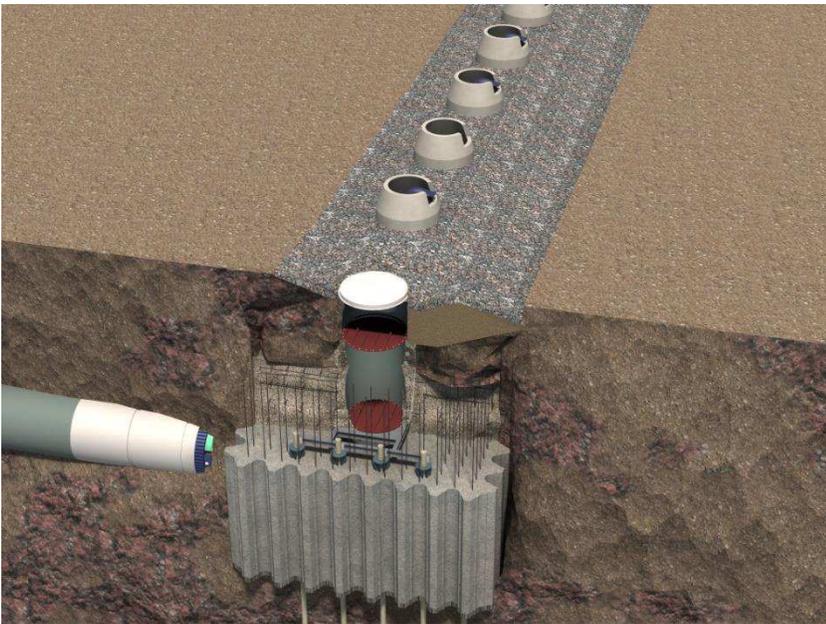


APPENDIX J ENVIRONMENTAL STUDIES

J.2: Construction Environmental Management Plan

Annacis Island WWTP New Outfall System

Vancouver Fraser Port Authority
Project and Environmental Review Application



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SERVICES AND SOLUTIONS FOR
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**CDM
Smith**

 **Golder
Associates**

envirowest

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**CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN
VFPA PROJECT AND ENVIRONMENTAL REVIEW**

**ANNACIS ISLAND WASTEWATER TREATMENT PLANT
NEW OUTFALL SYSTEM**

DRAFT

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December 29, 2017

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- Attachment B: River Construction Drawings

1.0 INTRODUCTION

This Construction Environmental Management Plan (CEMP) is the primary document to guide overall environmental best management practices to be implemented by the construction team for the Greater Vancouver Sewerage and Drainage District's (Metro Vancouver) Annacis Island Wastewater Treatment Plant Outfall Project (Project) to reduce or eliminate effects on the environment and meet regulatory requirements.

The objective of this CEMP is to provide Metro Vancouver's Contractor, including everyone engaged by or through the Contractor relating to the Project, with a prescriptive document for the protection of environmental resources during project activities related to the construction consistent with the Contract Specifications (Section 01355 - Environmental Requirements) included as **Attachment A**. This CEMP provides:

- Performance-based environmental requirements to be met by Contractor in conducting work in accordance with regulatory approvals, Best Management Practices (BMPs), and engineering specifications;
- Measures to mitigate, and where possible avoid, potential adverse impacts to the site's terrestrial and aquatic resources; and,
- An overview of environmental legislation applicable to the Project.

This CEMP provides a basis for the development of the site or activity-specific Environmental Protection Plan (EPP) to be prepared by the Contractor(s) accounting for their selected construction practices and mitigation strategies prior to starting construction activities.

It is important to note that the CEMP and the Contractors EPP may need revisions when the Vancouver Fraser Port Authority (Port Authority) makes a final determination on the suitability, completeness and adequacy of the CEMP, as well as when further site-specific information becomes available or Project conditions change. The CEMP and EPP will be reviewed on an annual basis to ensure mitigation measures are appropriate for the current and scheduled construction activities at the Project site.

2.0 PROJECT INFORMATION

2.1 Project Location

The Project is located between the Annacis Island Waste Water Treatment Plant and the southern shoreline of Annacis Island, with the outfall terminating within Annieville Channel of the Fraser River, immediately downstream of the north pier of the Alex Fraser Bridge, Delta, British Columbia (Figure 2.1). The geographical coordinates of the approximate centre of the design footprint of the Project are 49°9'30.99" N latitude and 122°56'51.38" W longitude.

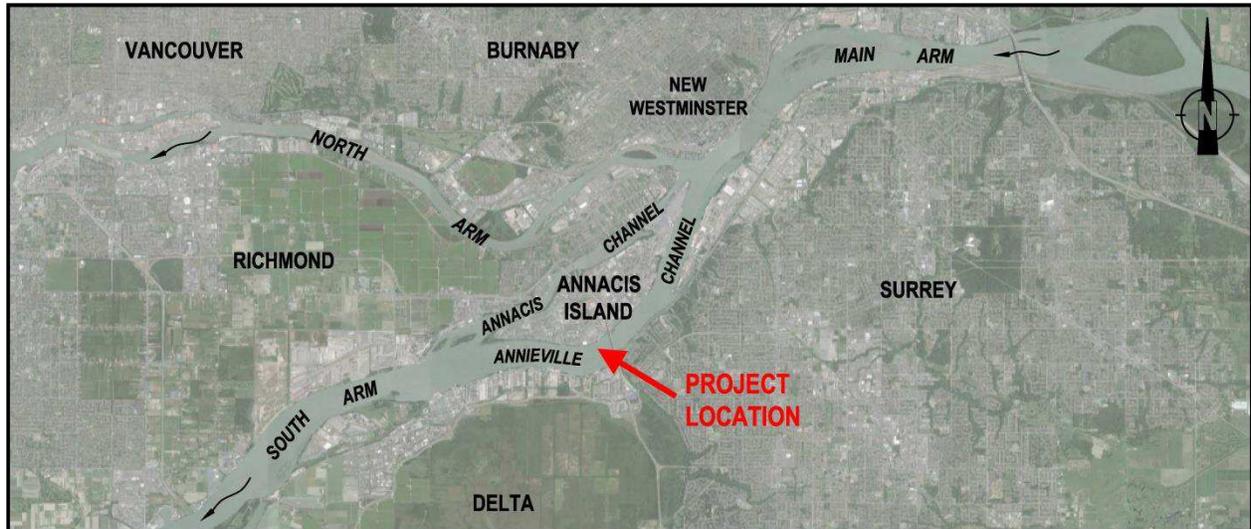


Figure 2.1 Project Location

2.2 Project Description

Metro Vancouver is currently expanding the Annacis Island Wastewater Treatment Plant (Treatment Plant) to increase secondary-treatment hydraulic capacity. The Treatment Plant currently discharges an average of approximately 483 million litres per day (MLD) of secondary-treated effluent into the Fraser River through the existing outfall to a distance of 160 metres (m) off the southern shoreline of Annacis Island, immediately downstream of the Alex Fraser Bridge. The current peak wet-weather capacity of the Treatment Plant is 1089 MLD. Sewage consists of industrial, commercial and domestic wastewaters.

The Treatment Plant is currently being expanded to increase the hydraulic capacity of secondary treatment. This Stage V expansion will increase the average annual capacity to 732 MLD with a peak wet-weather capacity of 1632 MLD. A new outfall is required as the existing outfall system is unable to sufficiently dilute effluent, particularly during slack tide and low discharge in the river, and lacks sufficient hydraulic capacity to discharge estimated increased flows during high water in the river.

The new outfall will commence at the Treatment Plant and terminate at the edge of the north boundary of the navigation channel within Annieville Channel. The outfall will consist of a 4.2 m diameter pipe extending below ground from the Treatment Plant to a riser located in the river. Diffuser manifold pipes will extend approximately 120 to 150 m upstream and downstream from the riser, for a total of 240 to 300 m, aligned approximately parallel with and immediately shoreward of the northern margin of the navigation channel. These pipes will be buried at a relatively shallow depth; multiple diffusers will rise from the pipes into the water column.

The project includes several components between the Chlorine Contact Tank (CCT) level control structure on the Treatment Plant site to the outfall diffuser located in the Fraser River (Figure 2.2):

- a Level Control Structure (LCS) with new level control gates and connection to the exiting CCT;
- an Effluent Shaft which connects the LCS to the Effluent Tunnel;
- an Effluent Tunnel mined at a depth of approximately 30 metres between the Effluent and Outfall Shafts;
- an Outfall Shaft for launching the tunnel boring machine (TBM) to excavate the two tunnels, and provide for a future Effluent Pump Station;
- an Outfall Tunnel mined at a depth of approximately 30 meters between the Outfall and Riser Shafts;
- a River Riser structure located in the Fraser River connecting the Outfall Tunnel to the Diffuser Manifold;
- a Diffuser Manifold buried in the river bed with risers extending to approximately 1 metre above the river bed.

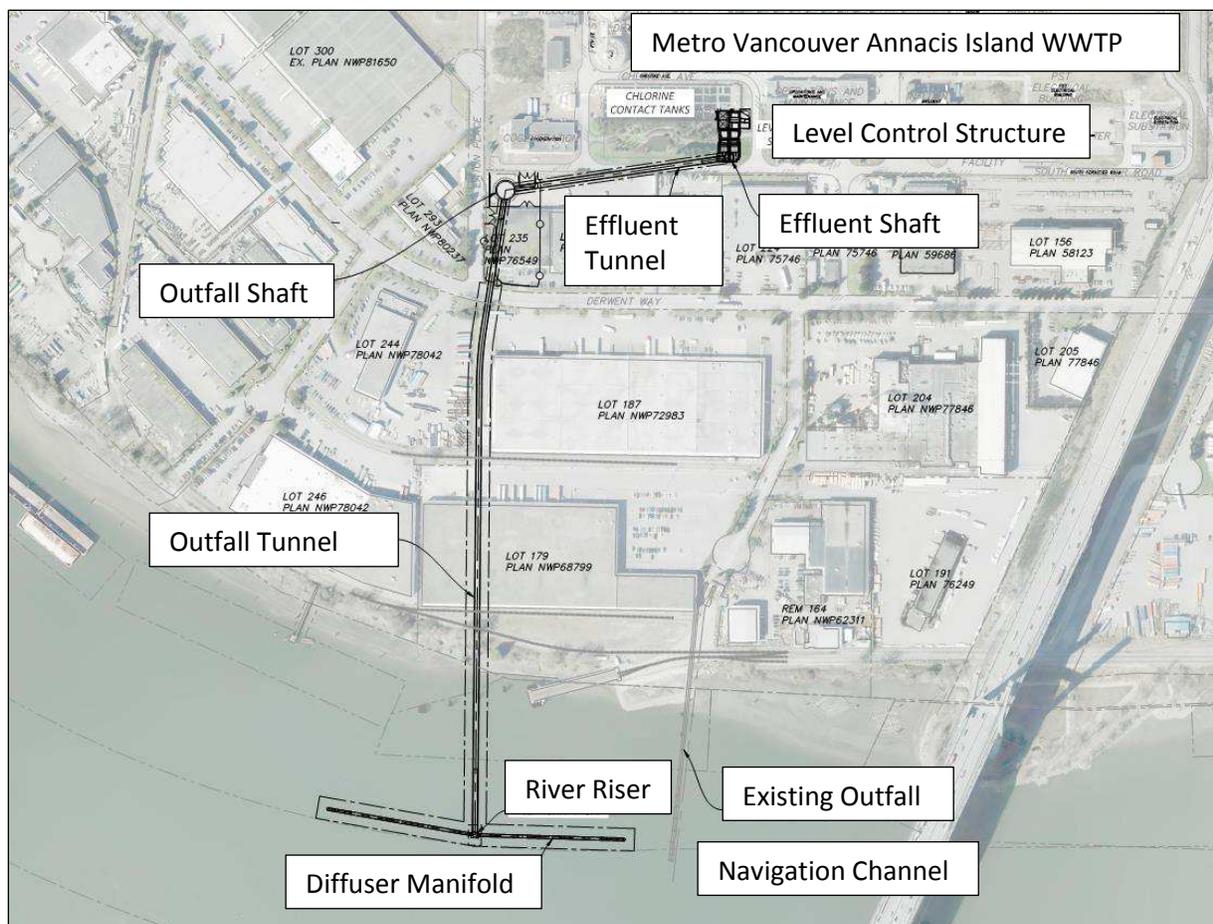


Figure 2.2 Project Components

Construction methodologies for each of these components are as follows.

