not specified explicitly in the design because they complicate confirmation testing and installation of the HDPE pipe. Confirmation testing would require selective removal of sheet pile sections and then replacement after samples are collected. Also, the lateral supports that maintain the integrity of the excavation support would need to be removed and repositioned to prevent interference with pipe installation while simultaneously meeting applicable codes for an excavation support system. If the shoring system were to employ cross bracing to support the walls, rolling welded HDPE pipe into the trench would require additional welding and cutting, or jacking and unjacking, of support members. This would increase the number of days and laborers required to install the drainage system.

- Soil must be removed for the new trench that bypasses the existing tunnel, from two receiving pits required for sliplining HDPE pipe within existing corrugated metal pipe (CMP), and from locations where overexcavation is required for manholes to be installed. All soil to be excavated is considered unsuitable for backfill and will be removed from the site. It may contain low concentrations of contamination (below remedial action objective levels) and will be disposed of at a Subtitle D landfill. All excavated soil will be sampled prior to final disposal.

Soil left in place with contaminant concentrations between unrestricted and industrial cleanup levels will be covered with clean backfill as a capping measure to limit future potential exposure.

2.1.4.3 Water

Water can be expected to be generated from dewatering of sediment removed from the flume and Slip 4 (either naturally accumulated or introduced through the cleaning process), from water used to clean the flume, and from dewatering associated with excavations that extend below the water table. Stormwater associated with rainfall events also is expected to accumulate in the flume (the project has been scheduled to minimize the likelihood of large storm events). Water generated from stockpiles or from excavations will be collected and stored onsite, tested, and then either treated or not prior to discharge to the King County sewer system; treatment requirements will be determined by the discharge permit obtained by SCL prior to commencement of work. During site investigation activities, no contamination was found in the single shallow ground water sample collected from adjacent to the wood flume structure at South Myrtle Street.

The contractor will assemble a water storage and treatment system prior to commencement of removal activities. Enough storage capacity will be required to accommodate any water generated by the contractor, which will depend on standing water in the flume, water used to clean the flume, climatic conditions during the project, and the ground water removal rate required to work in the excavations. The treatment system must be able to meet King County

discharge requirements. The plans identify gravity separation, sand filter, bag filter, and activated carbon filter as possible treatment steps based on the contaminants of concern at the site.

Sampling of water quality prior to discharge to the sewer will be conducted by the contractor based on permit requirements.

2.1.4.4 Wood

The wood used to construct the flume was treated with creosote. Creosote-treated wood (approximately 120 tons) will be stockpiled onsite and transported to a RCRA Subtitle D landfill. The contractor will complete any sampling and analysis necessary to meet waste disposal facility acceptance criteria.

2.1.4.5 Concrete

Contaminated sediment has come into contact with concrete portions of the flume. Although PCBs have been known to leach into concrete, this is normally facilitated by an oily carrier matrix or solvents in paint containing high concentrations of the chemical. Flume concrete is not expected to be contaminated, based on the lack of observable oil and relatively low concentrations found in the sediment. Destructive concrete samples will be collected by SCL following cleaning at several locations previously in contact with sediment to confirm remaining concrete will not be a future source of PCBs. Any concrete containing PCBs above 1 mg/kg will be removed. Concrete above the sediment line is assumed to be clean and will not be tested. Limited amounts of "clean" concrete (approximately 340 tons) will be removed at transition locations between different flume structural sections, or to eliminate undesirable surface features such as curbing.

Clean concrete will be segregated from contaminated concrete. Demolished clean concrete will either be crushed and used onsite for backfill or will be taken offsite, as determined by the contractor. Concrete that is determined to be contaminated will be sent offsite for disposal based on the PCB concentrations.

2.1.4.6 Metal

A small amount of metal will be removed from the site, primarily CMP at manhole M100 and fencing that covers open portions of the flume. Metal that has come in contact with contaminated media will be decontaminated prior to transport offsite. Metal may then be recycled or disposed of, as determined by the contractor.

2.1.5 Special Requirements for Work in North Boeing Field

Work in and around North Boeing Field will require that the contractor and subcontractors follow special security procedures, including:

- Security Badging – Obtaining temporary photo badging and access clearance for all workers will be required to work within the Boeing security perimeter. Accessing areas outside of identified work areas by contractor personnel will be limited based on permissions provided by Boeing.

- Vehicle Clearance – All equipment brought onto the work site within the Boeing secure perimeter will be required to undergo inspection; the contractor will ensure that all vehicles carry all required markings and certifications.

- Boeing Perimeter Breach – The perimeter fence includes locations that a contractor may propose to pass in order to more effectively complete the removal action and drainage system construction. Where these events occur is dependent upon the contractor's means and methods. Alternative locations are indicated on the contract drawings. Additionally, some sections of the perimeter fencing are being relocated to accommodate Seattle Public Utility access to new drainage features such as maintenance holes and bioswales. For each requested breach in the perimeter security fencing system, the contractor will provide Boeing the required notification time and will pay for Boeing security personnel to be present to ensure that the integrity of the overall security system is maintained. The contractor will also replace the removed fencing with fencing that meets Boeing's current standards.

2.1.6 Replacement Drainage System

The new drainage system that will replace the existing flume structure for stormwater conveyance will be constructed of high density polyethylene (HDPE) pipe material. This material has been selected because it can be constructed without joints using butt-fusion thermal welding. Eliminating joints greatly minimizes the potential for groundwater seepage into the new conveyance system. Pipe diameter will generally increase along the alignment, ranging from 8 inches at the Georgetown Steam Plant up to 24 inches at the outfall.

Pipe sections will be laid in straight alignments with maintenance holes located at deflections. Pipe diameter changes also will occur at these structures (station locations are indicated in Table 2-1; design plan sheets C201 through C205 provide plan and profile views of the replacement drainpipe). The maintenance holes will be precast concrete units and will be sealed internally with an epoxy-based coating system to help reduce infiltration by groundwater into the new drainage system. Pipe connections to the maintenance holes will be made by special flexible couplings that minimize deflection in the plastic pipe that could occur from potential settlement of the structures.

Table 2-1. Replacement drainpipe descriptions.

New Drainage Pipe Diameter (Length, feet)	Segment	Stationing Start	Stationing End
8” (176)	F	00+00	1+57
12” (202)	F, E	1+57	3+62
18” (1,018)	D	3+62	13+80
24” (833)	C, B, A	13+80	20+67

Notes:

1) Stationing can be referenced on design plan sheets
2) Lengths of pipe do not correlate directly to stationing, as the pipe alignment does not always follow the existing flume alignment

2.1.7 Project Sequencing

While the actual construction work sequence will be determined by the contractor based on planned use of site features, equipment, staffing, and environmental conditions, the contract drawings provides for a suggested construction sequence that may be followed. Figures 2-1 through 2-3 illustrate some of the key project elements that are described in the sequencing; additional references to design plan sheets also are provided (design plan sheets C101 through C105 provide plan and profile views of the demolition and removal of the existing flume). The probable construction sequencing is as follows:

1. Upon receiving notice to proceed from SCL, obtaining the necessary security clearances from Boeing and giving adequate notice to Burlington Northern Santa Fe Railroad, the contractor will install security measures around the project perimeter outside of North Boeing Field and begin to establish working areas.

2. The contractor will install the appropriate TESC measures and pollution prevention controls around the site, including the silt screen and oil boom at Slip 4 (Figure 2-3), truck tire washes, and stabilized construction entrances. This will be followed by general clearing and grubbing in the upland areas of Slip 4, unpaved areas of the flume removal sections and the steam plant property where new pipe will be constructed and tunnel access made. The access road to the outfall at Slip 4 will be constructed and stabilized.

3. Concurrent with TESC installation, groundwater dewatering treatment equipment will be sited near manhole M100 and assembled. The discharge connection to the permitted sewer manhole will be installed and the system made operational (Sheets C4 and G6).

4. The outfall cover plate will be installed during a low tide event. This activity will take several days of consecutive low tides in order to excavate

the front of the outfall, establish a stable working surface at the end of the pipe, remove the existing grating, clean and inspect the concrete, and install the new steel plate and gaskets (C108).

5. Flume dewatering equipment, including pumps at M100, will be installed and operational after the plate has been inspected and approved by the resident engineer.

6. Sheet piling or sheeting will be installed along the suspected drain field behind the Aero Motel to protect this area from damage during the flume removal (Sheet C104).

7. Steam plant roof drains will be disconnected from the flume at the existing blow off tank and rerouted to a temporary on-site storage tank before discharge to the sewer. This discharge will be made to a sewer manhole at the steam plant site (Sheet C3).

8. The steam plant tunnel (Segment F) will be dewatered and stored onsite for testing and treatment prior to disposal into the sewer.

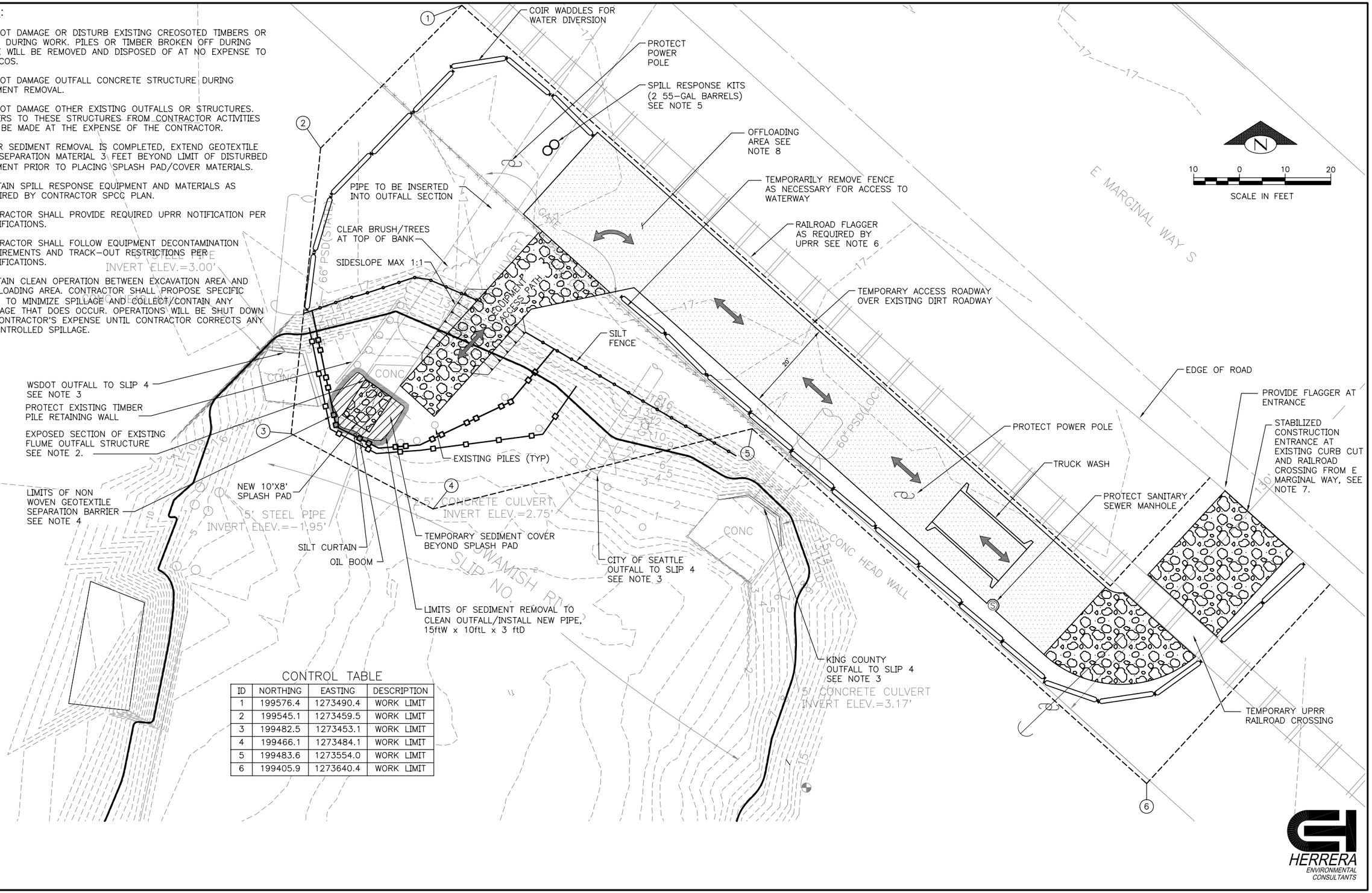
9. The contractor will excavate the tunnel roof near the steam plant structure and clear the downstream blockage in order to gain access to the tunnel for cleaning (Sheet C101). Sediment and any accumulated debris will be removed from the tunnel and steam plant condenser pit and disposed of as required in the project specifications. The tunnel and condenser pit will be cleaned as required in the project specifications. The resident engineer will make the determination that cleaning is complete and allow the contractor to fabricate the closures of the existing tunnel inputs at the steam plant condenser pit and blow off tank.

10. The contractor will fill in the tunnel using cement slurry. The new storm drain pipe construction will be started once the tunnel has been filled and the opening in the tunnel roof near the steam plant wall repaired.

11. The contractor will proceed to clean the next downstream segment of the flume (Segment E), removing contaminated sediment from the flume and cleaning the concrete surfaces that will remain in the ground. The new storm drain pipe will be routed into the flume and laid along the bottom of the clean concrete channel (Sheet C201). The space around the pipe will be filled with bedding and backfilled to grade. New asphalt paving will be constructed over the removed section of the flume along this section.