Level Control Structure

The Level Control Structure will be a new reinforced concrete structure attached to and at the same elevation as the existing Chlorine Contact Tanks. The new LCS will consist of a Distribution Channel Area, Flexible Connection Channel, Level Control Gate Area, and Effluent Shaft Top Structure Area. Construction of the LCS will require shallow excavations and conventional reinforce concrete structure construction.

On-Land Shafts

The on-land shafts (Effluent and Outfall Shafts) will likely be constructed using slurry panels for temporary excavation support. Slurry panels are constructed by excavation of vertical trenches followed by backfilling with concrete to create a vertical panel. Once the slurry panels are completed to form a water tight, circular shoring system, native soils will be excavated from within the shoring, stockpiled on site, and disposed at a permitted upland site. A 1 metre thick cast-in-place concrete lining will be placed to form the permanent structure.

Outfall Conveyance Tunnels

The installation of the outfall conveyance tunnels will utilize a trenchless methodology, specifically pressurized-face tunnelling using a tunnel boring machine (TBM). The top to the tunnel will be located at a depth of 30 metres below land surface and more than 20 metres beneath intertidal and nearshore subtidal river bottom, terminating at the location of the river riser.

Conveyance tunnel excavation will be performed with either a slurry pressure balance (SPB) TBM or an earth pressure balance (EPB) TBM. 254 mm thick concrete liner segments will be installed concurrently with tunneling to form the permanent tunnel lining. Activities associated with tunnel excavating include delivery and storage of pre-cast tunnel lining segments; grout and ground conditioning materials; process and ventilation pipe; tunnel train rails or conveyors; processing of TBM slurry (SPB) or removal of tunnel spoil from the shaft (EPB); and temporary storage of the excavated material on site prior disposal at a permitted upland site.

The conveyance tunnels will be located within denser Fraser River sand deposits. These deposits have been identified through geotechnical investigation as sufficiently competent material to ensure the new outfall system is functional following design ground motions corresponding to a return period of 2,475 years, the equivalent of a nearby 6.5 to 7.5 Richter scale magnitude earthquake, or an offshore subduction zone 7.0 to 8.0 magnitude earthquake.

River Riser

The construction methodology for the river riser is presented by Drawing Nos. X-A61S0081 through to X-A61S0083 (**Attachment B**).

The river riser will be installed in isolation of Fraser River waters. This will be achieved through installation of a cofferdam. The cofferdam will extend from the river bed through the water column, above the high-water elevation. The cofferdam will be composed of metal pipe piles and sheet piles; piles will be installed using a vibratory hammer. Completion of the river riser involves removal of river sediments, installation of foundation piling, and backfilling the excavation with concrete encasing a 3.8 metre diameter vertical riser pipe. Once the river riser is completed, the cofferdam will be removed.

Diffuser Manifold

The diffuser manifold will be installed through dredging a shallow trench in the river bed. It is anticipated that temporary shoring will be utilized to mitigate sloughing of bank sediments into the trench. Drawing No. A61C0073 (**Attachment B**) provides details regarding a diffuser manifold with shoring.

Dredging will be conducted using a clamshell dredge (i.e. a crane equipped with a clamshell bucket). A clamshell dredge is selected, in part, due to its ability to precisely excavate to the limits delineated by the design. Hydraulic dredges, such as cutterhead suction and hopper dredges, tend to over-excavate, especially where sand is the dominant sediment. The use of a clamshell limits impacts on the river bed associated with construction.

The crane with bucket will be operated from a floating spud-derrick. The bucket is operated through a series of cables fitted to the crane. Dredged material is deposited onto a barge. It is anticipated that a portion of the dredged material will be utilized to restore the river bottom (sediment and elevation) upon completion of the installation of the manifold.

Project Schedule

Construction of the Project is proposed to commence January 2019, the anticipated date of the commencement of operation of the outfall is August 2021, and completion of the entire Project is expected in early 2022.

A bar chart schedule showing the anticipated duration of construction activities is presented in Figure 2.3 based on an anticipated start of construction date in January 2019. The tunnel construction activities are shown in orange, on-land shaft construction activities in teal, in-river construction activities in purple, and the construction activities associated with completion of shaft lining, LCS and connection to the CCTs in green.

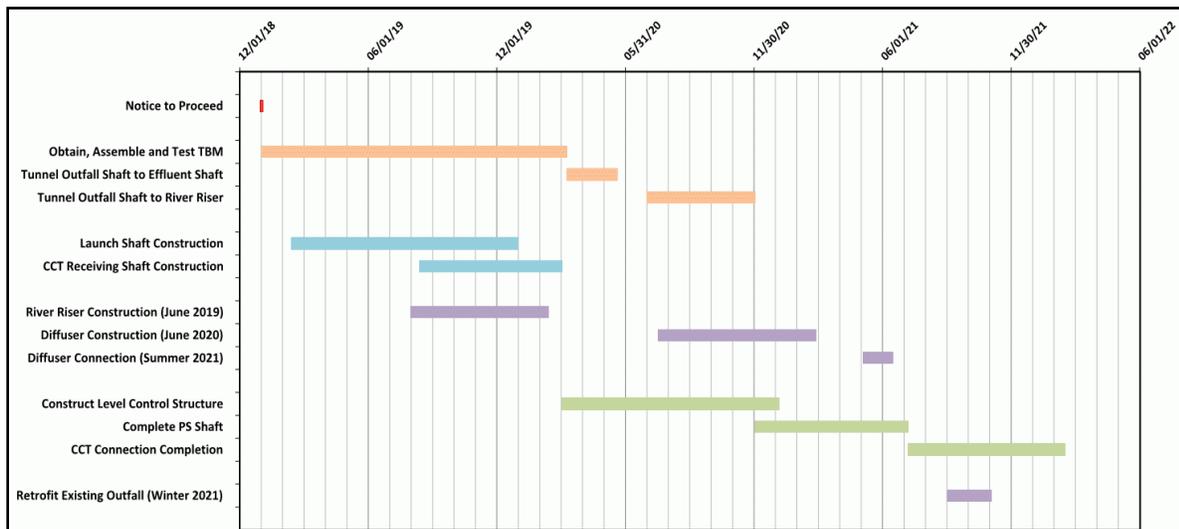


Figure 2.3 Construction Schedule

The first two in-river seasons (river riser and diffuser manifold construction) will be restricted to the timing window for inwater works of least risk to fish, specifically June 16 through to February 28¹.

The second two in-river seasons/activities (diffuser connection and existing outfall rehabilitation) do not involve any disturbance to fish or fish habitat at the river bed, other than short-term, temporary anchoring of spud barges. Although it would be preferable to perform these activities later in the fish window when river flows are lowest, the contractor will be allowed to perform these activities outside the in-river work window as necessary to limit the overall duration and impact of the ps construction activities.

¹ <http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/index-eng.html>

2.4 Site Description

Existing Infrastructure

Annacis Island Waste Water Treatment Plant

The Annacis Island Wastewater Treatment Plant is located on the southern part of Annacis, with the existing effluent discharge off the southern shoreline of the island, within Annieville Channel of the Fraser River. The Treatment Plant provides secondary treatment to wastewater for over 1 million residents in 14 municipalities².

The existing outfall is aligned along and immediately downstream of the South Surrey Interceptor. The outfall is comprised of three pipes (two 1676-millimetre (mm) OD pipes and one 1219 mm OD pipe) that extend 165 m into Annieville Channel from the north bank of Annacis Island. Secondary-treated effluent is discharged through seven sets of steel risers that are situated between 105 and 165 m from the north bank (Northwest Hydraulic Consultants Ltd. 2015). The risers consist of 450 mm diameter, 6.1 m high pipes; the top of these pipes are approximately flush with the bed of the channel. There is limited scour protection around the pipes.

The South Surrey Interceptor occurs approximately 500 m downstream of the Alex Fraser Bridge, approximately 190 m upstream of the proposed outfall diffuser. It is a conduit for influent that enters the Treatment Plant. It was constructed in 1974. The Interceptor consists of two 48 inch outside diameter (OD) cement-lined steel pipes and a 36 inch OD steel pipe in an excavated trench that is backfilled with native river bed material. The pipes occurred from 6.0 to 6.4 m below the bed of the river at the time construction was complete.

Riprap scour protection has been added atop the pipes on several occasions, the first time in 1984, and the last time in 1995.

Industrial/ Commercial Development

Annacis Island was the first industrial park opened in Canada (1955)³. The 1,200-acre island hosts 430 companies employing more than 10,300 people⁴. It has both highway and rail access, and has a barge loading facility along its southern shoreline.

Alex Fraser Bridge

The Alex Fraser Bridge occurs upstream of the proposed diffuser outfall. It was constructed in 1984. It is part of Highway 91; the highway has ramp access to Annacis Island.

The bridge has a span of 464 m. The alignment of the bridge is approximately 30 degrees to the alignment of Annieville Channel; the effective waterway opening is 370 m. The channel width upstream and downstream of the bridge is 450 m and 800 m, respectively. The bridge forms a significant constriction to flows within the channel.

² <http://www.metrovancouver.org/services/liquid-waste/treatment/treatment-plants/annacis-island/Pages/default.aspx>

³ <http://www.vancouverhistory.ca/chronology1955.htm>

⁴ <http://www.deltachamber.ca/our-communities.html>

The two bridge towers are protected against ship collisions by large sand islands that are armoured with riprap. The islands extend into flows, forming short guide banks. A conspicuous back eddy occurs downstream of the north island, facilitating deposition of sediments and collection of woody debris shoreward of the proposed diffuser outfall location.