NOTES:

1. DO NOT DAMAGE OR DISTURB EXISTING CREOSOTED TIMBERS OR PILES DURING WORK. PILES OR TIMBER BROKEN OFF DURING WORK WILL BE REMOVED AND DISPOSED OF AT NO EXPENSE TO THE COS.
2. DO NOT DAMAGE OUTFALL CONCRETE STRUCTURE DURING SEDIMENT REMOVAL.
3. DO NOT DAMAGE OTHER EXISTING OUTFALLS OR STRUCTURES. REPAIRS TO THESE STRUCTURES FROM CONTRACTOR ACTIVITIES WILL BE MADE AT THE EXPENSE OF THE CONTRACTOR.
4. AFTER SEDIMENT REMOVAL IS COMPLETED, EXTEND GEOTEXTILE FOR SEPARATION MATERIAL 3 FEET BEYOND LIMIT OF DISTURBED SEDIMENT PRIOR TO PLACING SPLASH PAD/COVER MATERIALS.
5. MAINTAIN SPILL RESPONSE EQUIPMENT AND MATERIALS AS REQUIRED BY CONTRACTOR SPCC PLAN.
6. CONTRACTOR SHALL PROVIDE REQUIRED UPRR NOTIFICATION PER SPECIFICATIONS.
7. CONTRACTOR SHALL FOLLOW EQUIPMENT DECONTAMINATION REQUIREMENTS AND TRACK-OUT RESTRICTIONS PER SPECIFICATIONS.
8. MAINTAIN CLEAN OPERATION BETWEEN EXCAVATION AREA AND OFF LOADING AREA. CONTRACTOR SHALL PROPOSE SPECIFIC BMPS TO MINIMIZE SPILLAGE AND COLLECT/CONTAIN ANY SPILLAGE THAT DOES OCCUR. OPERATIONS WILL BE SHUT DOWN AT CONTRACTOR'S EXPENSE UNTIL CONTRACTOR CORRECTS ANY UNCONTROLLED SPILLAGE.



CONTROL TABLE

ID	NORTHING	EASTING	DESCRIPTION
1	199576.4	1273490.4	WORK LIMIT
2	199545.1	1273459.5	WORK LIMIT
3	199482.5	1273453.1	WORK LIMIT
4	199466.1	1273484.1	WORK LIMIT
5	199483.6	1273554.0	WORK LIMIT
6	199405.9	1273640.4	WORK LIMIT

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Path: O:\pro\Y2006\06-03385-000\CAD\Dwgs\Figures\Figure 2-3.dwg
Plot Date: 1/28/2008 11:27 AM Cad User: Laura Turnidge
Plot Style Table: PlotterCADD_standard.ctb Adobe PDF

Figure 2-3 Georgetown - Slip 4 access

12. The contractor will clean the downstream twin 42-inch concrete pipes (Segment D) and demolish the upstream concrete bifurcation structure (Sheet C101). Existing connections to the pipes will be plugged. A section of the western pipe will be excavated and a new manhole constructed for the new drainage system. The resident engineer will inspect both existing 42-inch pipes using visual methods and verify that the pipes are clean and structurally fit to accept cement slurry fill. The eastern pipe will be plugged and filled entirely with cement slurry. The western pipe will have the new storm drain pipe sliplined prior its annular space being filled with cement slurry. The drain pipe will be connected to the intermediate manhole and routed to the end of the concrete pipe at the end of Segment D.

13. The contractor will remove sediment in the open section of the flume (Segment C). The upper portion of this segment is concrete lined open channel. The concrete will be demolished to below grade and cleaned prior to continuing the new drainage pipe down the flume alignment. Fencing and cover over the flume will be removed and disposed of or recycled. The culvert crossings at S Willow Street and S Myrtle Street will be removed. Wooden flume structural members, walls, and flooring will be removed and disposed of. Excavation to the side of the existing flume will be performed to accommodate the new bioswales (Sheets C102, C103).

14. The contractor will complete the contaminated soil and ballast removal at the Willow Street substation (Sheet C112).

15. The Ellis Street Substation site will be cleaned and materials removed. Final site grading and other site work including construction of curbing and pavement sections will be completed (Sheet C104).

16. The resident engineer will provide confirmation sampling of the resulting excavation prior to continuing construction of the new drainage pipe. Once the excavation has been determined to be clean (per the Confirmation Monitoring Plan), the new drainage pipe will be constructed along this segment and the excavation backfilled to match the existing adjacent grades.

17. The contractor will construct a receiving pit near the entrance of the 72-inch CMP culvert (Sheet C104) for sliplining this segment with the new drainage pipe. The corrugated pipe will be cleaned and visually inspected prior to sliplining. Any repairs to the existing pipe will be made and the new drainage pipe inserted. The new pipe will be fastened to the existing pipe, plugs to contain the cement slurry fill will be constructed, and the resulting annular space filled with cement slurry.

18. The contractor will install well points to dewater the drainage pipe sliplining pit near manhole M100. The well point discharge will be treated at the onsite water treatment system, as required. The contractor will demolish the top section of M100 and start cleaning the outfall section of the flume (Sheet C105). Sediment will be removed per the specifications and the final condition of the existing outfall CMP assessed by the resident engineer. If repairs are required to the CMP prior to sliplining, the contractor will complete these repairs at this time.

19. The contractor will excavate the dewatered receiving pit and demolish a portion of the M100 structure in order to facilitate pipe insertion. The drainage pipe will be fabricated and prepared for insertion into the cleaned outfall pipe.

20. The contractor will remove the exterior (temporary) outfall plate (Plate 2 in Figure 2-4) and set a mandrel and pulley system to help pull the HDPE pipe into the CMP. Spacers will be set at the design interval along the HDPE, which will be carefully pulled through the permanent outfall plate (Plate 1 in Figure 2-4). This work will require several days of low tide events. The temporary outfall plate will be replaced as needed in order to keep the CMP dry and free from possible recontamination by intruding water from Slip 4. Once the new drainage pipe has been successfully pulled through the outfall plate end, the contractor will provide a temporary seal and prepare the CMP for backfilling with cement slurry. The new tide valve will be installed and the outfall splash pad will be constructed.

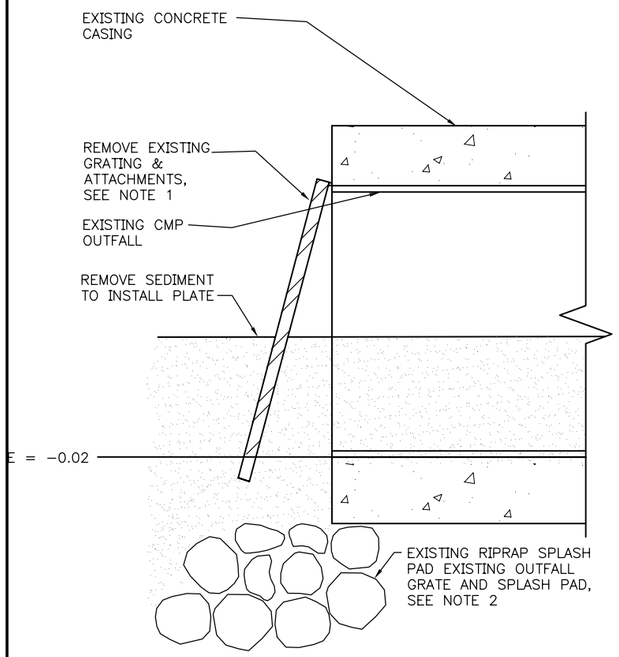
21. The new manhole insert at M100 will be constructed and the drainage pipe connected. The receiving pit excavation will be backfilled with clean imported material. The annular space in the CMP and at M100 will be filled with cement slurry.

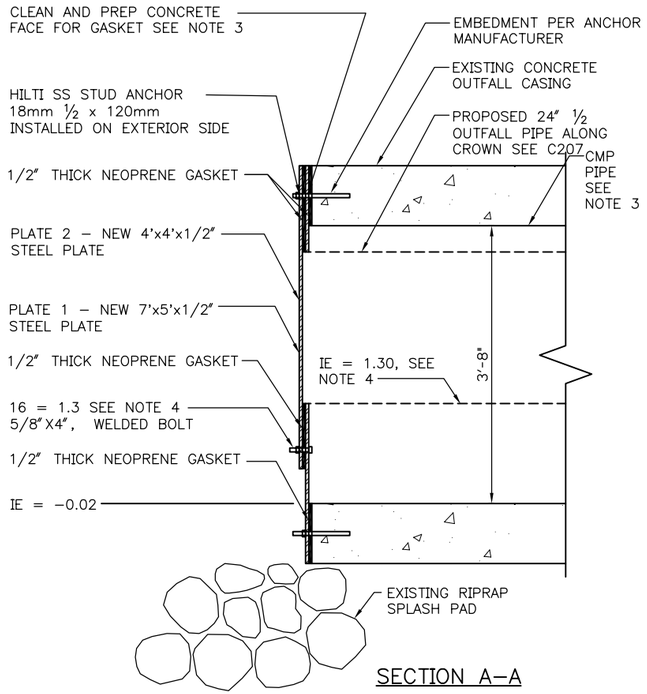
22. The upland area of Slip 4 will be restored. After a specified duration, the silt screen and oil boom will be removed. Permanent erosion control measures will be installed in the upland section of Slip 4 and the railroad crossing and other temporary construction surfaces removed completely.

23. Bioswale construction and planting will be completed and fence sections repaired or installed.

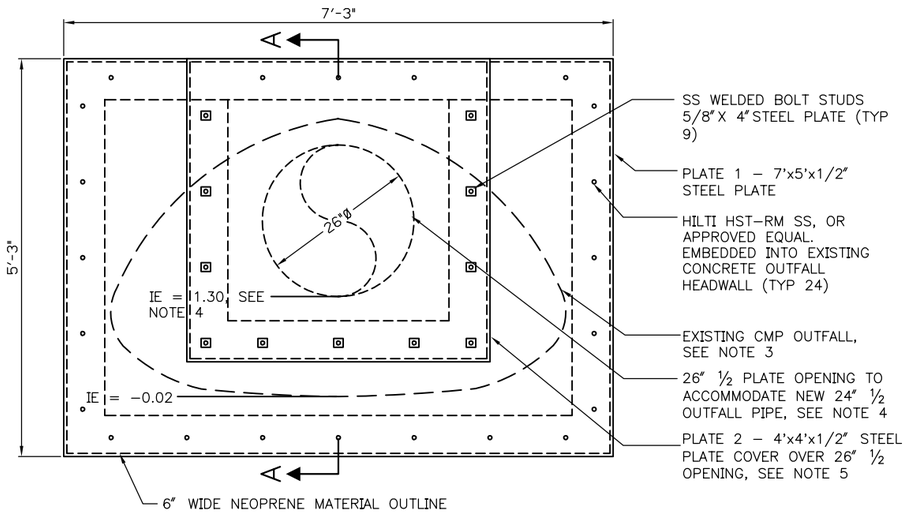
24. The contractor will perform a final cleaning of the new drainage system and complete the commissioning period.

25. The contractor will complete any remaining punchlist items and prepare for demobilization. All equipment will be removed from the site. Site cleaning and final site restoration will be accepted.





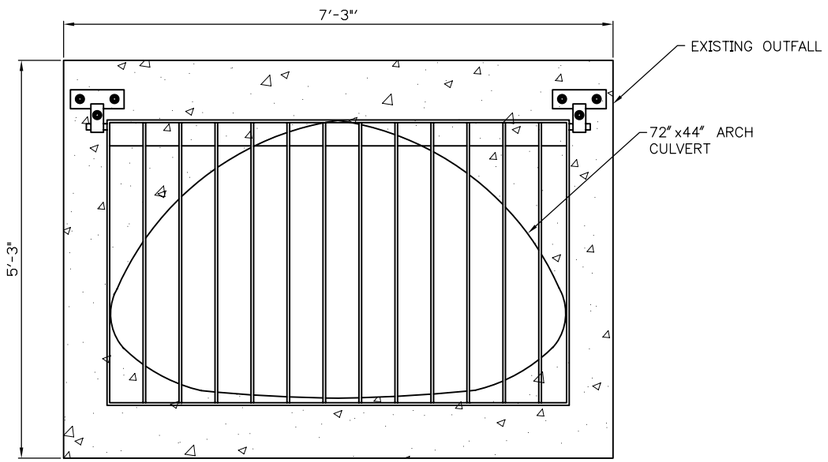
SECTION A–A



FRONT VIEW

OUTLET STEEL PLATE DETAIL

SCALE: 1″ = 1'–0″



EXISTING OUTFALL END DEMOLITION

SCALE: 1″ = 1'–0″

NOTES:

1. EXISTING GRATING AND ATTACHMENTS SHALL BE REMOVED WITHOUT DAMAGING EXISTING CONCRETE FACE. RECYCLE ALL METAL MATERIALS REMOVED.

2. EXISTING RIP RAP SPLASH PAD SHOWN AT ASSUMED LOCATION BASED ON FIELD MEASUREMENTS. DO NOT EXCAVATE BELOW THE BOTTOM OF THE EXISTING OUTFALL STRUCTURE OR REMOVE OUTFALL STRUCTURE BEDDING. EXCAVATE FACE OF OUTFALL CONCRETE TO LIMITS REQUIRED TO CLEAN END OF OUTFALL AND INSTALL NEW METAL PLATE ASSEMBLY.

3. EXISTING CMP OUTFALL PIPE LIP MAY PROTRUDE OUT PAST THE CONCRETE SURFACE. REMOVE ANY PROTRUSIONS USING CUTTING TORCHES OR GRINDING WHEELS SUCH THAT NO PROTRUSIONS WILL INTERFERE WITH INSTALLATION OF PLATE 1 AND GASKETING MATERIALS. RECYCLE REMOVED METAL MATERIALS. IF CONCRETE FACE IS SPALLED OR DAMAGED, USE QUICKSET OR SIMILAR QUICK CURING CONCRETE PATCHING MATERIAL TO CONSTRUCT A SMOOTH SURFACE THAT CAN THEN BE DRILLED AND FITTED WITH THE GASKET/PLATE 1 ASSEMBLY. GASKET MUST FORM WATERTIGHT SEAL TO CLEANED CONCRETE SURFACE.

4. OPENING IN METAL PLATE 1 TO ACCOMMODATE NEW HDPE OUTFALL PIPE SHALL BE SIZED TO FIT THE OUTER DIAMETER OF THE CONTRACTOR'S SUPPLIED HDPE PIPE. CONTRACTOR SHALL VERIFY DIMENSIONS OF PROCURED MATERIALS PRIOR TO CONSTRUCTING PLATE 1. PLATE 1 OPENING DIAMETER SHALL NOT BE MORE THAN 2 INCHES LARGER THAN OUTER DIAMETER OF SUPPLIED PIPE MATERIALS.

5. REMOVABLE STEEL PLATE 2 SHALL BE FABRICATED SUCH THAT THE NUTS CAN BE REMOVED FROM THE EXTERIOR AFTER THE EXISTING PIPE HAS BEEN CLEANED AND MATERIAL HAS BEEN REMOVED. GASKET MATERIALS SHALL PREVENT SEEPING OF WATER DURING CLEANING OPERATIONS AND CEMENT SLURRY DURING FILLING OF ANNULAR SPACE.