Southern Railway Railcar Barge Terminal

The design alignment of the outfall pipe engages the distal half of the moorage basin of Southern Railway's railcar barge terminal. The moorage basin is dredged on a regular basis to maintain the design depth of the basin, specifically 6.0 m below chart datum.

Existing Channel Bed

Intertidal

Intertidal flats occur as a narrow fringe within the design alignment of the effluent pipe. Sediments consist of silts to fine sands. The riverward margin of intertidal flats are demarcated by the moorage basin of Southern Railway's railcar barge terminal.

The flats are particularly wide downstream and upstream of the design alignment of the pipe, as a result of the hydraulic shadows associated with moored chip barges and the north sand island of the Alex Fraser Bridge, respectively. Sediments at lower elevations of the flats are predominantly silts and fine sands; coarser sands are prevalent at and about the high water elevation where waves frequently break upon bottom sediments.

Intertidal marsh occurs as discontinuous patches along the higher margins of the flats. Characteristic species include spikerush (*Eleocharis palustris*), articulated rush (*Juncus articulatus*), Lyngby's sedge (*Carex lyngbyei*), reed canarygrass (*Phalaris arundinacea*), bentgrass (*Agrostis stolonifera*), American bugleweed (*Lycopus americanus*), knotweed (*Polygonum* sp.), and aster (*Aster* sp.).

Subtidal

The bed elevation at the design location of the diffuser outfall is approximately 10 m below chart datum. Since the construction of the Alex Fraser Bridge, the bed elevation at the design outfall location has varied up to 2 m.

The formation and migration of dunes on the channel bottom at and about the location of the outfall diffusers is likely accountable for this variability in bed elevations. Dunes have been observed at the location of the diffusers across a range of observed flows. They are transient in nature, with the largest dunes being prevalent during low river discharge, and the smallest dunes associated with high river discharge.

Bottom sediments consist of a range of fine to coarse sands. These sands are readily transported by flows characteristic of the proposed outfall location, facilitating the formation of dunes observed throughout those parts of the channel within and in proximity to the outfall location.

Hydrology, Hydraulics and Salinity

The Fraser River has a snowmelt-dominated flow regime, with the discharge typically rising in April, peaking between May and July, and then receding during the autumn and winter months. The long-term mean flow at Mission is 3,200 m³/s. The discharge at Mission for the 20-year return period is estimated at 13,700 m³/s. Monthly average flows from 1965 to 1992 at the Port Mann Pump Station, upstream of Annacis Island, ranged from 1,030 m³/s in winter to 11,900 m³/s during freshet in early summer. The distribution of flows amongst the branches of the lower Fraser River was measured by Public Works Government Services Canada in May-June 2002. The measurements revealed that Annieville Channel carried 80 percent of the flow measured at New Westminster, upstream of the trifurcation of the main stem of Fraser River into the North Arm, Annacis Channel and Annieville Channel.

The variation in mean velocities for the simulated 2012 flood condition at the design location of the outfall, coinciding to a 20-year return period event, ranged from 1.2 m/s to 2.5 m/s.

The design location of the outfall occurs within the lower part of the Fraser River estuary. The oceanographic characteristics of the lower part of the estuary are strongly affected by the quantity, quality, and timing of freshwater discharge and by the tides and winds of the Strait of Georgia. Fresh waters of the river are less dense than the salt waters of the strait. As a result, a halocline occurs within the lower estuary.

During a flood tide, salt waters tend to flow upstream beneath the downstream-flowing fresh waters until an equilibrium of vertical pressures is reached. A curved interface is formed between salt and fresh waters when this equilibrium is reached, forming a salt wedge. The interface touches the bottom when the salt water reaches a point of zero velocity. The position of the salt wedge varies with both tide and freshwater discharge.

The position of the salt wedge occurs upstream of the Alex Fraser Bridge when freshwater discharge is low, typically during winter. During freshet, from May through to early July, when discharge is highest, the upstream-most position of the salt wedge is often at the delta front.

3.0 CONTACTS AND RESPONSIBILITIES

3.1 Key Project Personnel

This section of the CEMP describes the roles and responsibilities of Metro Vancouver (Corporation) and the Project’s Contractor for implementing, inspecting, and reporting on the effectiveness of environmental protection and mitigation measures.

The Corporation and Contractor, and all respective personnel working on the Project, have a responsibility to protect environmental, socioeconomic, First Nation and heritage values for the Project. Personnel involved with the planning and implementation of the Project’s overall environmental program are presented in Table 1. Details on the roles and responsibilities these personnel follow. Specific requirements of the Contractor are detailed in Contract Specification Section 01355 - Environmental Requirements (**Attachment A**).

Table 3.1 Key Project Contacts

| Name | Role | Organization | Phone Number |
|--------------|----------------------------------------|------------------|--------------|
| Ken Massé | Project Manager | Corporation | |
| John Newby | Corporation’s Engineer | CDM Smith | |
| Tim Langmaid | Corporation’s Construction Manager | Hatch | |
| TBD | Corporation’s Environmental Monitor | Golder | |
| TBD | Contractor Project Manager | Contractor | |
| TBD | Contractor Environmental Manager | Contractor | |
| TBD | Contractor Environmental Specialist(s) | Contractor | |
| TBD | VFPA Contact | VFPA | |
| TBD | DFO Contact | DFO | |
| TBD | TC Contact | Transport Canada | |
| TBD | Delta Contact | City of Delta | |

3.2 Metro Vancouver (Corporation)

Metro Vancouver (Corporation) has responsibility for overall Project implementation, including the administration of contracts, technical quality control, adherence to and performance of engineering requirements of contract specifications. The Corporation, in collaboration with its Engineer and Construction Manager, is responsible to:

- ensure compliance with terms and conditions of regulatory permits, approvals, and authorizations, relevant legislation, and best management practices and standards;
- coordinate construction inspections to ensure compliance with engineering specifications and standards;
- ensure effective communication links among respective personnel of the Corporation and Contractor;
- manage communications and relations with public stakeholders, regulatory agencies and First Nations;
- delegate authority and communicate requirements as needed regarding all aspects of the Project;

- assess the qualifications, experience and performance record of the Contractor’s Environmental Manager and Specialist(s), and the Contractor’s environmental record, as part of tender evaluations; and,
- engage a Qualified Environmental Practitioner as the Corporation’s Environmental Monitor.

3.3 Corporation’s Environmental Monitor

The scope of the Corporation’s Environmental Monitor will include inspection, evaluation and audit of the work of the Contractor and its Environmental Manager and Environmental Specialist. Roles and responsibilities of the Corporation’s Environmental Monitor include:

- communication of the requirements of this CEMP to the Contractor’s Project Manager, Environmental Manager, and Environmental Specialist(s);
- audit of environmental orientation and training sessions delivered to Contractor staff by the Contractor’s Environmental Manager;
- review of the Contractor’s EPP and component details, procedures, and plans as they relate to compliance with this CEMP, regulatory permits and approvals issued to the Project, relevant legislation, and best management practices and standards;
- review of the Contractor’s environmental monitoring reports, as prepared by the Contractor’s Environmental Manager, for completeness, accuracy, adequacy of applied mitigation measures, and compliance with the environmental protection requirements of this CEMP;
- report to the Corporation on the effectiveness of mitigation measures being implemented to avoid or limit project-related environmental impacts, difficulties and/or deficiencies encountered, and how such difficulties and/or deficiencies were addressed;
- audit reports and manifests produced by the Contractor’s Environmental Manager and Environmental Specialist(s);
- verify that copies of environmental agencies’ permits/approvals and spill response and emergency procedures are maintained at work site(s) at all times;
- audit and evaluate compliance of work practices, procedures and effectiveness of mitigation measures with terms and conditions of regulatory approvals, with this CEMP, and with applicable EPP and component details, procedures, and plans.
- as required, provide recommendations to Contractor through the Corporation’s Project Manager to address deficiencies in compliance with this CEMP and the EPP, and respective component details, procedures, and plans, with regulatory permits and approvals, with relevant legislation, and with best management practices and standards.
- review the Contractor’s Environmental Monitoring Completion Reports;
- assist in emergency situations or incidents with regard to the implementation of mitigation to minimize adverse environmental effects; and,

- recommends suspension of construction activities to the Corporation's Project Manager, based on non-compliance with this CEMP or EPP, contravention of regulatory permits and approvals, contravention of relevant legislation, absence of best management practices and standards, and/or environmental damage resulting from construction related activities, until appropriate actions to achieve compliance and/or prevent further environmental damage are identified and implemented to the satisfaction of the Corporation.

3.4 Contractor

Performance-based environmental goals and objectives that are to be met by the Contractor for the Project are presented by Contact Specification Section 01355 – Environmental Protection of the Project. This contractual obligation of the Contractor ensures that environmental goals and objectives of the Project are met in a timely and effective manner. The Contractor's roles and responsibilities, as defined in the specification, includes:

- compliance with project and environmental conditions of the Port Authority Project Permit and any other agency permit, approval or authorization issued to the Project, and all relevant federal, provincial, and municipal laws, statutes, by-laws, regulations, orders and policies;
- retention of a qualified Environmental Manager responsible for the duties listed in the specification; the Environmental Manager reports directly to the Contractor's Project Manager and the Corporation's Environmental Monitor.
- development and implementation of a site and activity-specific Environmental Protection Plan (EPP) in accordance with requirements of Specification Section 01355, and with prescriptive performance-based environmental protection requirements of this CEMP.
- retention of Environmental Specialists as necessary to assist the Contractor's Environmental Manager with preparation and implementation of the Contractor's Environmental Protection Plan, including environmental monitoring, environmental reports, requirements, emergency spill response, cleanup activities, and incident investigation reports, and compliance with the environmental protection requirements of this CEMP.

4.0 RELEVANT ENVIRONMENTAL LEGISLATION

The following table provides a list of relevant environmental legislation and legal requirements applicable to the Project. The list will be revisited and updated as required throughout the construction phase of the Project to address prospective changes in construction activities that may introduce further regulatory requirements.

Table 4.1 Relevant Environmental Legislation

| Act, Regulation or Bylaw | Description | Applicability | Approval or Permit in Place or Addressed |
|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal | | | |
| <i>Fisheries Act:</i> administered by Fisheries and Oceans Canada and Environment Canada | The <i>Fisheries Act</i> provides protection of fish, fish habitat and water quality. The <i>Fisheries Act</i> prohibits ‘serious harm to fish’ and the deposition of deleterious substances to water frequented by fish. The protection of marine mammals from harm is provided by the Marine Mammal Regulations SOR/93-56 of the <i>Fisheries Act</i> . Marine mammals include pinnipeds (seals and sea lions) and cetaceans (dolphins, porpoises and whales). | Works will engage the water column and the river bottom within the nearshore subtidal zone of Annieville Channel, Fraser River. Fish, as defined by the <i>Fisheries Act</i> , occur within the design and construction footprints of the Outfall Project. Marine mammals may occur within the design and construction footprints of the Project. | A Request for Review was submitted to Fisheries and Oceans Canada (DFO) in June 2017. DFO has yet to complete their review. |
| <i>Navigation Protection Act:</i> administered by Transport Canada through the Navigation Protection Program (NPP) | The <i>Navigation Protection Act</i> protects the public right of free and unobstructed passage through navigable waters. | Works will engage Annieville Channel, Fraser River. | The Outfall Project will be required to submit a ‘Notice of Works’ to the NPP. An NPP approval is likely required; an application for approval will be submitted concurrent with the Port Authority application. |
| <i>Canada Marine Act:</i> administered by the Vancouver Fraser Port Authority (Port Authority) | The <i>Canada Marine Act</i> requires Ports to facilitate Canada’s trade in a way that ensures the safe movement of goods. | In administering the <i>Canada Marine Act</i> , the Vancouver Fraser River Port Authority is required to conduct an environmental review, in accordance with the <i>Canadian Environmental Assessment Act, 2012</i> of any proposed activity on Port lands. | An application for a Port Authority Project Permit is currently in its draft stage. The application will be submitted to Port Authority in December 2017. |

| Act, Regulation or Bylaw | Description | Applicability | Approval or Permit in Place or Addressed |
|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal | | | |
| Port Authority Non-Road Diesel Emissions (NRDE) Regulation | The NRDE fee recovers costs associated with managing air quality and reducing diesel particulate matter emissions. | The NRDE fee is applicable to all parties granted permission by the Port to operate on lands owned, managed, administered by the Port. | Permitted parties must not operate non-road diesel engines that are “non-certified” or certified as “Tier 1” without prior written approval. “Tier 2” certified engines will be used for construction. |
| <i>Migratory Birds Convention Act, 1994:</i> administered by the Canadian Wildlife Service of Environment Canada | The <i>Migratory Birds Convention Act, 1994</i> protects migratory birds, their eggs and their nests. | In water works associated with construction of the outfall will be conducted during timing window for inwater works of least risk to fish, specifically June 16 through to February 28. This avoids the period of active nesting for most bird species. The notable exception is bald eagle; however, active nesting sites are adequately set back from construction activities to avoid undue harm to eagles during nesting | An approval or permit from the Canadian Wildlife Service with regard to migratory birds is not required. Constraints to construction attributable to nesting by migratory birds are not associated with the Project. |
| Provincial | | | |
| Spill Reporting Regulation of the <i>Environmental Management Act:</i> administered by the Ministry of Environment and Climate Change Strategy | The Spill Reporting Regulation establishes a protocol for reporting the unauthorized release of substances into the environment. The same protocol will be used for the Project with reports submitted to the Port Authority. | Substances, such as hydrocarbons, that are harmful if released to the environment will be used as part of construction of the Project. | The CEMP provides an emergency and spill response protocol. The Contractor is to assign a specific individual to lead implementation of the protocol. All spills of a toxic or hazardous substance into the Fraser River (of any volume) will be immediately reported verbally to the Port Authority; an Environmental Incident Report will be submitted to the Port Authority within 24 hours of the verbal report. |

| Act, Regulation or Bylaw | Description | Applicability | Approval or Permit in Place or Addressed |
|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Provincial | | | |
| Contaminated Sites and Hazardous Waste Regulations of the <i>Environmental Management Act</i> : administered by the Ministry of Environment | The Contaminated Sites and Hazardous Waste Regulations govern the handling, storage, transportation, treatment and disposal of contaminated material and hazardous waste. | Previously contaminated material within the design and construction footprints of the Outfall Project is unlikely. | The CEMP provides a protocol to manage hazardous waste and contaminated material if encountered. |
| <i>Wildlife Act</i> : administered by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development | The <i>Wildlife Act</i> defines wildlife as all native and some non-native amphibians, reptiles, birds and mammals. Wildlife is managed by the <i>Act</i> . | Nesting (birds) and denning (small mammals) may occur within the riparian environment of the design footprint of the Outfall Project. However, the outfall pipe will be tunneled beneath the riparian environment; construction activities will not occur within the riparian environment. | Constraints to construction attributable to the presence and activities of wildlife are not associated with the Project. |
| <i>Heritage Conservation Act</i> : administered by the Ministry of Forests, Lands and Natural Resource Operations | Archaeological sites on Provincial Lands are protected by the <i>Heritage Conservation Act</i> . The Project occurs on Federal Lands. The management of prospective archaeological resources will be conducted in accordance with Union of BC Indian Chiefs "First Nations Heritage Planning Toolkit." | No archaeological sites are known to occur within the design and construction footprints of the Outfall Project. | In the event that evidence of what is suspected to be an archaeological resource is encountered, the Contractor will implement a "Chance Find" protocol in accordance with the Special Provisions of Contract. |
| Municipal | | | |
| City of Delta Noise Control Bylaw 1906, 1972 | The City of Delta Noise Control Bylaw regulates noise and sound within the limits of the municipality. | Marine construction is the primary activity of the Project. | The Bylaw restricts construction to 0700 - 1900 hours on any weekday or Saturday, and no construction on Sunday or holiday. A variance to the Bylaw will be obtained to suit specific construction activities. |

5.0 PROJECT MITIGATION MEASURES AND ENVIRONMENTAL SPECIFICATIONS

The performance-based environmental standards to be met by the Contractor are covered by the Section 01355 – Environmental Protection – of the Annacis Island WWTP New Outfall System (AIWWTPNOS) Contract Specifications. The Section 01355 is attached as **Attachment A** to this document. In sub-sections below, presented is a summary of most important project mitigation measures and environmental specifications.

5.1 Training and General Practices

Training and general management practices will be implemented by the Contractor to facilitate the protection of the environment during the construction phase of the Project. These include, but are not limited to:

- ensuring that all staff and sub-contractors have received CEMP training and are adequately trained in the implementation of best environmental practices and standards before the commencement of overall construction, and before specific tasks and/or activities that have the disproportionate risk of adverse effects upon environmental resources;
- conducting a tailgate meeting with staff and/or sub-contractors regarding the CEMP whenever a change of conditions may affect the risk of impacts to the environment; changes of conditions include changes in construction personnel, work activities, weather, and the presence of visitors within the limits of the site;
- documentation of all training sessions, meetings, and instructions through signed training and tailgate forms, and written instructions signed by the instructor; documentation will include a description of subjects addressed and the identification and signatures of all training session and meeting attendees;
- ensuring that adequate supplies are onsite to implement impact mitigation measures (e.g. dredged material containment on barges) and respond to incidents (e.g. spill response); and,
- embracing an adaptive management approach to the implementation of prescriptive measures contained within the CEMP, and best management practices and standards; the Environmental Monitor is part of this adaptive approach, and should be consulted during consideration and implementation of actions intended to mitigate adverse effects upon environmental resources.

5.2 Site Access, Mobilization and Laydown Areas

A variance to the City of Delta Bylaw 1906, 1972, whereby hours of construction and related physical activities would be otherwise restricted to 0700 – 1900 hours during weekdays and Saturdays, with no construction on Sundays or holidays, will be obtained to suit specific construction activities. The application of any restriction on a specific construction activity will be with regard to the control of noise and vibration, and the prospective disturbance of the surrounding community.

Site access, mobilization and laydown will capitalize upon existing site conditions, and will largely occur within the design footprint of the Project.

Equipment and material storage will occur either on land within developed areas of Annacis Island, landward of the rail line, or on barges associated with the operation of marine equipment. Construction material (e.g. aggregates) will be delivered by, and staged on scows prior to placement. Large equipment (e.g. clamshell dredge, crane, front end loaders) will be operated from barges or aggregate scows.

In-river work elements of the Project consist of the installation of 1) the riser shaft and 2) the diffuser manifold. Distinct work areas are associated with each of these elements, and are delineated in **Attachment B**.

Riser Shaft

A Contractor staging area and an exclusive work area occur shoreward of the navigation channel, within the safety zone of the channel. A Contractor temporary work area, which accommodates barge operations, occurs within the navigation channel.

Diffuser Manifold

A Contractor staging area and an exclusive work area occur shoreward of the navigation channel, within the safety zone of the channel. The Contractor temporary work area, which accommodates barge operations, occurs within the navigation channel, occupies approximately 3 times the area assigned to the riser shaft.

5.3 Machinery and Equipment

A list of all equipment and machinery to be used onsite during construction will be provided by the Contractor to the Corporation prior to construction. All non-road diesel equipment will be subject to the Port Authority Non-Road Diesel Emissions Program (NRDE). The Contractor will complete and submit the NRDE Annual Reporting Tool for applicable equipment once construction commences.

The following measures will be implemented by the Contractor to mitigate the risk of adverse impacts to environmental resources:

- inspection of all equipment prior to mobilization to the site to ensure they are in good operating order and free of leaks, excess and oil grease;
- major maintenance and repairs of all equipment will be done offsite;
- all equipment, including light-duty vehicles, will have a spill containment kit onboard at all times;
- inspection of equipment on a daily basis, prior to commencement of construction, by the operator to ensure it is in good operating order; the inspection will be documented and reported to the Contractor; minor maintenance may occur onsite to address deficiencies; major maintenance will occur offsite to address deficiencies; and,
- cleaning of equipment, involving surfactants and/or degreasers, will occur offsite; and, use of only biodegradable oil and/or hydraulic fluid within machinery and equipment.

5.4 Equipment Refueling Procedures

The Contractor will implement the following mitigation strategies to ensure that petroleum and other hazardous products are not discharged to the environment during refueling:

- any land-based storage of petroleum and/or other hazardous products is to be located at least 30 metres from the mean high-water elevation of the Fraser River, and the storm water drainage system;
- petroleum storage is to be in accordance with the Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products (Canadian Council of Ministers of the Environment 2003);
- any land-based petroleum storage facility is to be surrounded by an impermeable berm capable of containing at least 125 percent of the stored volume or comprise a double walled tank protected from accidental rupture by barriers capable of preventing heavy equipment and/or vehicle access (with the exception of the fuel truck);
- refueling of equipment is only to be undertaken by personnel trained for this work;
- all refueling of all equipment is to be undertaken only with immediate access to a spill response kit;
- storage containers will be inspected daily for leaks and/or other structural deficiencies;
- stationary equipment will be inspected on a daily basis for structural deficiencies;
- stationary equipment with fuel tank capacity exceeding 25 litres is to be placed within a tray capable of containing at least 125 percent of the volume of the fuel tank; and,
- spill event reporting (5.5.1 Emergency and Spill Response Plan) is to be implemented immediately in the event of a spill.

5.5 Emergency Response

A comprehensive emergency response protocol is required to affect a rapid response of emergency services and/or the containment and cleanup of environment emergencies.