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Figure 2-4 Georgetown flume - Outfall design detail

2.2 Segment A

2.2.1 Description

Segment A is the topographically lowest section of the flume system and functions as the outfall pipe to Slip 4 on the Duwamish Waterway. This segment consists of approximately 205 feet of buried 44-inch by 72-inch CMP arch culvert starting at the discharge to Slip 4 and extending northeast to a manhole (M100) located in a storage yard and parking lot used by Boeing just east of East Marginal Way South. The bottom half of the pipe diameter is filled with sediment along its length.

Sediment has accumulated in Slip 4 beyond the outfall pipe due to lack of flushing by water supplied by the flume. This sediment has mounded around the outfall, causing a backup into the pipe.

A 24-inch vitrified clay pipe and an 18-inch wood stave pipe are connected at manhole M100. These pipes were viewed inside the manhole using CCTV equipment; the bottom half of each pipe is filled with sediment.

Access to the downstream end of Segment A (the outfall pipe) will be from the eastern shore and requires working near an active rail spur. A general lack of upland area above mean higher high water (MHHW) on the other three sides of the outfall limits available space for construction near the culvert. Staging in this area will require clearing and some regrading to provide access for workers and machinery below MHHW to the end of the outfall. Figure 2-3 provides design details providing for equipment access at the flume discharge location and for blocking the end of pipe.

The upstream end of the Segment A can be accessed from manhole M100. Construction activities at M100 will require coordination with Boeing to move equipment currently staged in this area and to ensure that security is maintained as specified in the Project Manual. Significant buried utilities, including a 96-inch King County trunk sewer, a 96-inch Washington State Department of Transportation (WSDOT) stormwater outfall, and local sewers and stormwater lines are located above, below, and adjacent to Segment A of the flume. High voltage electrical lines also pass over the pipe in the East Marginal Way right-of-way. Union Pacific Railroad (UPRR) operates a single spur line that passes over the outfall in this same right-of-way.

The contract documents specify the coordination requirements for Boeing and UPRR, as well as requirements for protecting existing utilities and infrastructure during the course of completing the work.

General watercraft traffic in Slip 4 corridor during construction is not expected to impact activities around the flume outfall, due to the shallow intermittent depth associated with tidal fluctuations and the presence of obstructing pilings in front of the outfall structure. Coordination with rail traffic along the spur line and with property owners around the Slip 4 area is required by

the specification when construction involves staging at the shoreline. Tidal conditions in the Duwamish result in complete inundation of this segment one or two times daily. Measures to prevent tides from entering the outfall during cleaning and to prevent migration of sediment out of the flume into Slip 4 have been developed and are discussed below.

2.2.2 Sediment Removal (CERCLA)

Sediment removal from the flume will require blocking the outfall to prevent tide water from entering the pipe during construction. The contractor will be required to isolate the end of the culvert using a custom metal fabrication to form a cap over the end of the CMP that is imbedded in a concrete arch culvert (design details are provided in Figure 2-4). Installation of a plate to block the pipe necessitates removal of approximately 20 cubic yards of sediment that has accumulated at the end of the pipe in Slip 4. Access must be constructed on the shoreline for heavy equipment. Capping the flume outfall will be performed prior to flume sediment removal in any segment.

2.2.2.1 Sediment Removal from Slip 4

The upland area near the outfall is on property that the City recently acquired from Crowley Marine Services. This area will be used for staging equipment and for accessing the end of the outfall at Slip 4. The bank will be graded and a stabilized surface consisting of clean materials that conform to Clean Water Act requirements will be constructed (e.g., clean quarry spalls). This surface will allow machinery to safely access the end of the outfall pipe during low tides without adversely impacting water quality in the tidal zone. The Contractor will be responsible for implementing and maintaining engineering controls for water quality control, including silt and oil booms, silt fencing, and spill response kits. Sediment removal and end-of-pipe cap installation process is expected to take approximately 10 working days. During this time, work may be performed only in the dry (above the existing tidal water level). Equipment will be staged above the waterline at all times of the day and materials storage below the mean higher high water elevation (MHHW) will be prohibited.

The work will involve installing Temporary Sedimentation and Erosion Control (TESC) measures and construction of a temporary access road from East Marginal Way South to the outfall structure. The contractor will be required to submit a TESC plan before beginning work. TESC measures will include installing a permeable silt screen attached to the existing piles (see plans). The silt screen will extend above MHHW down to the sediment, acting as a barrier to fish entering the work area while filtering water into and out of the work site. The bottom of the boom will be weighted to provide containment of sediment throughout the entire water column during construction activities. An oil boom is required and will to be placed around the work area outside of the silt screen boom.

The equipment access road will require clearing of vegetation and grading. The existing slope at the head of the slip will be graded back to a 2H:1V slope to create an 8-foot to 10-foot wide path down to the outfall end. This will require removal of roughly 30 cubic yards of bank material,

including 10 cubic yards of material below MHHW. All excavated bank materials will be managed for subtitle D landfill disposal. Clean 4-inch to 6-inch quarry spalls will be laid over a heavy duty non-woven geotextile to stabilize soil along the equipment access path. Approximately 10 cubic yards of quarry spalls will be placed in a 250 square foot area below the MHHW level. Silt fence will be required along the top of bank in the work area and along each side of the construction access ramp. Coir waddles will be placed in areas where silt fencing can not be installed and stormwater runoff needs to be treated to remove coarse and fine suspended material. Spill kits are required to be staged in or adjacent to the work area, as indicated in the Project Manual.

Sediment that has accumulated in front of the flume outfall will be removed using either a vactor truck or an excavator as shown on the drawings. Note that the project specifications will not limit the contractor's means and methods for completing this work, including limiting equipment that can be used (specific recommendations are made for excavator bucket reach in the Project Manual drawings as a basis for providing a bid).

Removal activities will be conducted from the equipment pad. As previously noted, work will not be performed in the water at any time. Erosion control measures will be inspected as required in the Project Manual to ensure that sediment does not leave the work area. If an excavator is used, the removed sediments may be direct loaded into roll-off boxes and taken directly for rail or truck transport to an EPA-approved landfill. Alternatively, a spoils skiff may be used to temporarily hold the spoils until they can be loaded into roll-off boxes. If a vactor truck is used, the truck will collect sediment by extending its boom to the removal location and vacuuming the sediment into its holding tank. The truck can then transfer the material to an offsite facility for transfer or when full, transfer the material to a roll-off box while on-site.

Some personnel may stand in the intertidal zone to help direct the excavator or vactor operator. An estimated 20 cubic yards of sediment will be removed in this area in order to expose the top of the existing rip rap splash pad or until an elevation of -2.0 feet MLLW is reached (the existing flume discharge pipe invert elevation is -1.95 feet MLLW). It is expected that this removal will be completed in 1 day.

Once the entire outfall is exposed, workers will enter the intertidal work area to finish sediment removal and to remove the existing grating, clean the face of the concrete outfall structure, and attach a steel plate to seal the outfall during cleaning. Work will not be performed in the water at any time. Once the existing flume outfall grating is removed, some sediment from immediately inside the outfall will need to be removed by hand or using a vactor truck in order to install the new steel cover plate. If removed by hand, this sediment will be placed into drums or directly into the excavator bucket, and will be mechanically lifted out of the work area. The concrete face of the outfall structure will be pressure washed, holes drilled in the concrete, and anchor bolts installed to attach the steel plate using a water-setting epoxy. A neoprene gasket will be applied to the concrete face and a prefabricated steel plate bolted over the gasket. This permanent plate will have a 26-inch hole cut near the top to accommodate the new slip lined outfall pipe. A temporary removable plate will be positioned over the hole until all sediment is

removed from within the CMP and the new HDPE pipe and tide valve are ready to be installed. We anticipate that sealing the flume outfall can be completed in 3 days with suitable low tides.

A new splash pad will be constructed at the end of the outfall where Slip 4 sediment has been disturbed. The splash pad will include a heavy duty, non-woven geotextile fabric laid over the existing splash pad (riprap) and adjacent exposed sediment. The fabric will be placed to provide an initial separation layer to minimize the spread of contaminated sediment by workers while they attach the flume outfall plate. The geotextile directly covering the existing splash pad will be covered by an 18-inch layer of 4-inch to 6-inch quarry spalls. Once the outfall tide valve has been installed, the rock layer will be built up to within 12 inches of the tide valve invert and sloped away from the outfall. A 6-inch layer of sand will be laid over the fabric covering the disturbed areas adjacent to the existing splash pad, followed by a 12-inch layer of rock and a 6-inch layer of fish mix. The anticipated duration for the installation of the splash pad materials will take 1 to 2 days.

Upland restoration will be limited to removal of contractor equipment and materials and hydroseeding of the upland slope. Any materials contaminated by contact with sediment during removal will be removed, disposed of, and replaced with clean materials. The equipment access path installed on the bank will remain in place for future use during the future Slip 4 sediment Removal Action. The grading shown on the drawings as part of this project was designed to nearly accommodate the future the proposed Slip 4 grading plan design. Any additional grading conducted as part of this project to facilitate access to the outfall will complement the final grading activities proposed for this area.

2.2.2.2 Sediment Removal from CMP

Sediment in the pipe will be removed and the pipe interior cleaned to prevent recontamination of Slip 4. Soil surrounding the culvert will not be removed as part of this project. The project specifications will not limit the contractor's means and methods for sediment removal. Possible means for removing sediment include the following:

- Hydro-mining using high-pressure jets and pumping the resulting slurry into containers for treatment
- Employing a sled dredge on cables that will scrape sediment from within the pipe by layers and move it to either the pipe outfall or manhole M100, where it can be moved to the ground surface
- Using proprietary equipment and systems designed to clean sediment from large diameter pipelines with powerful vacuums and pressure jets
- Using hand tools (e.g., shovels, trowels, buckets).

Hydro-mining would be accomplished by capping the end of the outfall pipe, installing a slurry pump at the downstream end through the metal cap or the top of the concrete culvert, and jetting

sediments down the outfall with high pressure hoses gradually pulled from the downstream end or pushed down the pipe from the upstream end. The process creates sediment-laden water that would be pumped with slurry pumps via discharge piping to settling tanks staged in the upland area above the outfall. The sediment would be dewatered onsite and the waste products disposed of appropriately. Difficulties with hydro-mining include requiring multiple passes with the jets to remove the large accumulation of sediment; the inability of the jets and pumps to remove large objects such as rocks, boulders, and foreign objects from the pipe. Sediment dewatering by gravity may take several days or weeks, due to the unknown nature of settlement characteristics, and could require that the contractor implement mechanical settlement or filtration, which would increase the cost. If settlement occurs quickly, it is possible that the decanted water could be reused for jetting. It is expected that the volume of sediment and the potential for bulky foreign objects would preclude use of a standard vactor truck; however, this technique will not be precluded from use by the contractor.

A dredge sled employs a system of cables and pulleys to move a small sled along the top of the sediment. As the sled slides over the surface, sediment is scraped into a small compartment on the sled. The sled is then pulled forward or backward to a location where the sediment is removed. The process is repeated until the sediment is removed and the bottom of the pipe exposed. This system is not typically employed in a closed conduit and would most likely experience difficulties from hitting the sides of the culvert. A considerable amount of material could be left in the bottom of the culvert that would require another method for removal, such as jetting and pumping or hand removal.

Proprietary equipment such as the SewerHog™ uses a process similar to hydro-mining; however, the equipment is combined into one integrated system. Sediment is removed from the pipe using a vacuum while jetting with high pressure water, which is collected into a storage tank where it is dewatered. The difficulty in using this approach is that the entire system, which is large, must be located at one end of the pipe. Because the volume of sediment in the pipe would exceed the capacity of the holding tank, frequent dumping would be required.

Hand removal of sediment may be necessary as part of any final cleaning process. Hand removal is not considered a practical method to remove a majority of the sediment due to the confined space nature of the culvert, risk factors associated with working in the pipe with contaminated material, possible inundation from a failed outfall seal, and the large volume of material to be moved.

Final cleaning of this segment could be completed using hand-operated pressure washers or custom remotely-operated vehicles (ROVs) with pressure washing appurtenances operated from above ground. Similar equipment has been used for cleaning small and large diameter gravity sanitary sewers. Wash water would be collected at the discharge end for treatment and disposal.

No more than 1 inch of sediment (approximately 3 cubic yards) will remain in the 205-foot long CMP following the cleaning process (the CMP has ridges that will impede complete sediment removal by the mechanical means identified above). A sediment sample collected for site characterization at manhole M100 indicates a PCB level of 15 mg/kg OC, just above the

Sediment Quality Standard (SQS) of 12 mg/kg OC. This residual material will be partially mixed, stabilized, and contained by resuspension into the concrete slurry materials pumped into the CMP as annular fill during the sliplining process (see below).

2.2.3 Soil Removal (MTCA)

There are no plans to remove soil surrounding the CMP; however, soil will be excavated to provide access to the flume outfall along the bank of Slip 4 and to provide access at manhole M100 for sliplining of the HDPE pipe, both of which are discussed in Section 2.2.5. Management of potentially contaminated soil is discussed in Section 2.2.6.2.

2.2.4 Confirmation Testing

The Segment A CMP has ridges along its 205-foot length. No more than 1 inch of residual sediment (up to 3 cubic yards) may remain along the bottom of the pipe following the cleaning process. No sediment confirmation sampling will be performed based on the small amount of residual material left in place, indications of low chemical concentrations, the permanent emplacement of cement slurry overlying the sediment, and the sealing of the existing outfall (see Section 2.2.5). A visual survey will be used to verify that the performance standard has been met. No sampling of soil outside of the CMP is planned.

2.2.5 Drainage Pipe and Backfill

Specifications will require that the contractor perform a CCTV inspection of the cleaned culvert for review by the City to ensure that the culvert integrity was not damaged prior to or during sediment removal. The new HDPE drainage pipe will be routed into the existing pipe through an excavation (receiving pit) into the side of manhole M100. The elevation of the new outfall will be between 2.96 feet and 4.31 feet MLLW. Custom spacers will be used to suspend the HDPE pipe at the existing CMP crown during filling of the annular space between the pipes with cement slurry. Damaged pipe surface will be repaired prior to cement slurry placement to prevent the slurry from escaping into the surrounding formation. Repairs will consist of mechanically fastening a section of metal plating over the damaged area as a patch or using an expandable, quick-setting foam or mortar mixture to fill in the void and create a relatively liquid tight barrier.