Clear and rapid communication is required to minimize potential impacts associated with an emergency. The Corporation, the Port Authority and the BC Ministry of Environment and Climate Change Strategy will be contacted in the event of a spill (as defined and in accordance with the Spill Reporting Regulation of the Environmental Management Act (British Columbia)). Further, the Canadian Coast Guard will be contacted for any spill of hazardous material to the Fraser River. Contact information is provided by Table 5.5.1.

Emergency and Spill Response Plan

Accidental spills of deleterious materials resulting in impacts to the environment may occur during the Project, despite all reasonable efforts to prevent such an event. The following measures will be implemented by the Contractor to reduce the risk of, and/or control an accidental discharge.

Table 5.1 Emergency Contact Information

| Name | Phone Number |
|-----------------------------------------------------------------|---------------------|
| Emergency Services (Fire, Ambulance, Police) | 911 |
| Port Authority Operations Centre | 604-665-9086 |
| Local Non-emergency police (Delta) | 604-946-4411 |
| Local Non-emergency fire (Hall No.3, 11373 84th Avenue, Delta) | 604-595-2730 |
| Delta Hospital (5800 Mountain View Blvd.) | 604-946-1121 |
| Surrey Memorial Hospital (13750 96 Avenue, Surrey) | 604-581-2211 |
| Emergency Management BC (formerly PEP) | 1-800-663-3456 |
| Fisheries and Oceans Canada Radio Room | 604-666-3500 |
| Canadian Coast Guard | 604-775-8881 |
| Tri-Arrow Industrial Recovery Inc. (third party spill response) | 604-682-2751 |
| HazCo Emergency Response (third party spill response) | 1-800-667-0444 |
| Safety-Kleen Emergency Response (third party spill response) | 1-888-375-5336 |
| Hatch (Tim Langmaid), Corporation's Construction Manager | 604-639-1014 |
| Golder (TBD), Corporation's Environmental Monitor | TBD |
| TBD, Contractor Project Manager | TBD |
| TBD, Contractor Environmental Manager | TBD |

Complete a daily visual inspection of all prospective sources of hazardous materials for signs of leakage and/or other conditions that may contribute to a spill; daily visual inspections will ensure that all personal protective equipment and other emergency response equipment is in place and readily accessible.

Post the list of key emergency contacts at conspicuous locations throughout the site and within onsite offices.

Spill Response Kits

The Contractor will maintain Large and Small Fuel Spill Emergency Response Kits at the Project site.

The Large Fuel Spill Emergency Response Kit is to be kept at the site trailer and/or equipment barges, is to be applied to spills generally exceeding 100 litres, and is to include:

- minimum 100 propylene 'white' oil and lubricant absorbent pads;
- minimum 50 cellulose 'general purpose' glycol absorbent pads;
- minimum 20 propylene containment booms (each 3.0 metres long);
- minimum 100 metres 'Restricted Access' barrier tape;

- minimum 25 black contractors garbage bags (6 mil);
- personal protective equipment (20 nitrile gloves (both hands), 2 splash goggles, 2 poly coated tyvek suits and boots, 2 P100 dual cartridge respirators);
- Material Safety Data Sheets (MSDS) for any hazardous substances used on site;
- key emergency contacts with telephone numbers; and
- written procedures for emergency response and spill reporting.

Small Fuel Spill Emergency Response Kits are to be kept in each Construction Vehicle, are to be used for spills generally not exceeding 100 litres, and are to include:

- minimum 25 propylene ‘white’ oil and lubricant absorbent pads;
- minimum 10 cellulose ‘general purpose’ glycol absorbent pads;
- minimum 3 propylene containment booms (each 3.0 metres long);
- minimum 2 black contractors garbage bags (6 mil);
- personal protective equipment (6 nitrile gloves (both hands), 1 splash goggle); and,
- key emergency contacts with telephone numbers.

Spill Response

The Contractor will immediately take the necessary steps, including reliance on external resources, to abate an uncontrolled discharge. The Contractor will provide the necessary labour, equipment, materials and absorbents to contain and remove the spill, clean up the affected area, dispose of waste materials at an approved disposal site, and restore the area.

Any individual who notices a potential spill, spill, or equipment malfunction is to stop work immediately and shut down equipment. The person involved will contact the Contractor Project Manager and/or the Contractor Environmental Manager. The person involved will commence spill response; the Contractor Project Manager and/or Contractor Environmental Manager will facilitate additional spill response measures as required.

Initial response to spills is as follows:

- assess safety risks in the spill area;
- notify Contractor Project Manager and/or Contractor Environmental Manager;
- stop the discharge of deleterious substance if safe to do so;
- secure and isolate the spill area;
- investigate and conduct an initial assessment of the situation (identify product, equipment involved, affected area, spill status, time at which spill commenced);
- commence recovery of the deleterious substance with onsite emergency spill equipment and material if safe to do so; and,
- complete the spill notification and reporting procedure as described below.

The Contractor will conduct a Spill Event Debriefing following response and cleanup of a spill. The debriefing will review the spill event timeline and actions leading up to, during and after the event, the response and its effectiveness, adverse environmental effects, further remedial action requirements, and lessons learned.

Spill Event Reporting

Spill event reporting is focused upon communications directed to both the Corporation and the Port Authority. Spill event reporting to the BC Ministry of Environment and Climate Change Strategy (Emergency Management BC) will be in accordance with the Spill Reporting Regulation of the Environmental Management Act. Actions are to be implemented immediately and communicated directly to the Corporation and the Port Authority, specifically:

- all spills of a toxic or hazardous substance onto land or into the Fraser River (of any volume) will be immediately reported verbally to the Corporation and the Port Authority; a written Environmental Incident Report (EIR) is to be submitted by the Contractor to the Corporation and the Port Authority within 24 hours of the verbal report;
- the EIR will be submitted by the Contractor as an attachment to the weekly monitoring report; and,
- site remediation is to be conducted upon successful containment of the spill incident and as directed by the Contractor, Corporation's Environmental Monitor, the Port Authority and/or other responding regulatory agency (e.g. BC Ministry of Environment and Climate Change Canada, Fisheries and Oceans Canada, Environment Canada); remedial works may include, but are not limited to, the removal of all contaminated materials (i.e., constituents of concern in soil and/or groundwater) to levels approved by regulatory authorities.

In verbally reporting a spill to the Corporation and the Port Authority, the caller will provide the Corporation and the Port Authority with the following information:

- name and contact number of the person and affiliation (e.g. company) initiating the call;
- name and contact number of the person and affiliation (e.g. company) that cause the spill;
- location and time of spill,
- type and quantity of substance spilled;
- cause and effects of spill;
- details of remedial actions taken and/or proposed;
- description of spill location and surrounding areas;
- name of authorities and/or agencies responding to the spill location; and,
- name of other persons and/or authorities and/or agencies notified of spill or to be notified of spill.

5.6 Hazardous Material Management and Spill Prevention

The proper management of hazardous materials mitigates the prospect for spills of hazardous material that may be associated with the construction phase of the Project. Measures to mitigate the prospect for spills, and the overall management of hazardous materials, are as follows:

- hazardous waste containers will be leak-resistant, possess removable tops, kept upright, and kept closed except when being filled or emptied;
- each container or areas used to store hazardous waste will be clearly labeled as containing hazardous waste;
- each container or areas used to store hazardous waste will be equipped with secondary containment sufficient to contain the entire volume of waste;
- hazardous waste storage areas will be checked weekly and a corresponding log will be kept; waste disposal will be recorded on the waste disposal tracking sheet;
- a Waste Stream Profile form will be prepared by the Contractor for each hazardous waste and kept on file at the relevant site office;
- training records for those involved with the handling and transportation of hazardous waste will be kept at the relevant site office;
- hazardous wastes will be managed in compliance with applicable fire codes;
- hazardous materials including, but not limited to, fuels, bitumens, solvents, cleaners, used fuel and oil filters, and other construction materials will be stored and handled to minimize loss and to allow containment and recovery in the event of a spill;
- the Contractor will designate area(s) for the transfer and temporary storage of hazardous materials and wastes; land-based storage is to be at least 30 metres away from the mean high-water elevation of the Fraser River and the storm water drainage system; there will not be marine-based storage of hazardous materials; land-based storage area(s) will be clearly delineated by signage and appropriately managed;
- the Contractor will promptly remove hazardous wastes and/or hazardous materials from the Project location that are not in active use;
- the Contractor will be responsible for maintaining proper Workplace Hazardous Materials Information Systems (WHMIS) labels and Material Safety Data Sheets (MSDS) for all hazardous materials used and stored onsite; and,
- hazardous waste generated by the Contractor during the course of the construction activities will be disposed of in accordance with the Hazardous Waste Regulation of the Environmental Management Act (British Columbia); waste includes, but is not limited to, waste oils, greases, lubricants, solvents, batteries, and used spill cleanup materials.

The Contractor will prepare a Hazardous Waste Management Plan for submission to and approval by the Corporation. The Plan will contain means of collection and disposal of waste, and monitoring and reporting protocols. It will be included as a component of the EPP.

5.7 Contaminated Soil and Groundwater Management

Studies conducted along the design alignment of the effluent pipe did not portray contamination of soil and groundwater as significant. However, limitations in the scope of the studies allow for possible encounters, during construction, of soil and groundwater with concentrations of contaminants that may require special considerations with regard to permitting and/or disposal. Additional sampling and analyses may be required to characterize both sediments and sediments for the purposes of permitting and/or disposal.

Permits for the handling, storage, transport and/or disposal of soil and water during construction of the effluent pipe are the responsibility of the Contractor.

The Corporation may, from time to time, check soil and groundwater for contaminants during construction. If contaminated material is encountered or suspected, construction activities within the affected is to immediately cease and the Engineer and the Corporation notified. The Engineer may prepare a plan or direct the Contractor to prepare a plan for identification, handling, or disposal of contaminated soil or groundwater.

An investigation into constituent concentration of potential contaminants of concern within surficial sediments of the dredge pocket at the location of the diffuser determined that the sediments meet the pre-application sampling requirements for a potential Disposal at Sea permit application pursuant to the Disposal at Sea Regulations. No further characterization of sediments is required within the dredge pocket.

5.8 Non- Hazardous Waste Management

Collection, sorting and temporary onsite storage of non-hazardous solids associated with onsite activities will occur. Non-hazardous waste will be disposed offsite on a regular basis, before onsite storage containers are filled. Commercial waste disposal contractors will collect and dispose of office waste offsite. Non-hazardous solid wastes, such as, but not limited to, waste wood, asphalt, concrete, and metals will be disposed of offsite at an approved disposal facility in compliance with the Environmental Management Act (British Columbia) and applicable Regulations.

The Contractor will prepare a Non-Hazardous Waste Management Plan for submission to and approval by the Corporation. The Plan will contain means of collection and disposal of waste, and monitoring and reporting protocols. It will be included as a component of the EPP.

5.9 Concrete

Cast-in-place concrete is associated with the construction of the riser shaft. Construction of the riser shaft will be contained within a sheet and pile pipe cofferdam. It is anticipated that the cofferdam will be partially flooded during construction of the riser shaft.

The Contractor will conduct all construction activities involving the use of concrete, cement, mortars and other Portland cement or lime-containing construction materials in a manner that prevents sediments, debris, concrete (cured or uncured), and concrete wastewater from being deposited into the Fraser River or the storm water drainage system of Annacis Island, either directly or indirectly. Containment, whether on land, on barges, or in concrete trucks, will be provided for concrete wastewater and solid concrete waste, concrete waste water and solid

concrete waste will not be disposed of in the Fraser River or on Annacis Island. Concrete waste water associated with the wash down of concrete trucks will be contained within the concrete truck and transported back to the batch plant for reuse.

A concrete spill response kit will be kept onsite and will be readily accessible during concrete pours. The kit will include:

- 2 tanks (minimum 100 litres) of pressurized carbon dioxide;
- 2 flow control valves;
- 2 lengths of 25-metre-long weighted perforated hose and multiple aerators;
- a calibrated pH meter; and
- Material Safety Data Sheets (MSDS) for uncured concrete.

Staff and sub-contractors will be trained in the application and use of the spill response kit by the Contractor.

Other than those directly associated with the riser shaft structure, all events where uncured concrete, concrete solid waste, and/or concrete waste water escapes containment, the Contractor will collect the material and dispose of it offsite in accordance with applicable legislation. If it cannot be readily removed from the site (e.g. by vacuum truck), the kit will be applied to any isolated bodies of water isolated containing such material until an ambient pH of 6.5-9.0 is achieved; multiple treatments may be necessary (e.g on successive days). Drainage containing uncured concrete, concrete solid waste, and/or concrete waste water will be prevented from entering the Fraser River or the storm water drainage system of Annacis Island.

During concrete pours within the coffer dam, sufficient live storage within the dam is to be maintained such that no internal water overtops the dam and is discharged to the Fraser River. Uncured concrete and concrete waste will not be released into the Fraser River during concrete pours within the coffer dam. The coffer dam will not leak internal water to an extent that will affect the pH of ambient Fraser River waters such that the pH exceeds 9.0. Monitoring of ambient waters within 5 metres of the perimeter of the dam for pH is to occur on a daily basis during concrete related works.

Prior to decommissioning the coffer dam, pH of residual water within the dam will be measured; as required, the kit will be applied to the water until an ambient pH of 6.5-9.0 is achieved.

The Contractor will prepare a Cofferdam Water and Containment Plan for submission to and approval by the Corporation. The Plan will address the management of sediment-laden water within the cofferdam at the time of decommissioning. The Plan will include monitoring and reporting protocols. It will be included as a component of the EPP.

5.10 Air Quality

The generation of airborne pollutants is expected to be largely attributable to vehicular exhaust emissions. The generation of dust will be extremely localized, and will be largely restricted to the area around the access portal associated with the boring of the pipe tunnel. Bored soils will be staged at and about the access portal and loaded on trucks for transport offsite to a permitted disposal location.

The Contractor will implement the following measures to mitigate impacts to air quality:

- the Contractor will control dust and other airborne emissions from activities including, but not limited to, vehicular and machinery movement, excavation, and stockpiling;
- dust will be controlled onsite through the application of water on dry soils; chemical dust suppressants are not to be used; water will be applied with distributors equipped with a spray system that will ensure uniform application and with a means of shut-off; the application rate will be adjustable to suit the desired treatment of the site; the application rate will be sufficient to only reduce the potential for the dispersion of soil particles; the application rate will not be of a magnitude to induce erosion of soils and the delivery of the soils to the Fraser River or to the storm water system of Annacis Island;
- paved surfaces and/or roads in immediate proximity to access portal are to be swept by mechanical or manual means as often as necessary to minimize the accumulation and/or entrainment of fugitive sediments;
- highway trucks will cover loads with tarpaulin to prevent development of airborne particulates;
- burning of refuse or other material is prohibited;
- emission ratings of construction vehicles and/or equipment is to be “Tier 2” or better (Canadian Environmental Protection Act (1999), On Road Vehicle and Engine Emissions Regulation (2004)), as implemented by the Port of Vancouver Non-Road Diesel Engine Regulatory Program;
- diesel fuel is to contain less than 15 ppm sulphur content;
- equipment is to operate at optimum rated loads and be regularly maintained;
- light duty vehicle engines are to be shut off after 1-minute idling; and,
- heavy duty truck engines are to be shut off after 5 minutes idling.

Qualitative monitoring of air quality (i.e. visual observation of air quality) will be undertaken by the Contractor. Monitoring will focus on activities that have the greatest potential for impacts upon air quality.

The Contractor will prepare an Air Quality Management Plan. It will include methods to control dust, and will include records of inspection of construction vehicles and/or equipment for emissions. The Plan will include monitoring and reporting protocols. It will be included as a component of the EPP.

5.11 Erosion and Sediment Control

On-Land Work Areas

All dewatering, storm, and process water within on-land construction work areas will be controlled, collected, treated, and discharged to the sanitary sewer system subject to the discharge restrictions contained within Contract Specification. No water is to be discharged to the sanitary sewer systems that exceeds acceptable discharge requirements.

The Contract Specifications also require the contractor to provide a wheel wash and incorporate other measures as necessary to ensure sediment, concrete slurry, cement, and other construction materials or debris are not carried off-site by construction equipment or vehicles.

The Contractor will prepare a Dewatering and Discharge Plan for submission to and approval by the Corporation. The Plan will include monitoring and reporting protocols. It will be a component of the EPP.

Corporation Verification

In-situ water quality sampling to assess turbidity, total suspended sediments, and pH will be undertaken by the Corporation's Environmental Monitor throughout the duration of the Project whenever there is evidence that site water is entering the storm drains or natural drainages, or if surface street runoff exceeds prescribed quality levels due to materials being tracked off-site.

Waters discharged to the Fraser River through storm water outfalls will also be sampled during significant rainfall events (SREs) (e.g. 25 millimetres in 24 hours) to assess the extent to which sediments may be entering the receiving waters of the Fraser River.

Erosion and sediment control shall comply with the following water quality criteria.

- when background is less than or equal to 50 nephelometric turbidity units (NTU) or 100 milligrams per litre (mg/L) non-filterable residue (NFR), induced turbidity should not exceed 5 NTU or 10 mg/L above the background value
- when background is greater than 50 NTU or 100 mg/L NFR, induced turbidity should not exceed background values by more than 10% of the background value

“Background value” is defined as the NTU or NFR value of an appropriate reference site within the Fraser River that is not affected by construction activities.

The Contractor will prepare an Erosion and Sediment Control Plan for submission to and approval by the Corporation. The Plan will include monitoring and reporting protocols. It will be a component of the EPP.

5.12 Noise and Vibration

The ambient noise and vibration environment of the Project location is affected by the operation of several marine and transportation facilities, including:

- Southern Rail Coastal Shipping Terminal (rail) located within the outfall alignment;
- Southern Rail line (along the top-of-bank of Annacis Island's southern shoreline);
- wood chip scow moorage located to the immediate west;

- Annacis car terminal located east at upstream end of Annacis Island;
- Fraser Surrey Docks located east on opposite shoreline;
- Sunbury Cedar sawmill located immediately across channel on opposite shoreline;
- Interfor Acorn sawmill located east on opposite shoreline;
- South Fraser Perimeter Road located landward of opposite shoreline; and,
- Alex Fraser Bridge (Highway No.91) located to the immediate east.

It is anticipated that noise and vibration associated with construction of the Project will largely fall within the realm of the existing noise and vibration environment of the Project location and proximal. A noise study (BKL Consultants) commissioned by the Corporation to assess prospective impacts of noise on nesting activities of Bald Eagles determined that the prospective increase in noise attributable to construction activities is not significant (see 5.14 Vegetation and Wildlife).

A variance to the City of Delta Bylaw 1906, 1972, whereby hours of construction and related physical activities would be otherwise restricted to 0700 – 1900 hours during weekdays and Saturdays, with no construction on Sundays or holidays, will be obtained to suit specific construction activities. The application of any restriction on a specific construction activity will be with regard to the control of noise and vibration, and the prospective disturbance of the surrounding community.

Mitigation measures to limit the impact of noise and vibration include:

- maintenance of construction equipment in good working order;
- operation of equipment within load tolerances and ratings;
- frequent maintenance of equipment, in particular lubrication, replacement of worn parts, and replacement of deficient exhaust systems;
- shut off of equipment after 5 minutes idling;
- avoidance of unnecessary engine revving and use of engine brakes;
- minimization of the use of back-up beepers within the compliance parameters of WorkSafe BC regulations; and,
- relocations and reorientation of stationary equipment as to engage natural noise screening/dampening features.

The Contractor will prepare a Noise and Vibration Control Plan for submission to and approval by the Corporation. The Plan will include monitoring and reporting protocols. It will be a component of the EPP.

5.13 Fish and Fish Habitat

The Contractor will not, directly or indirectly (a) deposit or permit the deposit of a deleterious substance of any type in water frequented by fish in a manner contrary to Section 36(3) of the *Fisheries Act* (Canada); or (b) adversely affect fish or fish habitat in a manner contrary to Section 35(1) of the *Fisheries Act* (Canada).

All construction activities will be implemented in accordance with the activities presented in the “Fisheries and Oceans Canada Request for Review – Annacis Island Wastewater Treatment Plant New Outfall – Annieville Channel, Fraser River” (June 01, 2017). The construction footprint will not exceed that defined by the aforementioned document.

Dredging will be conducted using a clamshell dredge (i.e. a crane equipped with a clamshell bucket). The use of a clamshell limits impacts on the river bed associated with construction.

The crane with bucket will be operated from a floating spud-derrick. The bucket is operated through a series of cables fitted to the crane. Dredged material is deposited onto a barge. It is anticipated that a portion of the dredged material will be utilized to restore the river bottom (sediment and elevation) upon completion of the installation of the manifold. It is anticipated that material not used to restore the river bed at and about the riser and diffuser manifold will be disposed at sea (Disposal-at-Sea Permit) or barged to an off-loading site for disposal at a permitted location.

The sheet and pipe piles of the temporary cofferdam for riser shaft construction will be installed using a vibratory hammer. Underwater pressures associated with vibratory hammer pile driving are typically well below 30kPa, the threshold at which physical harm to fish occurs. Extraordinary mitigation of underwater pressures is not required.

Dredging will be conducted during the timing window for inwater works of least risk to fish (June 16 through to February 28). The inwater timing window is specific to the mitigation of impacts to downstream migrating juvenile salmonids. Incidentally, the work window also protects upstream migrating eulachon; this species is typically migrating through Annieville Channel from March through to May. Likewise, late juvenile and adult white sturgeon feeding upon eulachon during spring and summer (April 01-August 01) are also protected.