The receiving pit will extend approximately 60 feet northeast from manhole M100 (Figure 2-2). It will be constructed as a trench with a ramp that slopes 2.5:1 down from the ground surface. The sidewalls will be vertical and supported by a contractor-designed excavation support system. The pit allows placement of the inflexible HDPE pipe into the side of the manhole leading down to the discharge point at Slip 4. Dewatering of this excavation is anticipated. Geotechnical analysis indicates that if the excavation extends more than 2 feet below the water table, well points or some other dewatering method than using excavation sump pumps will be required. A new concrete manhole will be inserted into the existing shell of M100 to connect to two sections

of HDPE pipe from Segments A and B. The manhole M100 structure will then be partially demolished and backfilled with cement slurry. The entire disturbed area will be repaved and graded to match the existing site grade.

2.2.6 Waste Management

Contaminated sediment and potentially contaminated soil and water will be generated as a result of the removal and construction process along Segment A.

2.2.6.1 Sediment

The only sediment sample collected from Segment A (at manhole M100) was found to contain cPAHs at 0.8 mg/kg. All sediment removed from the CMP will be managed as contaminated, requiring controls on stockpiling, transport, and disposal. Stockpiling will be performed with runon and runoff controls, as well as control of fugitive dust. Sediment will be transported to a Subtitle D landfill for disposal. Further analysis will be performed by the contractor to meet disposal facility acceptance criteria, as required.

2.2.6.2 Soil

Soil to be removed at the receiving pit has not been tested for contamination. According to information provided by Boeing, a gas station historically occupied the area adjacent to the receiving pit and low-level petroleum was identified in soil and ground water during the early 1990s; subsequent sampling in 2002 indicated no ground water contamination present. Soil will be segregated as potentially contaminated, tested, and disposed of at a Subtitle D landfill, if warranted.

2.2.6.3 Water

Water will be generated from stockpiled sediment, as well as from dewatering associated with excavation of the receiving pit adjacent to manhole M100. If water separates from stockpiled sediment due to gravity, it will be collected, tested by the contractor, and treated (if necessary) prior to disposal. Water from dewatering excavations will be temporarily stored in tanks. Treatment may be necessary to meet King County sewer discharge requirements, as stipulated in the discharge permit obtained by the City, which may entail gravity separation, sand filter, bag filter, and granulated activated carbon (GAC) filter stages depending on analytical results. The contractor will be responsible for testing and implementing proper treatment, according to the submitted and approved work plans and as overseen by the Resident Engineer.

2.2.6.4 Debris

The CMP section that will be removed from Segment A as part of the construction of the receiving pit will be recycled at a local metal recycling facility. The metal will be

decontaminated by the contractor to remove any attached sediment or soil prior to hauling and disposal.

2.2.7 Short-term Impacts during Construction

2.2.7.1 Environmental

Construction in Segment A requires disturbing steep slope soils on the bank of Slip 4 and disturbing sediment below MHHW within Slip 4, which could affect water quality in the river. Both of these activities require implementation of best management practices (BMPs,) which are identified in the plans and specifications, to minimize impacts. Shoreline BMPs will include silt fence, bank stabilization and stabilized construction entrance with quarry spalls, bank grading to reduce the slope, waddles to stabilize areas cleared of vegetation, and temporary daily cover with straw or mulch as necessary to protect exposed areas. A truck tire wash station is shown on the drawings at this location due to the high probability that sediments will be tracked by vehicles entering and exiting the sediment loading zone. The wash system will remove this sediment and prevent tracking onto East Marginal Way South.

To minimize impacts to fish in the river, work will not be allowed below the water line (i.e., work will be conducted in-the-dry). The contractor will be required to plan activities to coincide with low tide periods so that sediment is not disturbed while covered with water. Following removal of sediment that has built up beyond the outfall, a geotextile will be laid over the exposed splash pad to reduce suspension of sediment during the tidal cycle and to minimize worker impact on loose sediment while installing the outfall seal plate.

Fish will be further protected from construction activities by installing a silt screen in the water around the work area stretching from shore to shore, extending around pilings already in place. The silt screen will be anchored into the sediment and extend above the MHHW elevation to exclude fish from accessing the work zone. The silt screen also will mitigate movement of suspended sediment away from the area of disturbance. An oliophilic boom will be placed beyond the silt screen to protect from the potential accidental release of petroleum products associated with excavation equipment along the shore.

Water quality monitoring in Slip 4 is anticipated to be limited to visual monitoring performed by SCL, as all work will be conducted in the dry. Continual inspection of BMPs during the Work will include visual monitoring of the water for any turbidity plumes or sheens. The contractor will be required to modify operations and correct the condition should impacts associated with construction be noted. Specifics will be identified in EPA's CWA 401 certification.

2.2.7.2 Community

Upland access and staging requirements for the use of land-based equipment will not have significant impacts to tenant operations at either Crowley or First South Properties.

2.2.8 Other Constraints/Issues

The work areas associated with Segment A are located along the shore of Slip 4 and at manhole M100, neither of which are close to residential areas. Traffic control along East Marginal Way South is anticipated as part of the contractor's traffic control plan and will include signage and a flagger to assist trucks entering and leaving the work area. Traffic notices will be posted according to the provisions of the City-approved Traffic Control Plan.

Bank excavation will be localized to that area of Slip 4 owned by the City of Seattle. Coordination with UPRR and the use of a certified railroad flagger to guide contractor vehicles and equipment over and near the railroad during construction will minimize impacts to the adjacent rail system and minimize safety hazards from railroad activities. Coordination with UPRR will be the responsibility of the contractor and is required by the specifications. Because excavation will be completed from the upland side of the outfall and the extent of sediment removal is within an area currently bounded by piles that is not accessible by commercial vessels, no impacts to navigable access to the slip will occur.

2.3 Segment B

2.3.1 Description

Segment B consists of approximately 165 feet of buried 72-inch CMP culvert. This segment starts at the northern wall of manhole M100 and continues northwest, paralleling East Marginal Way South to an opening at its end where it transitions to the open wood-lined section of the flume. A video inspection of this segment performed in 2006 showed that the bottom 12 inches of the CMP is partially filled with sediment along its length. The exposed interior top portion of the culvert is partially corroded along the flow line. The condition of the bottom half of the culvert is unknown because sediment accumulation prevented camera access. Because the sediment depth in the pipe is less than 18 inches, hydro-mining, a proprietary integrated removal system, and hand removal are viable methods for removing material and cleaning the pipe.

2.3.2 Sediment Removal (CERCLA)

Sealing the flume outfall (described in Segment A above) will be performed prior to flume sediment removal in any segment.

Hydro-mining this section will be accomplished more easily than Segment A because vactor trucks instead of slurry pumps can be utilized to remove sediment and cleaning water at M100 reducing the amount of water needed for the removal process. A proprietary system such as the SewerHog™ would be well adapted for removal of sediment in the pipe. The equipment could be located at either end of the pipe for this segment.

Hand cleaning may not be a viable means for quickly and safely removing sediment from the pipe; however, final cleaning of this segment using hand tools, such as pressure washers, is more feasible than segment A because there is access/egress at either end of the pipe. The amount of

sediment accumulated in the pipe at the time of construction will be a key factor in determining the cleaning method for this segment.

Sediment accumulated in manhole M100 would most likely be removed as part of Segment B activities. This material could be easily removed using a vactor truck at the manhole structure. If Segment A is cleaned prior to Segment B, the contractor would need to install temporary blockage at manhole M100 to prevent upstream sediment from entering the cleaned outfall pipe. An inflatable sewer plug could be utilized if the new 24-inch outfall pipe has been installed prior to cleaning; however, because of the hydrostatic head from the tidal influence and potential build-up of water behind the plug, a larger inflatable plug custom fitted to the larger arch culvert is not feasible for this project. If the 44-inch by 72-inch arch culvert opening is still in place, a custom fabricated metal cutoff wall across the opening mounted to the interior of the manhole would limit recontaminating the downstream segment. Existing 18-inch wood stave and 24-inch clay pipes that connect to M100 will be demolished outside of the vault as a result of constructing the receiving pit to facilitate the installation of the HDPE outfall pipe.

Final cleaning of this segment could be completed using hand-operated pressure washers or custom ROVs with pressure washing appurtenances operated from above ground, as described for Segment A. Wash water would be collected at the discharge end for treatment through the contractor's water treatment system.

No more than 1 inch of sediment (approximately 2 cubic yards) will remain in the 165-foot long CMP following the cleaning process (the CMP has ridges that will impede complete sediment removal). A sediment sample collected for site characterization at manhole M100 indicates a PCB level of 15 mg/kg OC, just above the Sediment Quality Standard (SQS) of 12 mg/kg OC. A sediment sample collected near the upstream CMP opening indicates a PCB level of 8.4 mg/kg OC. This material will be mixed into the cement slurry used to fill the CMP during the sliplining process (see below).

2.3.3 Soil Removal (MTCA)

There are no plans to remove soil surrounding the CMP; however, soil will be excavated to the northwest toward the Aero Motel to provide access to the upstream end of the CMP for sliplining of the HDPE pipe (discussed in Section 2.3.5).

2.3.4 Confirmation Testing

As for Segment A, a visual survey will be completed to ensure that no more than 1 inch of sediment remains anywhere within the pipe. This remaining material will be partially mixed by resuspension into the concrete materials pumped into the CMP as annular fill during the sliplining process (see below). No sediment confirmation sampling will be performed based on the small amount of residual material left in place, indications of low chemical concentrations, the permanent emplacement of cement slurry overlying the sediment, and the sealing of the existing outfall (see Section 2.3.5). No soil sampling outside of the CMP is planned.

2.3.5 Drainage Pipe and Backfill

Specifications will require that the contractor perform a CCTV inspection of the cleaned culvert for review by the City to ensure that the culvert's integrity was not damaged during sediment removal. The new HDPE drainage pipe will be routed into the existing CMP through a receiving pit extending northwest of the upstream opening. Custom spacers will be used to suspend the HDPE pipe at the existing CMP crown during the filling of the annular space between the pipes with cement slurry. Damaged pipe surface will be repaired prior to cement slurry placement to prevent the slurry from escaping into the surrounding formation. Repairs will consist of mechanically fastening a section of metal plating over the damaged area as a patch or using an expandable, quick-setting foam or mortar mixture to fill in the void and create a relatively liquid tight barrier.

The receiving pit will extend approximately 60 feet west from the open end of the CMP, toward the Aero Motel. It will be constructed as a trench that slopes 2.5:1 down from the ground surface. The pit allows placement of the inflexible HDPE pipe into the existing CMP. It is not expected that dewatering will be required, since the bottom of the excavation will not extend below the existing CMP invert elevation.

2.3.6 Waste Management

Contaminated sediment, CMP, and potentially contaminated soil and water will be generated as a result of the removal and construction process along Segment B.

2.3.6.1 Sediment

Sediment samples collected from manhole M100 and near the upstream opening of the CMP were found to contain PCBs at 15 and 8.4 mg/kg OC; cPAHs were found at 800 and 1,900 mg/kg (dry weight), respectively. All sediment removed from the flume will be managed as non-TSCA, requiring controls on stockpiling, transport, and disposal. Stockpiling will be performed with runon and runoff controls, as well as control of fugitive dust. Sediment will be transported to a Subtitle D landfill for disposal. Further analysis will be performed by the contractor to meet disposal facility acceptance criteria, as required.

2.3.6.2 Soil

Soil to be removed at the receiving pit has not been tested for contamination and contamination is not expected to exist in this area. However, soil will still be segregated and sampled to determine appropriate disposal options.

2.3.6.3 Water

Water likely will be generated from stockpiled sediment, associated with hydromining and accumulated stormwater. The contractor will be responsible for testing and implementing proper treatment, according to the approved project plans.

2.3.6.4 Debris

Some CMP removed from Segment B as part of receiving pit construction will be recycled at a local metal recycling facility. The metal will be decontaminated by the contractor to remove any attached sediment or soil prior to hauling and disposal.

2.3.7 Short-term Impacts during Construction

2.3.7.1 Environmental

All work will be performed either within existing CMP or in an excavation extending from the existing flume. If stockpiling is performed, runon and runoff controls will be in place as prescribed in the Project Manual. BMPs include liners and cover, bermed perimeter, and leachate collection.

2.3.7.2 Community

Excavation work at the north end of Segment B will be conducted in close proximity to the Aero Motel. Barriers, including but not limited to temporary chain link fencing, will be erected to separate residents and passersby from the work area. Specific care will be taken to ensure that site access from East Marginal Way South is not allowed by connecting temporary fencing to existing permanent fencing at the Aero Motel and Boeing.

The City will notify the Aero Motel of planned construction activities. Work hours will be closely monitored by the Resident Engineer to ensure compliance with the project specifications.

2.3.8 Other Constraints/Issues

To minimize traffic impacts, accessing this segment from East Marginal Way South will be prohibited; access will be allowed from South Myrtle Street only There are active businesses and a fire station located on this street; therefore, one lane of South Myrtle Street will be required to remain open at all times. Traffic control along South Myrtle Street will be addressed in the contractor's traffic control plan to include signage and a flagger to assist trucks entering and leaving the work area. The contractor will be required to give right-of-way to fire department vehicles at all times.

2.4 Segment C

2.4.1 Description

Segment C is the lower open section of flume that runs from East Marginal Way South through North Boeing Field to the beginning of the twin 42-inch concrete pipes. Access to Segment C is from City property on South Myrtle Street or at the main North Boeing Field entrance gate. Contractor staging along this segment will follow the progress of removal, with truck traffic queuing for loading in the active work zone following the flume alignment.

The open flume is wood lined for much of this segment, transitioning to concrete at the upstream end. Demolition and removal methods for this segment are based on removal of sediment from within the flume and excavation of soil beyond the flume structure to prevent sidewall sloughing and to accommodate the replacement drain system design.

2.4.2 Sediment Removal (CERCLA)

Sealing the flume outfall will be performed prior to flume sediment removal in any segment.

Initial work will entail removal of chain-link fence and cross braces, followed by excavation of sediment from the open channel. Metal materials will be recycled at a local metal recycling facility. Backhoes and some hand tools will be used to remove sediment and load directly onto trucks or stockpiled for testing and final disposition.