Extraordinary mitigation measures for the containment of sediment plumes attributable to dredging, such as silt curtains, are not part of dredging activities. Silt curtains cannot be maintained in place due to fluvial and tidal currents. Other means of containment, such as steel sheet pile, are cost-prohibitive and not appropriate for the scale of dredging that is to occur.

5.14 Vegetation and Wildlife

Removal of vegetation is not required by the Project to facilitate construction; as such, vegetation will not be removed by the Project.

Visual and noise disturbance is likely the notable impact on wildlife. Nesting activity by shorebirds may be impacted if construction activities associated with temporary shoring of the riser and installation (including dredging and rock placement) of the diffuser occur within the active nesting period of shorebirds characteristic of the area. However, prospective nesting by shorebirds is unlikely as Southern Rail’s barge loading facility and associate rail line is located immediately shoreward of the location of the riser pipe. Activities associated with the facility

and associated rail line likely pre-empt nesting. Further, construction activities associated with the Project occur outside the nesting season of most bird species occurring within proximal shoreline environments.

Bald Eagles nest on Annacis Island. The closest nest occurs within a large cottonwood tree approximately 700 metres upstream of the Project location and upstream of the Alex Fraser Bridge. Construction activities can negatively affect nesting success.

The view of the Project location from the nest is obscured by the north pier of the Alex Fraser Bridge. The view of the rail line, of marine traffic on the Fraser River both south and east, and industrial (e.g. sawmill and associated log handling) and infrastructure (South Fraser Perimeter Road and Highway No. 91) is largely unimpeded.

Nesting occurs within an environment with visually conspicuous and potentially intruding activities. The location of work areas on the river are well defined (see Section 5.2 Site Access, Mobilization and Laydown Areas). Construction activities associated with Project will not add to the visual disturbance of the nest location. Accordingly, extraordinary mitigative measures are not required to address prospective visual disturbance of Bald Eagles during nesting.

As for the visual environment, the noise environment at and about the Project location is defined by industrial and infrastructure activities. To address prospective impacts on Bald Eagles during nesting, Metro Vancouver commissioned a study (BKL Consultants) to assess existing ambient and prospective construction noise at the nest location. The study found that the average noise level near the nest was 61 decibels (dBA). During construction, it is expected that the noise level will increase by a maximum of 6 dBA. A 10 dBA increase in noise level is considered a significant increase; noise below this threshold is not considered significant. As the threshold was not exceeded, impacts on Bald Eagles during nesting attributable to construction activities are not considered significant.

The aforementioned presents an evaluation of the impacts of noise in specific context to construction activities associated with the Project. Guidelines exist for all construction activities in proximity to Bald Eagle nests. The breeding season quiet buffer recommended by the provincial Guidelines for Raptor Conservation⁵ is 175 metres, calculated as the vegetation buffer of 1.5 times the approximately 50 metre nest tree height, plus an additional 100 metres. The quiet buffer is intended to protect birds during their breeding season, and to reduce the likelihood that birds will desert their nests and young⁶; Construction activities associated with the Project are located more than 500 metres southwest of the outer perimeter of the breeding season quiet buffer for the Bald Eagle nest.

In consideration of the findings of the site-specific assessment of prospective visual and noise disturbance of Bald Eagles during nesting, and demonstrated conformance with provincial guidelines, extraordinary measures to mitigate impacts on Bald Eagles during nesting are not required.

⁵ http://www.env.gov.bc.ca/wld/documents/bmp/raptor_conservation_guidelines_2013.pdf

⁶ <http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare/DWC-Section-4.pdf>

Prospective impacts to marine mammals are largely limited to strikes attributable to the operation of the clam shell dredge. It is highly unlikely that marine mammals would be struck by marine equipment or materials during the installation and decommissioning of the coffer dam.

The occurrence of marine mammals in proximity to the Project location will be associated with active feeding by such mammals (e.g. sea lions). The occurrence of marine mammals outside of the timing window for inwater works of least risk to fish will be largely limited to the upstream migration of adult salmon. Adult salmon will largely use the centre of Annieville Channel for migration. It is not anticipated that marine mammals will occur directly within the construction footprint of activities associated with the operation of the clam shell dredge. Accordingly, extraordinary measures to mitigate impacts on marine mammal area not required.

5.15 Historical and Archaeological Management

There are no known archeological or heritage resources at risk from the Project. Nevertheless, in the event that potential archaeological resources are encountered during construction, specifically during excavation of native soils, the Contractor will work under “Archaeological Chance Find Procedure” protocols including ceasing construction activities that may disturb potential resources and immediately contacting appropriate authorities.

A brief, non-exclusive summary of the protocols is as follows:

- if suspected archaeological and/or cultural objects are observed, likely within borehole sediments or dredge sediments, the Contractor will notify the Corporation and the Port Authority immediately; all work resulting in the observation area is to be halted immediately and cordoned off from adjacent activities to await inspection by a qualified archaeologist;
- a qualified archaeologist is to be contacted upon the observation of archaeological and/or cultural objects; the archaeologist will determine protocols in coordination with the Contractor, the Corporation and the Port Authority;
- suspected archaeological and/or cultural objects are to be covered with plastic sheeting to await arrival of the qualified archaeologist; and,
- if archaeological and/or cultural objects are confirmed to be present (by the qualified archaeologist), no further construction is to be undertaken within and immediately adjacent to the affected area until otherwise notified by the Corporation and the Port Authority.

The Contractor will prepare a Archaeological Chance Find Procedure specific to tunnel boring. It will be submitted to the Corporation for approval. The Procedure will include monitoring and reporting protocols. It will be a component of the EPP.

Attachment A: Contract Specification Section 01355

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Section 01355 – Environmental Protection

PART 1 GENERAL

1.1 Summary

1.1.1 This Section covers performance-based environmental standards to be met by the Contractor for the Work.

1.2 References

1.2.1 This Section incorporates by reference the following documents. They are part of this Section insofar as specified and modified herein. In the event of conflict between the requirements of this Section and those of a listed document, the requirements of this Section prevail.

- .1 Construction Environment Management Plan (CEMP).
- .2 Vancouver Fraser Port Authority (VFPA) Project Permit No. 2018-XXX (Environmental Permit).
- .3 Section 02226 – Dewatering and Site Water Treatment

1.2.2 Environmental protection practices to comply with the following acts, regulations, and guidelines, as applicable:

- .1 Environment Management Act; Ministry of Environment.
- .2 Fisheries Act; Fisheries and Oceans Canada.
- .3 Land Development Guidelines for the Protection of Aquatic Habitat (1992); Fisheries and Oceans Canada and Ministry of Environment.
- .4 Occupational Health & Safety Regulation; WorkSafeBC.
- .5 Waste Management Act; Ministry of Environment.
- .6 Standards and Best Practices for In-Stream Work; Ministry of Environment.
- .7 Best Management Practices Guide for Stormwater, Greater Vancouver Sewerage and Drainage District.
- .8 Bylaw No. 7221 (Soil Removal and Deposit Regulation); Corporation of Delta.
- .9 Environmental Protection Practices by Corporation of Delta.
- .10 Environmental Protection requirements by Corporation.

1.3 Submittals

1.3.1 Procedures: Section 01300

1.3.2 Action Submittals:

- .1 Qualifications of proposed environmental manager demonstrating satisfaction of requirements of this Section.
- .2 Environmental Protection Plan (EPP).

1.3.3 Informational Submittals:

- .1 Details of incidents, non-compliance, and non-conformance events with the associated corrective action(s) within one working day of the observation of the incident or event.
- .2 On a quarterly basis, provide comprehensive environmental report demonstrating that the Contractor is complying with the reviewed EPP, detailing all incidents, non-compliance, and non-conformance events, and associated corrective actions.
- .3 Migratory bird survey, if required.

1.4 Permits

1.4.1 If required, provide notification to the Ministry of Environment prior to commencement of Work as per the requirements for Notification of Independent Remediation under the Contaminated Sites Regulation.

1.4.2 Permits and/or authorizations for the handling, storage, transport and/or disposal of materials, including but not limited to soil and water, for the Work are the responsibility of the Contractor.

1.5 Contractor's Responsibility

1.5.1 The Contractor must have an approved Environmental Protection Plan prior to the commencement of construction activities. The Environmental Protection Plan must be approved for fulfillment of Pay Item A01- Mobilization as specified in Section 01020.

1.5.2 Undertake the Work in strict compliance with the conditions contained in the appropriate acts, authorization permits, licenses, and approvals. Do not perform, omit, or permit, any act or thing which contravenes the requirements of this Section, or contravenes applicable legislation, regulations and/or bylaws, or which causes, or has the potential to cause, environmental damage.

- 1.5.3 In the event of a discrepancy between any of the requirements of this Section, and the provisions of any legislation, regulations, or municipal bylaws, the provisions of existing laws, regulations and bylaws must prevail.
- 1.5.4 Should any of the Contractor's activities contravene the requirements of the Contract Documents, the Corporation may issue a stop Work order directing the immediate cessation of such activities. The Corporation may itself undertake remedial measures, or may order the Contractor to do so, as deemed necessary. The costs of any work stoppages, and/or remedial works thus undertaken, must be paid by the Contractor.
- 1.5.5 Notify the Engineer, in writing within 60 minutes, upon the discovery of any hazardous conditions within or immediately adjacent to the Work Site. The Contractor must take suitable precautions to prevent injury to persons, and damage to the environment or property, until the hazardous conditions are remedied or removed by the responsible party.

1.6 Environmental Manager

- 1.6.1 Employ a qualified Environmental Manager to ensure that environmentally sound construction practices are followed, to monitor the impacts of construction on the environment, and to ensure that permit requirements are met.
- 1.6.2 Employ environmental specialist(s) as necessary to assist the Environmental Manger with preparation and implementation of the Environmental Protection Plan.
- 1.6.3 The Environmental Manager's minimum qualifications to include:
 - .1 Minimum of five years of experience performing a similar role in a construction setting.
 - .2 Suitably trained, and with sufficient experience to perform work safely with or without minimal supervision.
 - .3 Authorized to act and make decisions on behalf of the Contractor to achieve the environmental protection requirements of the Contract.
 - .4 Provide a minimum of three project references for which the Environmental Manager has performed a similar role. Include project client contact information.
 - .5 The Corporation reserves the right to approve or disapprove of the proposed Environmental Manager.
- 1.6.4 The Environmental Manager's duties include:

- .1 Ensuring that Contractor's employees and sub-contractors are provided training prior to commencement of the overall Project and prior to key phases of work where environmental risk is readily apparent.
- .2 Marking out sensitive areas.
- .3 Providing construction guidelines and environmental training.
- .4 Recommending and developing appropriate mitigation measures.
- .5 Liaising with the Contractor, the Corporation, the Engineer, and government agencies.
- .6 Directly liaise with the Corporation's Environmental Monitor to facilitate compliance with written and verbal directions of the Environmental Monitor as they relate to environmental management protocols and prescriptions of the CEMP and EPP.
- .7 Preparing environmental documentation for the Corporation and government agencies, including report on all environmental measures that are required and being undertaken at the Work Site.
- .8 Inspections of construction activities and practices a minimum of once per week during key activities, and when rainfall is greater than 25 millimetres in a 24-hour period.
- .9 Advising construction personnel on environmentally sound approaches and practices.
- .10 Monitoring the effects of Work activities on the environment as required by the EPP.
- .11 Assisting in the preparation of the spill prevention and emergency response plan.
- .12 Emergency spill response and facilitating subsequent cleanup activities.
- .13 Incident investigation and reporting.
- .14 Stopping Work if it appears that permit or approval conditions are not being followed.
- .15 Updating quarterly progress reports with environmental compliance details.