Sediment under the three bridge crossings along this segment will be removed using hand tools, as would any associated creosote-treated wood used for supports. Active buried utilities that cross the flume will be protected and the crossing maintained. Pipes at the Aero Motel and South Myrtle Street that currently terminate at the flume structure walls will be capped at the limit of excavation or plumbed into the new drain pipe.

Sediment samples collected at 10 locations along Segment C indicate PCB concentrations ranging between the detection limit to 1,700 mg/kg OC, with seven of the 10 locations below the SQS limit of 12 mg/kg OC. SQS or CSL exceedances occurred for phenanthrene and fluoranthene, benzyl alcohol, and bis (2-ethyl-hexyl) phthalate at three separate locations. No other SMS exceedances were found. All sediment will be removed from Segment C.

2.4.3 Soil Removal (MTCA)

Soil samples were collected at four stations evenly distributed along Segment C from immediately adjacent to both sides and from beneath the flume structure. PCBs exceeded the Removal Action Objective of 1 mg/kg immediately beneath the flume at one location only. Carcinogenic PAHs were detected at a number of locations at concentrations falling between unrestricted land use and industrial site cleanup levels. Soil removed from adjacent to the flume structure will be managed as contaminated for disposal at a Subtitle D landfill.

Once sediment has been removed from the flume, the creosote treated wood will be removed intact, to the extent possible to minimize construction debris, using mechanical grabbers mounted on track hoes or wheeled excavators. This material will be disposed of at a Subtitle D landfill.

The concrete section of the open channel flume in this segment will be partially demolished such that the walls will be reduced to an elevation below existing grade. This concrete has not been in contact with sediment and is assumed to be clean. The floor slab of the concrete section will be left in place, except where the invert elevation of the new drainage system requires partial

demolition. The concrete floor will tested by collecting destructive samples to determine appropriate containment or disposal requirements.

The ground water surface elevation has been measured within a foot below the bottom of the flume structure at South Myrtle Street. As soil beneath the wood is removed, portions of the excavation may become wet. The excavation also may become wet as a result of rainfall events. If dewatering is deemed necessary, the water will be pumped to holding tanks. Sediment within the tanks will be allowed to settle and the supernatant analyzed to determine treatment requirements prior to discharge. Potential treatment is discussed in Section 2.4.6.3.

2.4.4 Confirmation Testing

After the wood and enough soil have been removed in preparation for laying the replacement drain pipe, confirmation soil samples will be collected and analyzed for PCBs and PAHs. Further removal of soil will be conducted at locations that exhibit concentrations exceeding MTCA method A levels for industrial properties. Confirmation samples will then be collected across any of the areas requiring the additional removal.

2.4.5 Drainage Pipe and Backfill

The new drainage pipe alignment along this segment will require some excavation beyond the existing flume structure. All of Segment C will be backfilled above the replacement pipe to existing grade and two bioswales will be installed to provide future water quality improvements to stormwater discharges to Slip 4. Grading and backfilling will be completed to accommodate the new swales and to facilitate stormwater drainage from City property into the new drainage system. Runoff collected and routed into the swales will be discharged into the new drainage pipe at the swale outlets.

Excavation dewatering will be required along this section to ensure that soil compaction requirements and bedding installation limits as specified are achieved. A 12-inch layer of quarry spalls wrapped in a non-woven geotextile will be laid along the bottom of the trench to provide an adequate base for installation of the pipe and manholes and proper compaction of the backfill. This wrapped section will also minimize the potential for differential settlement over the service life of the new drainage system. Trench dams will be installed every 150 feet along the pipe trench to reduce the likelihood of preferential flow along the granular bedding material.

If a paved or crushed rock surface is required for final cover in areas of this segment currently not paved or drivable, a bulk scraper, bulldozer or front end loader will be employed to grade soil. Where proposed manholes for the new drainage system are located outside of the existing flume limits, those areas will be excavated and the soils removed, tested, and disposed of as described earlier.

2.4.6 Waste Management

Contaminated sediment, creosote-treated wood, concrete debris, and potentially contaminated soil and water will be generated as a result of the removal and construction process along Segment C.

2.4.6.1 Sediment

All sediment removed from the flume will be managed as contaminated, requiring controls on stockpiling, transport, and disposal. Stockpiles will be constructed using stormwater controls to limit runon and runoff, as well as controls for limiting generation of fugitive dust. Sediment will be transported to a Subtitle D landfill for disposal. Further analysis will be performed by the contractor to meet disposal facility acceptance criteria, as required.

2.4.6.2 Soil

No soil removal is required in order to meet Removal Action Objectives; however, soil removal is required in order to install the new drainage system. This soil may be contaminated with low levels of PAHs or metals and therefore require disposal at a subtitle D landfill. The contractor will be responsible for characterizing the removed soil to meet disposal facility acceptance criteria.

2.4.6.3 Water

Water may be generated from stockpiled sediment, flume dewatering prior to sediment removal, and dewatering in preparation for laying bedding material for the new drain pipe. If water separates from stockpiled sediment due to gravity, it will be collected, tested by the contractor, and treated (if necessary) prior to disposal. Water generated from the excavation will be temporarily stored in tanks and treated as necessary to meet King County sewer discharge requirements, as stipulated in the discharge permit obtained by the City. Treatment may entail gravity separation, sand filter, bag filter, and granulated activated carbon (GAC) filter stages depending on analytical results. The contractor will be responsible for testing and implementing proper treatment, according to the approved Work Plan that defines the water treatment provisions.

2.4.6.4 Debris

The wood removed as part of the flume demolition is creosote treated wood and will be disposed of based on waste acceptance criteria at the facility selected by the contractor. This may require testing for toxicity characteristic if recycling is not pursued. Concrete debris generated from partially demolishing the concrete flume open channel sections will either be broken up and used as backfill (if never in contact with sediment) or disposed of with other soil generated from the project (if confirmation sampling indicates the presence of PCBs through destructive sampling).

2.4.7 Short-term Impacts during Construction

2.4.7.1 Environmental

All work will be performed within the existing flume footprint. If stockpiling is performed, runon and runoff controls will be in place as prescribed in the Project Manual. BMPs include liners and cover, bermed perimeter, and leachate collection.

Several large trees (16-inch to 30-inch in diameter) will be removed as part of the clearing and grading and construction of the new drainage system. The removal of these trees will be timed in order to comply with the requirements for the Migratory Bird Treaty Act. SCL may hire a separate contractor to remove these trees during the winter of 2007-2008 prior to starting the removal project work.

2.4.7.2 Community

Excavation work at the southern end of Segment C will be conducted in close proximity to the Aero Motel. Barriers, including but not limited to temporary chain link fencing, will be erected to separate residents and passersby from the work area. Specific care will be taken to ensure that site access from East Marginal Way South is not allowed by connecting temporary fencing to existing permanent fencing at the Aero Motel and Boeing.

Notification of construction activities and scheduled outages or impacts to services will be made by the City to the Aero Motel and businesses along South Myrtle Street. Work hours will be closely monitored by the Resident Engineer to ensure that specification requirements are met.

2.4.8 Other Constraints/Issues

To minimize traffic impacts, accessing this segment from East Marginal Way South will be prohibited; access will be allowed from South Myrtle Street only There are active businesses and a fire station located on this street; therefore, one lane of South Myrtle Street will be required to remain open at all times. Traffic control along South Myrtle Street will be addressed in the contractor's traffic control plan to include signage and a flagger to assist trucks entering and leaving the work area. The contractor will be required to give right-of-way to fire department vehicles at all times.

A large number of utilities cross through or under the existing flume. The contractor is required to coordinate with Boeing to determine shut-off locations for all utilities identified in the Project Manual and those that are encountered during the course of the work.

Contractor access to this working area via an existing contractor gate at South Willow Street provides an alternative entrance and exit for contractor vehicles; however, use of this gate would require additional security staff assistance from Boeing to screen workers and vehicles.

All excavation will be limited to areas outside of the suspected drain field boundary behind the Aero Motel (Sheet C104). This area will be marked in the field by the contractor prior to starting excavation and demolition.

2.5 Segment D

2.5.1 Description

The twin 42-inch concrete pipes that form Segment D are located under an asphalt paved surface for their entire length, running in close proximity to active Boeing facilities and buildings. Soil outside of the twin buried pipes will be removed only during the excavation of a new manhole near the southern end of the segment. The concrete bifurcation structure at the upstream end of this segment will be removed. One storm drainage pipe from an adjacent catch basin was identified connecting into the east pipe during the 2005 CCTV survey (Sheet C101), which will be sealed as a source control measure for the project (Boeing has been notified of this action and is expected to reroute flow in this pipe to the North Boeing Field drainage system).

2.5.2 Sediment Removal (CERCLA)

Sealing the flume outfall will be performed prior to flume sediment removal in any segment.

Sediment in the pipes is less than 12 inches deep. The contractor will employ pipe jetting from either the downstream or upstream end of each pipe. (Note: Using foam pigs was evaluated, but it requires that the pipe be either water tight or air tight. The gravity pipe has joints [observed using CCTV] that are partially separated or not constructed correctly, and has a capped utility connection that may not be adequately sealed [Boeing catch basin inlet]. Using pressurized air would not be feasible to clean the concrete surface. Using pressurized water and air would require constructing a pressure fitting on the pipe. Pressurized water could conceivably push contaminants from the pipe into the surrounding soils.) Sediment will be carried to the downstream end of the pipes where it can be collected with a vactor truck. Both pipes will be filled with cement slurry to provide for encapsulation prior to burying. Prior to adding the slurry, one of the pipes will be sliplined with the HDPE replacement drain pipe (described below).

Sediment samples have not been collected from within the twin pipes; samples collected upstream and downstream of the pipes both indicate PCB concentrations at 1,700 mg/kg OC, exceeding the CSL of 65 mg/kg OC. SQS or CSL exceedances occurred for lead, mercury, and zinc at the upstream location and phenanthrene and fluoranthene at the downstream location. No other SMS exceedances were found. All sediment will be removed from Segment D.

2.5.3 Soil Removal (MTCA)

No soil removal is needed in order to meet Removal Action Objectives. However, construction of the replacement drainage system will involve installation of a manhole near the center of the pipes that will require soil excavation. This soil is not expected to be contaminated, since the

flume contents have been contained within the concrete pipe structure. Never the less, soil will be tested prior to determining final disposal options.

2.5.4 Confirmation Testing

All of the sediment will be removed from the pipes, as determined through both visual and CCTV inspection. After final rinsing, destructive concrete samples will be collected from the bottom of the upstream and downstream ends of each pipe to document residual PCB concentrations. No further removal of the concrete is planned, since both pipes will be filled with the same cement slurry used in the Segment A and B CMP.

2.5.5 Drainage Pipe and Backfill

Eighteen-inch HDPE pipe will be inserted into the upstream end of the western 42-inch concrete pipe and pulled to an intermediate receiving pit approximately 300 feet downstream. The same pit will be used to pull a smaller section of HDPE pipe up from the downstream end of the 42-inch pipe. Both HDPE pipes will be joined at a new manhole installed in the receiving pit. The concrete pipe will have the annular space between the new pipe and existing pipe wall filled with the same concrete slurry filler material used in the CMP segments. The area around the new manhole will be filled with clean backfill material and graded and repaved to match the existing surface. High pressure steam and high voltage electrical buried utilities exist in the immediate vicinity of the receiving pit excavation.

2.5.6 Waste Management

Contaminated sediment, concrete debris, and potentially contaminated soil and water will be generated as a result of the removal and construction process along Segment D.

2.5.6.1 Sediment

All sediment removed from the flume will be managed as contaminated, requiring controls on stockpiling, transport, and disposal. Stockpiles will be constructed using stormwater controls to limit runon and runoff, as well as controls for limiting generation of fugitive dust. Sediment will be transported to a Subtitle D landfill for disposal. Further analysis will be performed by the contractor to meet disposal facility acceptance criteria, as required.

2.5.6.2 Soil

Soil to be removed along Segment D for installation of a manhole has not been tested for contamination; it will be segregated and tested prior to determining the appropriate disposal option.

2.5.6.3 Water

Water may be generated from stockpiled sediment and from dewatering that may be required when installing the manhole for the new drain pipe. If water separates from stockpiled sediment due to gravity, it will be collected, tested by the contractor, and treated (if necessary) prior to disposal. Water generated from the excavation will be temporarily stored in tanks and treated as necessary to meet King County sewer discharge requirements, as stipulated in the discharge permit obtained by the City. Treatment may entail gravity separation, sand filter, bag filter, and granulated activated carbon (GAC) filter stages depending on analytical results. The contractor will be responsible for testing and implementing proper treatment, according to the approved Work Plan.

2.5.6.4 Debris

Concrete debris generated from demolishing the concrete bifurcation structure and material removed when constructing the intermediate maintenance hole will either be broken up and used as backfill (if never in contact with sediment) or disposed of with other soil generated from the project (if confirmation sampling indicates the presence of PCBs through destructive sampling).

2.5.7 Short-term Impacts during Construction

2.5.7.1 Environmental

No short term impacts to the environment are anticipated as part of the sediment removal, demolition and drainage system construction for this segment. The contractor will monitor sediment traps to be placed in existing catch basins and maintenance holes in the project area, as noted in the Project Manual, to prevent spreading contaminated material through the existing drainage system.

2.5.7.2 Community

The work for this segment occurs entirely with the North Boeing Field security perimeter fence. The contractor will notify the appropriate Boeing contact as required in the Project Manual prior to starting work in this segment. Traffic control onsite will limit contractor vehicles to specific areas that do not impact Boeing operations.

2.5.8 Other Constraints/Issues

A large number of utilities cross through or under the existing flume. The contractor is required to coordinate with Boeing to determine shut-off locations for all utilities identified in the Project Manual and those that are encountered during the course of the work.

2.6 Segment E

2.6.1 Description

Segment E consists of an open concrete channel, except where it passes under an access road, as a 24-inch concrete pipe supported within a larger concrete structure. Sediment exists in the open flume, in the pipe (a nominal amount), and in the supporting concrete structure, which is accessible beneath the roadway. Sediment will be removed from all three locations and then concrete will be sampled to determine residual PCB concentrations. The open channel will then be backfilled to match the surrounding grade.

2.6.2 Sediment Removal (CERCLA)

Sealing the flume outfall will be performed prior to flume sediment removal in any segment.

All sediment will be removed from Segment E. The contractor will employ a small back hoe to remove the bulk of sediment from the open concrete structure. The 24-inch pipe underneath the roadway crossing will be rinsed clean and then removed in its entirety. Sediment under the bridge will be removed using hand tools in order to protect the electrical ductwork. Surface cleaning of all concrete left in place will be accomplished using pressure washers.

One sediment sample collected in Segment E was analyzed for comparison to SMS criteria, indicating a PCB concentration of 1,700 mg/kg OC. SQS or CSL exceedances also occurred for zinc, mercury, and lead. Sediment samples collected at 12 locations along Segment E indicate PCB concentrations ranging between 1.6 to 92 mg/kg. Samples were collected at an approximate 10-foot spacing to determine extent of contamination exceeding the TSCA limit of 50 mg/kg, identified during initial site characterization. One sample collected adjacent to the initial finding of 92 mg/kg was found to exceed the limit, indicating a 20-foot length of flume requiring TSCA waste management.

2.6.3 Soil Removal (MTCA)

Soil removal is not required to meet Removal Action Objectives. Soil samples collected from 3, 12, and 24 inches beneath the concrete bottom of the flume did not detect any PCBs or identify any other chemicals exceeding the MTCA method A cleanup level for industrial sites. However, construction of the replacement drainage system will involve installation of a manhole that will require soil excavation. This soil is not expected to be contaminated, since the flume contents have been contained within the concrete pipe structure.

Concrete walls along this segment currently protrude above the surrounding grade. The contractor will demolish the walls to an elevation allowing for a new pavement layer to be constructed over the site. The floor slab will not be removed, except to accommodate the new drainage system invert elevation or manhole base slabs.

2.6.4 Confirmation Testing

Confirmation destructive concrete samples will be collected from the bottom of the open channel portion of the flume, with one of those samples collected from the area identified during site characterization as associated with sediment exceeding 50 mg/kg. Destructive concrete samples will be collected from each end of the 24-inch pipe prior to demolition. All samples will be analyzed for PCBs only. If any sample exceeds 1 mg/kg, further sampling will be conducted to determine extent. Concrete that exceeds this level will be removed and disposed of along with contaminated soil.

2.6.5 Drainage Pipe and Backfill

The new drainage pipe will follow the existing concrete channel alignment and utilize the cleaned flume as the pipe trench. The 24-inch pipe beneath the existing bridge over the flume will be replaced by the new drain pipe. HDPE pipe will be laid in the flume and backfilled according to the specifications. The flume will be backfilled and graded and paved to tie into the existing edges of the pavement along the drain pile alignment.

2.6.6 Waste Management

Contaminated sediment, concrete debris, and potentially contaminated soil and water will be generated as a result of the removal and construction process along Segment E.

2.6.6.1 Sediment

The estimate 5 cubic yards of sediment identified as exceeding the TSCA limit of 50 mg/kg will be removed first and kept separate from other sediment removed from the flume. It will be dewatered as necessary and containerized for transport to a Subtitle C facility. Stockpiling of non-TSCA sediment removed from this segment will be performed with runon and runoff controls, as well as control of fugitive dust. As with other segments, non-TSCA sediment will be transported to a Subtitle D landfill for disposal. Further analysis will be performed by the contractor to meet disposal facility acceptance criteria, as required.

2.6.6.2 Soil

Soil to be removed along Segment E for installation of a manhole has not been tested for contamination; it will be segregated and tested prior to determining the appropriate disposal option.

2.6.6.3 Water

Water may be generated from stockpiled sediment and washing of the 24-inch pipe and concrete trench. If water separates from stockpiled sediment due to gravity, it will be collected, tested by the contractor, and treated (if necessary) prior to disposal. Water generated from excavation will

be temporarily stored in tanks and treated as necessary to meet King County sewer discharge requirements, as stipulated in the discharge permit obtained by the City. Rinse water associated with cleaning concrete surfaces will collect at the downstream end of Segment E where the twin pipe invert elevation is a couple of feet above the flume bottom. This water can be delivered to the treatment system. Treatment may entail gravity separation, sand filter, bag filter, and granulated activated carbon (GAC) filter stages depending on analytical results. The contractor will be responsible for testing and implementing proper treatment, according to the approved Work Plan.

2.6.6.4 Debris

Concrete debris generated from demolishing the tops of the concrete walls, the pipe beneath the roadway, and the pipe containment structure, as well as material removed when constructing the intermediate maintenance hole, will either be broken up and used as backfill (if never in contact with sediment) or disposed of with other soil generated from the project (if confirmation sampling indicates the presence of PCBs through destructive sampling).

2.6.7 Short-term Impacts during Construction

2.6.7.1 Environmental

No short term impacts to the environment are anticipated as part of the sediment removal, demolition, and drainage system construction for this segment. The contractor will monitor sediment traps to be placed in existing catch basins and maintenance holes in the project area, as required by the specifications, to prevent spreading contaminated material through the existing drainage system.

2.6.7.2 Community

The work for this segment occurs entirely within the North Boeing Field security perimeter fence. The contractor will notify the appropriate Boeing contact as required by the Project Manual prior to starting work in this segment. Traffic control onsite will limit contractor vehicles to specific areas that do not impact Boeing operations.

2.6.8 Other Constraints/Issues

A large number of utilities cross through or under the existing flume. The contractor is required to coordinate with Boeing to determine shut-off locations for all utilities identified in the Project Manual and those that are encountered during the course of the work.

2.7 Segment F

2.7.1 Description

Segment F consists of the steam plant tunnel, which is located partially within the boundary of North Boeing Field and partially on the steam plant property. Sediment will be removed from within the tunnel and the connected sections of steam plant condenser pit, the tunnel will be disconnected from the steam plant structure and concrete pressure tank, and the concrete tunnel will be filled with inert material. Those existing GTSP downspouts that can easily be connected to the new drain pipe will be connected (approximately half); the other downspouts will be allowed to drain to the ground surface until funding is available to allow connection in the future. The new drain pipe will bypass the tunnel in a separate excavation. Removal of the tunnel and condenser pit serves as a source control element of the project so that only roof drain inputs are allowed to the replacement drain pipe.

2.7.2 Sediment Removal (CERCLA)

Sealing the flume outfall will be performed prior to flume sediment removal in any segment.

The tunnel section is large enough to accommodate construction workers with safety equipment for access and egress. The top of the tunnel will likely be exposed on the steam plant property immediately adjacent to the steam plant structure and an opening cut into the top slab to provide ventilation and access. An 8-foot by 8-foot opening located near the downstream end south of the Boeing security fence that separates the properties will allow access for small equipment and construction workers.

Sediment thickness at the downstream end of the tunnel has been observed at less than 1 inch. It is expected that sediment depth will increase near the steam plant connection and in the condenser pit that runs underneath the steam plant. Water in the tunnel has been tested for SVOCs, PCBs, diesel-range organics, and priority pollutant metals, with only copper and zinc barely detected above reporting limits.

The project specifications will not limit the contractor's means and methods for sediment and water removal. Possible means for cleaning the tunnel include the following:

- Vactor trucks using openings cut into the top of the tunnel roof slab. Workers inside the tunnel could operate the vacuum hoses to gather up all sediment accumulated in the bottom of tunnel.

- Pressure washers used inside the tunnel to move sediment to a collection point where it could be pumped to the surface and dewatered prior to disposal. This method would produce more wastewater than the jetting method for the bulk removal of material; however, pressure washing is the recommended method for final cleaning of the concrete surface.

- Sediment in the condenser pit (measured at up to 1 foot in depth) could be removed by hand tools and pressure washing. There is not available space in the condenser pit or access through the floor of the steam plant to utilize heavy equipment.

One sediment sample collected from the condenser pit at the beginning of the tunnel identified PCBs at 43 mg/kg OC, exceeding the SQS criterion of 12 mg/kg OC. Other constituents with concentrations exceeding SQS or CSL criteria included lead, mercury, zinc, phenanthrene, and fluoranthene. All sediment in Segment F will be removed.

2.7.3 Soil Removal (MTCA)

No soil removal is required in order to meet Removal Action Objectives. Soil samples collected from 15 feet below ground surface on either side of the base of the tunnel did not detect any PCBs or identify any other chemicals exceeding the MTCA method A cleanup level for industrial sites. Some soil will be removed in order to install the new drainage pipe connecting the GTSP roof drains. Six near-surface soil samples collected across the planned trench area identified PCB concentrations ranging between 0.07 and 0.23 mg/kg, all below the MTCA method A cleanup level for unrestricted land use. All soil removed will be tested prior to disposal off site.

2.7.4 Confirmation Testing

After final rinsing of the tunnel, destructive concrete samples will be collected from the bottom of the tunnel to document residual PCB concentrations. Destructive concrete samples will be collected from the bottom of the condenser pit and analyzed for PCBs only. No removal of the concrete is planned, since the tunnel will be filled with an inert material, preventing possible future exposure.

If the new drainage pipe trench soil is found to be contaminated, samples will be collected along the bottom of the trench. No additional soil removal beyond that required to lay pipe is planned for this project.

2.7.5 Drainage Pipe and Backfill

The tunnel connection to the steam plant will be severed at the steam plant wall by breaking the tunnel concrete connection at the outer wall edge. The existing opening will be roughened and closed using reinforcing steel and concrete to construct a permanent and watertight wall patch to prevent ground water from entering the steam plant condenser pit through the tunnel opening. The contractor will repair any other cracks in the condenser pit work area that may allow ground water infiltration.

The tunnel will be abandoned by filling with structurally sound material, such as LDF, sand, or gravel. LDF, such as a concrete slurry, or sand could be pumped into the tunnel through

openings in the roof and vibrated for compaction. Filling the tunnel with gravel would require removal of much of the top roof slab and compacting as the material is placed in lifts.

The drainage pipe along this segment will be routed east of the tunnel in order to pick up existing downspout connections. Soil removed from the pipe trench will be managed as contaminated media. The site will be restored to match the existing grade and the existing landscaped condition.

2.7.6 Waste Management

Contaminated sediment, concrete debris and potentially contaminated soil and water will be generated as a result of the removal and construction process along Segment F.

2.7.6.1 Sediment

All sediment removed from the flume will be managed as contaminated, requiring controls on stockpiling, transport, and disposal. Stockpiles will be constructed using stormwater controls to limit runon and runoff, as well as controls for limiting generation of fugitive dust. Sediment will be transported to a Subtitle D landfill for disposal. Further analysis will be performed by the contractor to meet disposal facility acceptance criteria, as required.

2.7.6.2 Soil

Soil to be removed along Segment F for installation of the new drain pipe trench has not been tested for contamination, but is in the vicinity of previous underground oil storage tanks. Soil will be managed as potentially contaminated and disposed of at a Subtitle D landfill, which will require the contractor to profile the waste in accordance with the selected facility waste acceptance criteria.

2.7.6.3 Water

Standing water will be removed from the tunnel and condenser pit; additional water may be generated from stockpiled sediment. If water can be carefully removed from the tunnel, it may not require treatment. As sediment is entrained, the need for treatment will increase. This water and any water that separates from stockpiled sediment due to gravity will be collected, tested by the contractor, and treated (if necessary) to meet King County sewer discharge requirements, as stipulated in the discharge permit obtained by the City. Treatment may entail gravity separation, sand filter, bag filter, and granulated activated carbon (GAC) filter stages depending on analytical results. The contractor will be responsible for testing and implementing proper treatment, according to the approved Work Plan.

2.7.6.4 Debris

Concrete debris generated from demolishing the tunnel connection to the steam plant will either be broken up and used as backfill (if never in contact with sediment) or disposed of with other soil generated from the project (if confirmation sampling indicates the presence of PCBs through destructive sampling).

2.7.7 Short-term Impacts during Construction

2.7.7.1 Environmental

No short term impacts to the environment are anticipated as part of the sediment removal, demolition and drainage system construction for this segment. The contractor will monitor sediment traps placed existing catch basins and maintenance holes in the project area as noted in the Project Manual to prevent spreading contaminated material through the existing drainage system.

2.7.7.2 Community

The work for this segment occurs partially in North Boeing Field and partially on the SCL-owned steam plant parcels. The contractor will notify the appropriate Boeing contact, as required by the Project Manual, prior to starting work in this segment. Traffic control onsite will limit contractor vehicles to specific areas that do not impact Boeing or the steam plant operations. Specific staging areas are identified that require some impacts to the steam plant use of the property during the construction season.

2.7.8 Other Constraints/Issues

A large number of utilities cross through the replacement drainage pipe construction area. The contractor is required to coordinate with Boeing to determine shut-off locations for all utilities identified in the Project Manual and those that are encountered during the course of the work.

Because the steam plant and flume are designated historical monuments, the contractor will be required to protect the surface features and structural components of the steam plant during the demolition project.

2.8 Willow and Ellis Substations

2.8.1 Description

The Willow Street substation is located at the dead end of South Willow Street and abuts directly to the existing flume. The contaminated soil and ballast located near one transformer pad in the substation yard will be removed. Because the substation is active, contractor workers will be supervised directly by City of Seattle employees to ensure worker safety. This substation provides power to the Boeing facility and is considered an essential facility for Boeing's

operations. Temporary shutdown of the substation to facilitate removal for any duration is not necessary to complete the work.

The Ellis Street substation is a decommissioned facility located immediately adjacent to Segment C of the flume at South Myrtle Street. The substation electrical equipment has been removed; only concrete pads, foundations, and fencing remain at the site. The substation may be used for contractor staging and soil stockpiling during the project.

2.8.2 Soil Removal (MTCA)

One soil sample at the Willow substation identified PCBs at a concentration exceeding the TSCA limit of 50 mg/kg. It is estimated that approximately 3 cubic yards of TSCA-regulated soil will require removal. Because of the proximity to active high voltage transformers at the Willow substation, the contractor will use hand tools to remove contaminated ballast from within the active station. Soil surrounding the high concentration sample will be removed first and confirmation sampling will be performed by SCL to determine whether all TSCA-regulated soil has been removed. The surrounding soil then will be removed until PCB concentrations fall below the MTCA method A cleanup level for unrestricted land use (1 mg/kg). Drums will be used to transport and dispose of the PCB-contaminated materials at a licensed landfill. The contractor will replace soil up to the base of the surrounding ballast and then add ballast to meet the surrounding grade.

At the Ellis substation, PCB-contaminated soil has been identified along the edge of the flume within Segment C. This soil will be removed during demolition of the wood flume structure.

2.8.3 Confirmation Testing

Confirmation soil sampling will be performed by SCL, with all samples analyzed for PCBs only. At the Willow substation, sampling will be performed in two stages: first to confirm removal of TSCA-regulated soil and second to confirm removal of MTCA-regulated soil. Samples will be collected from excavation bottoms and sidewalls in each case. At the Ellis substation, confirmation samples will be collected along the 30-foot length of the identified contaminated area (this will be in addition to confirmation sampling performed for Segment C).

2.8.4 Waste Management

Soil identified as exceeding the TSCA limit of 50 mg/kg will be removed first and kept separate from other soil removed from Willow substation. It will be containerized for transport to a Subtitle C facility and SCL will complete the required TSCA documentation. Stockpiling of other soil removed from the flume will be performed with runon and runoff controls, as well as control of fugitive dust. This soil will be transported to a Subtitle D landfill for disposal. Further analysis will be performed by the contractor to meet disposal facility acceptance criteria, as required.

2.8.5 Short-term Impacts during Construction

2.8.5.1 Environmental

No short term impacts to the environment are anticipated as part of the contaminated soil and ballast removal or demolition of the concrete footings.

2.8.5.2 Community

No community impacts are expected as a result of this activity.

2.8.6 Other Constraints/Issues

The high voltage working conditions will necessitate that the contractor have SCL supervision during the removal action.

3.0 Compliance with Regulations

3.1 Water-related Regulations

3.1.1 Sections 401 and 404 of the Federal Clean Water Act – Water Quality Certification and Dredge and Fill Requirements (33 USC 1340, 1344; 33 CFR Parts 320 through 330 and 40 CFR Parts 230 and 231)

Sections 401 and 404 of the CWA set forth requirements for water quality certification, and for dredging and placing fill materials into the waters of the United States, respectively, and are applicable to in-water actions (below MHHW) at the end of pipe in Slip 4. Because these actions will take place onsite (within the CERCLA removal action area), only substantive requirements of these laws and implementing regulations apply.

Section 401 requires that a certification of water quality be issued by the state that cleanup actions will meet applicable water quality standards. EPA is examining the portions of the sediment removal design that affect Slip 4, and will determine requirements for ensuring substantive compliance. Prior to construction, EPA will issue a finding that substantive requirements of the 401 certification have been met. The design includes a number of BMPs to meet water quality standards. A silt fence will be installed to block fish access to the work area and reduce suspended solids from leaving the work area. A floating boom also will be installed to prevent movement of any oily material from the work area. All excavation of sediments and bank soil, and placement of fill materials will occur in-the-dry. Additional specific BMPs will be identified in the contractor's TESC plan. The Contractor will be required to monitor BMPs and repair or improve the measures in order to meet water quality performance requirements. Monitoring of the effectiveness of TESC measures and water quality will be performed by the City of Seattle. Water quality monitoring requirements will be determined by EPA in their CWA 401 certification, as discussed further under the *Water Quality Standards* heading.

Concurrent with the Slip 4 Action Memorandum, a Section 404(b)(l) evaluation was completed for the entire Slip 4 Non Time Critical Removal Action (NTCRA), which determined that the in-water removal action will be in compliance with the requirements of CWA Section 404 (USEPA 2006). For the flume outfall work, removal of bank material and mudflat sediment required to gain access to the flume pipe end will be limited to approximately 20 cubic yards. The bank soil and sediment to be removed is a small portion of the material that has been examined as part of the existing 404(b)(1) evaluation for the larger Slip 4 NTCRA.

40 CFR Part 230 sets forth specific standards to implement CWA Section 404(b)(l) requirements for evaluation and testing of dredged or fill material placed into navigable waters of the U.S**.** Placement of fill material in Slip 4 from upland sources is a CERCLA onsite action, and hence, the substantive requirements of 40 CFR Part 230 must be met. For this project, fill material to be placed below MHHW includes 10 cubic yards of 4 to 8 inch quarry spalls as access route stabilization material, 10 cubic yards of quarry spalls placed as a temporary outfall scour pad,

and 15 cubic yards of sandy gravel placed as habitat enhancement. EPA will verify that the proposed fill meets the requirements of 40 CFR Parts 230.60 and 230.61 (Evaluation and Testing) through consideration of such factors as the nature of material being placed, experience, and the results of import material tests required by the specifications. No material will be placed in the water until EPA has reviewed the characterization results.

3.1.2 Water Quality Standards for Surface Waters (Ch. 90.48 and 90.54 RCW; WAC 173-201A)

WAC 173-201A sets forth water quality standards that must be met in Slip 4. EPA's CWA 401 certification will identify monitoring required to ensure compliance with water quality standards. It is anticipated that visual monitoring of the effectiveness of TESC measures for the control of turbidity and sheens will be required. This water quality monitoring will be conducted by the City of Seattle.

3.1.3 Point Source Discharges to Surface Water (Ch. 90.48 and Ch. 90.54 RCW) and Regulations (Ch. 173-220 WAC)

These regulations govern the point source discharge of pollutants to surface water. All water generated during this project will be collected, analyzed, treated as needed, and discharged to the sanitary sewer (under a permit from King County). Therefore, no point-source discharges to surface water will occur.

3.1.4 Construction Projects in State Waters (Ch. 77.55 RCW) and Hydraulics Project Approval Regulations (Ch. 220-110 WAC)

Hydraulic code rules for construction projects in state waters have been established for the protection of fish and shellfish, and are applicable to Slip 4 construction activities. The flume removal action work in Slip 4 will comply with these substantive requirements by adhering to the common saltwater technical provisions of WAC 220-110-270. Some work waterward of the ordinary high water line may occur within the prohibited times identified in WAC 220-110-271; such work will be conditioned on avoiding any in-water work below MHHW, placing a barrier to fish surrounding the work zone, adhering to the other BMPs identified in the specifications, and conducting monitoring as required in EPA's CWA 401 certification.

3.1.5 Shoreline Management Act (Ch. 90.58 RCW)

According to SMA regulation WAC 173-27-060, federal agency actions within a coastal county such as King County must be consistent to the maximum extent practicable with the approved Washington state coastal zone management program, subject to certain limitations set forth in the Federal Coastal Zone Management Act, 16 U.S.C. 145 1 et seq. (CZMA) and regulations adopted pursuant to it.

Seattle Municipal Code (SMC) Chapter 23.60 and its regulations implement the State Shoreline Management Act, and are applicable to all building, excavation, dredging, and filling within 200 feet of regulated shorelines. The project will comply with these implementing regulations.

3.1.6 King County Wastewater Discharge Permit (KCC Title 28)

Discharge from construction dewatering into the King County sewerage system is governed by these regulations that are designed to prevent discharge of substances that degrade wastewater treatment processes or impact surface-water quality. In accordance with King County Code Title 28, SCL has applied and will obtain a King County Wastewater Discharge Permit. As required by the permit, the City will provide pre-treatment of wastewater to levels in accordance with King County's established discharge limits. Local King County (Title 28) as well as federal (40 CFR 403) limits apply to construction dewatering discharges and will be met by the removal action.

Ground water and captured surface water runoff removed from open excavations during construction likely will require treatment prior to disposal. Water treatment methods described in the contract documents include gravity pre-settling, mechanical separation, filtering to remove particles larger than 10 microns, and treatment through an activated carbon filter to remove organic compounds (specifically PCBs).

3.2 Wildlife-related Regulations

3.2.1 Federal Endangered Species Act (16 USC 1531 et seq.; 50 CFR Parts 17, 200, and 402)

As noted in the Slip 4 Engineering Evaluation/Cost Analysis (EE/CA), several federally threatened or endangered (T/E) wildlife and fish species may be present in the site area. In accordance with Section 7 of the Act, EPA has been consulting with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) (collectively "the Services") about the potential effects of the proposed removal activities and ways to minimize those effects. A biological assessment has been prepared for the Slip 4 Removal Action with EPA oversight.

USFWS and NMFS will issue a biological opinion outlining any jeopardy the removal action may represent for listed species. The Services may suggest project modifications to reduce adverse effects below the "jeopardy" threshold and allow the activity to proceed. If a no-jeopardy opinion is issued, the removal action may be conducted as planned. Since work will not be allowed below the water line, it is not expected that the biological opinion would include additional conservation measures (such as restrictions on allowable work periods or monitoring for presence of listed species).

3.2.2 Fish and Wildlife Coordination Act (16 USC 661 et seq.)

This statute establishes criteria to protect fish and wildlife that could be affected by proposed or authorized federal projects involving "impounding, diverting, or controlling waters." This act is

relevant and appropriate to cleanup actions at the Georgetown flume as an extension to Slip 4. EPA has consulted with the U.S. Fish and Wildlife Service and the Washington Department of Fish and Wildlife regarding the potential effects of the project on fish and wildlife and has identified measures that would mitigate those impacts. Also, the statute requires that adequate provision be made for the conservation, maintenance, and management of fish and wildlife resources and their habitats. The ESA consultation described above satisfies the substantive requirements of the Fish and Wildlife Coordination Act.

3.2.3 Magnuson-Stevens Fishery Conservation and Management Act (16 USC 1801 et seq., 50 CFR Part 600)

Consideration of the effects of federal actions on Essential Fish Habitat (EFH) for covered species, including salmon, is required under the Magnuson-Stevens Fishery Conservation and Management Act (16 USC 1801 et seq.) and its implementing regulations (50 CFR Part 600), finalized January 17, 2002. Typically, state or federal agencies planning actions that might adversely affect an EFH-managed species must formally consult with NOAA Fisheries regarding the action.

EPA prepared an evaluation of EFH and concluded that the proposed Slip 4 action is not likely to adversely affect EFH for salmonid and groundfish (the Georgetown flume sediment removal at the head of Slip 4 is a small part of the entire Slip 4 Removal Action). A copy of EPA's evaluation was provided to NOAA Fisheries (USEPA 2006b).

3.2.4 Migratory Bird Treaty Act (16 USC 703-712)

This act governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. This act is applicable to cleanup actions at Slip 4 and the flume. During the removal action, actions will be taken as needed to protect habitat for migratory birds and avoid disturbances of their nests and eggs, if found during the construction inspection process. Trees will be removed during those times of the year when species of concern are not nesting in the project area.

3.3 Waste Management-related Regulations

3.3.1 Toxic Substances Control Act (TSCA) (40 CFR 761)

This regulation is applicable to sediment and soil containing PCBs at concentrations greater than or equal to 50 parts per million. The removal action will comply with TSCA by disposing of any soils and/or sediments with total PCB concentrations greater than or equal to 50 mg/kg at a RCRA Subtitle C landfill. Predesign investigations indicate that approximately 5 cubic yards of sediment in Segment E and soil at the Willow electrical substation exceeds this limit. PCB remediation wastes containing less than 50 mg/kg may be disposed of at non-TSCA municipal or solid waste landfills.

3.3.2 Model Toxics Control Act Regulations (MTCA) (WAC 173-340-440)

The flume property has been determined to meet the requirements of an industrial setting and MTCA method A (industrial) and method C cleanup values apply (Herrera 2007). Pre-design testing along the entire flume indicates that small pockets of soil exceeding these cleanup criteria exist in the designated work area. Waste profiling will be performed prior to removal from the project site to identify contamination prior to disposal, as per disposal facility requirements. Pre-design testing for SVOCs, PCBs, petroleum products, and priority pollutant metals was conducted, with only copper barely detected above the reporting limit.

In addressing soil cleanup standards for industrial properties, MTCA requires that hazardous substances remaining at the property (above Method A cleanup levels) not pose a threat to human health and the environment (WAC 173-340-745(1)(a)(iii)). This may be provided for by limiting access to the property and limiting exposure with a barrier (e.g., capping) or controlling future work that exposes contaminated soil (e.g., utility work). These factors will be addressed by placement of clean backfill in all trenches as a capping measure and providing strict control over access and use of the property into the foreseeable future.

3.3.3 Washington State Sediment Management Standards (SMS) (Ch. 173-204 WAC)

The SMS establish a narrative standard with specific biological effects criteria and numerical chemical concentrations for Puget Sound sediment. Under the SMS, the cleanup of a site should result in the elimination of adverse effects on biological resources and any health threats to humans. SMS has numerical standards for biological resources, and narrative standards for protection of human health.

Attainment of the Sediment Quality Standards (SQS) on the surface sediments within Slip 4 will not be achieved until construction of the Slip 4 NTCRA. The flume project includes placement of a temporary splash pad at the rebuilt outfall. The design of the splash pad requires use of imported "clean" sand, gravel, and rock that will be tested prior to placement. Materials will be required to have concentrations that are no greater than 1/2 the SQS, as described in the design documents, but it is anticipated that many concentrations will be undetected.

Imported backfill material for upland use will meet City standard specification material requirements.

3.3.4 Resource Conservation and Recovery Act (Subtitle C) Hazardous Waste (42 USC 6921 through 6939[e]) and (40 CFR 261.4[g])

Testing of the sediments for TCLP chemical constituents in support of the Slip 4 design indicates that the sediments excavated from slip 4 near the outfall for offsite disposal will not designate as hazardous waste. Similarly, soil contamination concentrations indicate that no soils will designate as hazardous waste.

3.3.5 Resource Conservation and Recovery Act (Subtitle D) Solid Waste (42 USC 6941 through 6949[a]) and (40 CFR Parts 257, 258)

The upland disposal of excavated contaminated sediments and soils will comply with federal and state solid waste management requirements. The requirements of the federal regulations have been incorporated into Ecology's solid waste regulations (below).

3.3.6 Solid Waste Management Act (Ch. 70.95) and Regulations

These requirements are applicable to the disposal of non-hazardous waste generated during removal activities. These standards set minimum functional performance standards for the proper handling and disposal of solid waste, identify functions necessary to ensure effective solid waste handling at both the state and local level, and follow priorities for the management of solid waste.

Because the disposal of the excavated soil, sediments, and debris will take place in a permitted solid waste landfill that is outside the site boundaries, both substantive and administrative requirements of applicable regulations must be met for this activity.

The offsite rule (40 CFR 302.440) of the NCP requires that solid and hazardous waste offsite landfills to which CERCLA hazardous substances are being sent must be acceptable to EPA. EPA will review the status of the proposed disposal facility as identified in the Work Plan.

In practical terms, the requirements for disposal of soil and sediments will be found in the permit of the landfill that agrees to accept the waste. For example, the Roosevelt Regional Landfill's permit allows it to accept sediments that, while dewatered, do not need to pass the paint filter test (to limit free-draining liquids) before disposal.

3.3.7 Washington State Dangerous Waste Regulations (WAC 173-303)

These rules regulate the generation, handling, storage, treatment and disposal of dangerous waste, Washington's stricter, more expansive term for federal hazardous waste.

One composite sediment sample and two composite bank soil samples collected across Slip 4 indicated that Slip 4 sediments and bank soils do not designate as Dangerous Waste and would not be considered as such for the Removal Action (Integral 2007). Excavated soils are also not expected to designate a Dangerous Waste.

3.4 Historic Preservation, Archeology, and Cultural Resource Regulations

3.4.1 City of Seattle Landmarks Preservation Ordinance (Title 25.12 SMC) and National Historic Preservation Act (16USC 470f; 36 CFR 800)

These laws require consultation with appropriate historic preservation officials prior to undertaking actions that may affect historic resources. They are applicable because the GTSP (including the flume) is a National Historic Landmark as well as a Seattle Landmark. The EPA will assume the lead, with assistance from SCL, in consulting with the state and local Historic Preservation Offices. If, during the consultation process, it is determined that the flume project will have an adverse effect on the Landmark, mitigation may be required. A mitigation plan, if needed, will be incorporated into an Agreement between EPA and the State Historic Preservation Office. A timeline for implementing the plan will also be included in the agreement. Although mitigation may be required for the flume project, it is not anticipated to impact the project design or construction schedule.

As required by the National Historic Preservation Act, local tribes will be requested in advance of construction to identify any past uses of the area that may have resulted in buried cultural or archaeological artifacts. Because the flume project will only disturb fill material or recently deposited sediments, this is not expected.

3.4.2 Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq., 43 CFR Part 10)

It is possible that disturbance of Native American materials from earlier times may occur as a result of soil removal from around the flume (sediment removal will be limited to only that material that has discharged from the flume and accumulated on the splash pad). NAGPRA and implementing regulations are intended to protect Native American graves from desecration through the removal and trafficking of human remains and "cultural items" including funerary and sacred objects. To protect Native American burials and cultural items, the regulations require that if such items are inadvertently discovered during excavation, the excavation must cease and the affiliated tribes notified and consulted. The City standard specifications contain language to ensure compliance with this law.

3.4.3 American Indian Religious Freedom Act (42 USC 1996 et seq.)

If Native American or other cultural materials are unearthed as part of the excavation process, NHPA and implementing regulations require that federal agencies consider the possible effects on historic sites. If an agency finds a potential adverse effect on historic sites or structures, the agency must evaluate alternatives to "avoid, minimize, or mitigate" the impact, in consultation with the State Historic Preservation Officer. Consultation with the SHPO will be performed as discussed above under the Historic Preservation Act.

3.4.4 Archaeological Resources Protection Act (ARPA) (16 USC § 470 et seq., 43 CFR Part 7)

Should cultural materials be discovered in excavated soil, the requirements of ARPA and its implementing regulations apply. They prohibit the unauthorized disturbance of archaeological resources on public and Indian lands. Archaeological resources are "any material remains of past human life and activities which are of archaeological interest," including pottery, baskets, tools, and human skeletal remains. The unauthorized removal of archaeological resources from public or Indian lands is prohibited, and any archaeological investigations at a site must be conducted by a professional archaeologist. The city standard specifications state: "Should the contractor discover during any construction activity or in any other way, any artifacts, skeletal remains, or other archaeological resources at the project site, it shall be the responsibility of the contractor to immediately suspend work and notify the Engineer."

3.5 Safety Regulations

3.5.1 Washington Industrial Health and Safety Act (RCW 49.17)

Establishes worker health and safety requirements that are at least as stringent as the Federal OSHA training, monitoring, protective equipment, and documentation requirements at contaminated sites. Construction specifications will require that all construction workers that may come in contact with contaminated soil, sediment, or water shall comply with these Department of Labor and Industries requirements. The contractor will be required to submit a Health & Safety Plan that identifies hazards, identifies safety procedures, and provides documentation of appropriate training for every worker that enters the work site.

3.6 Other Regulations

3.6.1 State Environmental Policy Act (SEPA) (WAC 197-011)

This regulation is applicable to upland soil removal outside the flume. SEPA requires Lead Agencies to conduct environmental review of certain projects. Environmental impacts are assessed through completion of a SEPA checklist, which the Lead Agency then uses to determine the level of required environmental review. As a public agency, SCL is the Lead Agency for SEPA compliance on its projects. A SEPA checklist has been prepared for the project and a determination of non-significance has been assigned.

3.6.2 Puget Sound Clean Air Agency Requirements

The Puget Sound Clean Air Agency (PSCAA) requires control of fugitive dust emissions generated by activities within its region. Specifically, Regulation I, Sections 9.11 (Emission of Air Contaminant: Detriment to Person or Property) and 9.15 (Fugitive Dust Control Measures) prohibit emissions of fugitive dust unless reasonable precautions are employed to minimize these

emissions. Examples of reasonable precautions listed in the regulations include control equipment, enclosures, wet suppression techniques, and cover during transport. These controls are stipulated in the City standard specifications.

Contaminated sediment requiring excavation is expected to be wet or moist; potentially contaminated soil likely will be dryer. Additional wetting will be required so that no visible dust escapes the work area. Clean materials brought to the site to construct the splash pad and backfill upland excavations will be managed in accordance with the requirements of this regulation. Dust from demolition will be controlled by the contractor.

3.6.3 City of Seattle Noise Ordinance (SMC Chapter 25.08)

The City of Seattle's noise ordinance (SMC, Ch. 25.08, Noise Control) sets maximum noise emission levels for three time periods: 1) daytime (7 a.m. to 10 p.m.); 2) weeknights (10 p.m. to 7 a.m.), and 3) weekends and holidays (10 p.m. to 9 a.m.). The site and its immediate area are within the ordinance's industrial zone. The contractor will control noise emissions to within the maximum stipulated 70 dBA.

3.6.4 Critical Areas Ordinance (Title 25.09 SMC)

This ordinance was established to promote safe, stable, and compatible development that avoids adverse environmental impacts and potential harm on the property and to adjacent properties, the surrounding neighborhood, and the drainage basin.

This ordinance is applicable to Critical Areas defined as susceptible to geologic hazard (i.e., liquefaction), designated as a fish and wildlife habitat conservation area, or designated as shoreline habitat. Under SMC 25.09.045 F, maintenance, repair, renovation, or structural alteration of an existing structure that does not increase the impact to, or encroach further within or further alter an environmentally critical area or buffer, is exempt from provisions of this chapter. Shoreline alterations made adjacent to the existing flume structure will be approved through the City of Seattle Department of Planning and Development.

3.6.5 Grading and Drainage Control (Title 22.800 SMC)

This ordinance establishes regulations for safe and responsible grading and drainage within the City to protect life, property, and the environment from loss, injury, and damage by pollution, erosion, flooding, landslides, strong ground motion, soil liquefaction, accelerated soil creep, settlement and subsidence, and other potential hazards, whether from natural causes or from human activities such as grading. It is applicable to grading activities (any volume of excavation, fill, dredging, or other movement of earth materials) at any potentially hazardous (contaminated) location, defined in Section 22.800.050. The City also requires permitted activities to comply with NPDES requirements. However, while city-funded or city-owned projects within the public right-of-way are exempt from acquiring a clear and grade permit (SMC 22.800.070), these projects must still meet the requirements of the ordinance.

4.0 Pre-construction Deliverables

4.1 Confirmation Sampling and Analysis Plan

SCL will provide a Sampling and Analysis Plan (SAP) for confirmation sampling to be completed during the course of the contractor's work. The SAP will identify responsible personnel, sampling and analytical methods, quality control measures, and reporting requirements. A draft plan will be provided to both EPA and Ecology for review prior to commencement of work.

4.2 Bid Documents

The bid documents that integrate flume demolition and cleanup with construction of a replacement drainage system are comprised of the following:

- City of Seattle Standard Specifications – 2005 edition
- City of Seattle Standard Plans – 2005 edition
- Project Manual – amends the Standard Plans and Specifications with the following components:
  - Special Provisions – updates of the standard specifications since 2005, as well as specifications developed for the Georgetown flume project
  - Project plans – updates of the standard plans since 2005, as well as plans developed for the Georgetown flume project
  - Attachment A – Geotech report reference
  - Attachment B – Site Characterization and Alternatives Analysis Report, Georgetown Flume (site characterization portion)
  - Copies of permits that have been obtained by the City of Seattle as part of the project that have contract implications or requirements that the contractor must adhere to during the course of completing the work.

Copies of any or all portions of the bid documents will be provided for agency review upon request.

5.0 Deliverables During Construction

5.1 Submittals

SCL will provide confirmation sampling results to both Ecology and EPA during the course of the project for agency review.

The Project Manual stipulates a list of plans and specific submittals that the contractor will submit to the Resident Engineer for approval. These plans are reviewed to gauge the contractor's understanding of the project requirements prior to starting the physical work or obtaining specified materials. Once the contractor has obtained approval for a submittal, the work dictated under that submittal can commence. The Resident Engineer ensures compliance with the submittal by monitoring the work closely on-site during construction. The specific submittals for this project will include the following:

- Submittal Control Document – This document identifies the specific submittals that will be provided to the Resident Engineer, what requirements of the Project Manual are being satisfied by each submittal, an approximate date for providing the submittals to the Resident Engineer for review and a date when the completed review is needed.

- Critical Path Schedule – The critical path schedule is provided to show that the work will be completed within specified timeframes, what tasks are interdependent upon each other, major phases of work, and specific milestones as required. This schedule will be used to illustrate the contractor's understanding and approach to completing the work in Slip 4 while accommodating the tidal influence into the waterway and work areas.

- Work Plan and Schedule – This plan provides details to the contractor's means and methods for completing the work as well a general timeframe. This document provide information such as facilities that will transport and receive waste materials, descriptions and narratives of equipment and machinery that will be used as part of the work, and the contractor's general plan to comply with the other project requirements. Included in this document are the contractor's specific plans for removing, transporting, storing and disposing of contaminated media generated as part of this project. This plan also includes the contractor's methods for containing, collecting and treating water generated from stockpiles and excavation dewatering. The dewatering plan must be designed and certified by a registered professional engineer. If shoring is required, a shoring plan designed and certified by a registered professional engineer must be submitted for review and approval by the Resident Engineer.

- Site Control Plan – This plan will identify how the contractor will comply with security requirements for personnel and equipment as required by North Boeing Field and Washington Air National Guard.

- Temporary Erosion and Sediment Control Plan (TESC Plan) – The TESC Plan provides information on the scheduling, installation, maintenance, phasing and removal of temporary erosion and sediment controls as related to the work along the upland segments of the flume as well as the area adjacent to Slip 4.

- Traffic Control Plan – This plan includes the safeguards that will be used to protect public and worker safety as well as public convenience from construction traffic. In addition to indicating schedule and types of controls to be used for vehicular traffic, this plan also addresses pedestrian control and protection and coordination with the UPRR.

- Spill Prevention Control and Countermeasures Plan (SPCC Plan) – This plan identifies what actions the contractor will implement and the equipment used to contain any spill or release of contaminants or materials that may be hazardous, dangerous, or harmful to the environment.

- Emergency Response Plan – The contractor will submit a plan to handle anticipated emergencies prior to commencement of any operations involving hazardous materials.

- Health and Safety Plan – This plan will include all applicable requirements of WAC 296-843 and will identify controls that will be implemented during the work in order to control safety and health standards and provide for emergency response for hazardous waste operations. The plan will also include detailed information on site workers including training certifications and medical surveillance requirements.

- Copy of all permits required by the contractor – The contractor will be required to obtain certain permits and copies of approvals specific to the means and methods that may be employed or as required by the Project Manual. Permits may include a traffic control plan and operating permits for specific equipment or variations from the hours of work specified, among others.

- Materials Catalog Cuts – This information is provided to allow the Resident Engineer to determine compliance with the specified performance requirements for equipment and materials to be used to complete the work.

Some of the above submittals may be included in larger overall work plans, particularly if a specifically required plan is submitted by a subcontractor for inclusion into a larger document. All of the above submittals will be made available for agency review upon request.

5.2 Construction Reports

The contractor will submit periodic reports to the Resident Engineer during the course of the work in order to document progress, determine payment items, and identify additional work that was not included in the contract that has been performed or that will need to be performed. The reports will identify the amount of materials removed from the site as well as amount of materials that have been placed at the site. The Resident Engineer and SCL will review these reports to monitor the progress of the removal actions. Construction reports will be made available for agency review upon request.

6.0 Post-Construction Deliverables

6.1 Removal Action Completion Report

SCL will produce a Removal Action Completion Report providing a description of the work, including removal dimensions, waste volumes, waste disposal documentation, confirmation sampling, analytical results, data validation, data interpretation, and final conditions at the site. A draft report will be provided for agency review and comment.

6.2 As-Built Drawings

The contractor will produce as-built construction drawings for the project.

6.3 Institutional Controls, Deed Restriction, and Site Maintenance

SCL will work with Ecology to establish institutional controls, such as deed restrictions and site maintenance requirements, based on confirmation sampling results and plans for further actions at North Boeing Field.

7.0 References

Herrera. 2007. Draft Site Characterization and Alternatives Evaluation Report: Georgetown Flume Demolition and Contaminated Soil Removal. Prepared for City of Seattle, Washington by Herrera Environmental Consultants, Inc., Seattle, Washington. April 2007.

Integral. 2006. Lower Duwamish Water Slip 4 Early Action Area Engineering Evaluation/Cost Analysis. Prepared for U.S. Environmental Protection Agency by Integral Consulting. February 10, 2006.

Integral. 2007. Lower Duwamish Waterway Early Action Area 100% Design Submittal, Design Analysis Report. Prepared for U.S. Environmental Protection Agency by Integral Consulting. February 9, 2007.

USEPA. 2006. Substantive compliance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act—Slip 4 Duwamish Waterway, Seattle, Washington. Prepared by U.S. Environmental Protection Agency, Region 10, Seattle, Washington.