1.7 Environmental Protection Plan

1.7.1 The Environmental Protection Plan is to be prepared by the Contractor's Environmental Manager. The plan must include, where appropriate, site specific strategies to deal with the following matters:

- .1 Provide a description of the environmental management responsibilities of the Work.

- .2 Provide a description and an organization chart of the Contractor's and external agencies organizational lines of reporting and communication.
- .3 Provide a list of the environmental precautions, actions, and mitigation measures that are applicable to the implementation of the Work and how the Contractor will implement these items in the Work.
- .4 Delineation of the Work boundaries and sensitive areas including pre-construction surveys (e.g., bird nesting surveys, etc.).
- .5 Details of site-situated Contractor's Plant and Equipment maintenance facilities.
- .6 Liquid storage, fueling and equipment operation and maintenance plan and procedures.
- .7 Hazardous materials handling procedures.
- .8 Concrete installation procedures.
- .9 Spill prevention and emergency response planning.
- .10 Solid wastes handling procedures, including dust suppression.
- .11 Dewatering plan for each Work Area as defined in Section 01016 with discharge points.
- .12 Storm and groundwater drainage and sediment control, including quantification of maximum anticipated flows.
- .13 Erosion and sediment control.
- .14 Streamside protection plan.
- .15 Storm water discharge testing and reporting.
- .16 Documentation to prove proposed imported soil or other materials meets applicable provincial environmental regulations and standards.
- .17 Soil disposal plan.
- .18 Noise and vibration mitigation.
- .19 Cofferdam containment plan.
- .20 Work Site inspection and reporting.
- .21 Archaeological chance find procedure.

1.7.2 Include in the Environmental Protection Plan the following:

- .1 Environmental Monitoring Plan for all environmental monitoring required by the Contract Documents or as required by the EPP. Conduct monitoring at a frequency appropriate to the specific work activity being conducted and the risk such an activity may adversely impact environmental resources. Risk factors that expose the immediate environment to impacts (e.g. waters of the

Fraser River) include weather, site conditions (e.g. water levels, currents, log debris), marine traffic, and type of construction equipment being utilized. The higher the risk the greater the frequency and duration of environmental monitoring.

- .2 Maintenance of complete records of activities related to the implementation and monitoring of the EPP, including monitoring reports, observations and/or measurements taken of biological, chemical and physical parameters (e.g. fish, birds, marine mammals, pH, conductivity, turbidity, temperature), photographs, and incident reports.
 - .3 Submittal of Environmental Monitoring Reports to Metro Vancouver, VFPA, and other regulatory agencies on a quarterly basis.
 - .4 Report more frequently in the event of an incident of an unanticipated adverse effect to environment describing the event, its cause and effect, implemented mitigative actions, and residual outcomes presented.
- 1.7.3 Submit upon completion of construction, a summary environmental monitoring report to Metro Vancouver, VFPA and other regulatory agencies (as required) within 6 weeks of completion of construction. all other required content specified in this Section.
- 1.7.4 Include in the Environmental Protection Plan all other required content specified in this Section.
- 1.7.5 The Corporation reserves the right to require the Contractor to amend and resubmit the Environmental Protection Plan prior to the commencement of Work or during execution of the Work if, in the sole opinion of the Corporation, the plan as submitted is inadequate to ensure compliance with the requirements of the Contract Documents.
- 1.7.6 By reviewing the Contractor's Environmental Protection Plan, the Corporation in no way assumes responsibility or liability for the plan. Further, the Corporation in no way assumes responsibility or liability for the Contractor's non-compliance with the requirements of applicable legislation and regulations.

PART 2 PRODUCTS

2.1 Reinforced Silt Fence

2.1.1 In accordance with the requirements of the table below:

| Physical Property | Required Value | Test Method |
|------------------------------------|----------------|-------------|
| Weight, gram/square metre, minimum | 137 | ASTM D3776 |

| Physical Property | Required Value | Test Method |
|--------------------------------------------------------------|----------------|-------------|
| Equivalent Opening Size, maximum | 50-70 | ASTM D4751 |
| Grab Tensile Strength, Newton, minimum | 715 | ASTM D4632 |
| Ultraviolet Radiation Resistance, percent strength retention | 70 | ASTM D4355 |

2.1.2 Manufacturers and Products:

- .1 Mirafi: 100 X
- .2 Geotext: 915sc
- .3 Approved equal

2.1.3 Reinforcing: Welded wire fabric, 14-gauge minimum with 50 millimetre by 100 millimetre mesh or standard chain link fencing.

2.1.4 Support Posts: As recommended by manufacturer of geotextile.

2.1.5 Fasteners: Heavy-duty wire staples at least 25-millimetre-long, tie wires, or hog rings, as recommended by manufacturer of geotextile.

2.2 Temporary Construction Barrier Fence

2.2.1 Fabric:

- .1 Ultraviolet stabilized polyethylene, polypropylene, or nylon filaments woven into uniform pattern, with distinct and measurable openings
- .2 Minimum Physical Qualities:
 - a) Tensile Yield: Average nine kilonewton per one metre width; ASTM D638
 - b) Ultimate Tensile Yield: Average 13 kilonewton per one metre width; ASTM D638
 - c) Elongation at Break: Greater than 1,000 percent; ASTM D638
 - d) Chemical Resistance: Inert to most chemicals and acids
- .3 Color: Yellow or orange
- .4 Height: one metre
- .5 Material Edges: Finished in order that filaments retain their relative positions under stress

2.2.2 Posts: Conventional metal "T" or "U" posts.

PART 3 EXECUTION

3.1 Environmental Monitoring and Supervision

- 3.1.1 The Corporation may direct the Contractor to immediately suspend Work if the results of environmental monitoring indicate that Work is contravening the Environmental Protection Plan, and/or the terms and conditions of permits, licenses, and approvals, including, but not limited to:
- .1 The release of unacceptable amounts, as determined by regulations or at the discretion of the Corporation, of deleterious substances into the environment.
 - .2 Activities which appear to be an infraction of any environmental regulations or requirements.
 - .3 Physical degradation of the environment.
 - .4 Imminent risk of any such events.
- 3.1.2 If the Work is suspended, do not resume Work without the prior approval of the Engineer. Approval may be conditional upon demonstrations to the satisfaction of the Corporation, and all authorities having jurisdiction, that the Contractor has taken appropriate steps, and instituted sufficient safeguards, to prevent a repeat of such incidents. The Contractor will not be entitled to additional time or monetary compensation for suspension delays.
- 3.1.3 The Corporation may, at its own discretion, use its own staff, or engage qualified consultants, to undertake biophysical monitoring and environmental inspections as part of auditing the Environmental Protection Plans of the Contractor. Cooperate with the Corporation in this audit, and provide whatever assistance is required at no extra cost.
- 3.1.4 Environmental monitoring and inspection by, or on behalf of, the Corporation does not relieve the Contractor of its sole responsibility for the performance of the work in accordance with the terms of the Contract and the terms and conditions of permits, licenses, and approval.

3.2 Air Quality and Dust Control

- 3.2.1 Control fugitive dust and other airborne emissions generated from the operation and movement of vehicles and machinery, and from the handling and stockpiling of soils and other construction materials. The application of chemical dust suppressants to control fugitive dust and other airborne emissions is prohibited.
- 3.2.2 When performing demolition, cleaning, or other site preparation Work, utilize dust collection and filtration equipment (e.g., vacuum filter bags).
- 3.2.3 Cover or wet down all friable materials to prevent blowing dust and debris.

- 3.2.4 When watering roads to control dust, appropriate silt control measures must be employed to ensure silt laden water does not enter the storm sewers or watercourses.
- 3.2.5 The Corporation may, at its sole discretion, order watering for dust control purposes. Failure of the Contractor to comply with such orders within 60 minutes will result in the Corporation conducting such watering and deducting all costs from payments due to the Contractor.
- 3.2.6 Burning of refuse or other construction waste materials is prohibited, unless otherwise authorized by an air discharge permit from the Corporation, or from the Ministry of Environment.
- 3.2.7 Properly maintain all equipment to reduce gaseous pollutant emissions.

3.3 Drainage and Sediment Control

- 3.3.1 Control, collect, treat and discharge to the sanitary sewer system all dewatering, storm, and process water within on-land construction work areas as specified in Section 02226 – Dewatering and Site Water Treatment.
- 3.3.2 Include in Environmental Protection Plan a site water control plan indicating how all water discharges from the Work Site and related Work areas will be continuously controlled during the execution of Work. Provide adequate backup systems to accomplish control of water and eliminate water, sediment, or construction waste discharge to areas of natural drainage.
- 3.3.3 The methods of control, handling, and disposal of erosion, sediment and water are to be by whatever means are necessary and in conformance with this Section to obtain satisfactory working conditions and maintain the progress of the Work.
- 3.3.4 Provide a wheel wash and incorporate other measures as necessary to ensure sediment, concrete slurry, cement, and other construction materials or debris are not carried off-site by construction equipment or vehicles.
- 3.3.5 Regularly monitor, maintain, and repair the various components of the on-land site water control, collection, treatment and discharge system, as necessary, to ensure they are working effectively, especially during and after heavy/prolonged rainfall events (i.e., > 25 mm in 24 hours). Maintain these components until the Work areas are completely stabilized and there is no longer a risk of discharges to the sanitary sewer system exceeding water quality requirements.
- 3.3.6 Handle and dispose all sediment, construction and excavation wastes, or other substances deleterious to aquatic life, generated within the River Riser cofferdam to prevent their entry into the Fraser River.

- 3.3.7 Provide means for removal, collection, storage, treatment, and disposal of all River Riser cofferdam water displaced by soil, concrete, or other backfill within the cofferdam without discharge to the Fraser River. Do not allow water to spill over the top of the cofferdam into the Fraser River.
- 3.3.8 Perform pH monitoring of Fraser River water outside the River Riser cofferdam daily during all activities involving concrete placement within the cofferdam. Do not exceed an ambient pH in excess of 9.0 outside the cofferdam.
- 3.3.9 Treat residual water within the cofferdam prior to decommissioning such that the water is not turbid and a pH level of 6.5-9.0 is achieved.
- 3.3.10 The Corporation may itself monitor the quality of water in storm drainage systems surrounding the on-land Work Areas, and may call on the Contractor to suspend its operations there is evidence that site water is entering the storm drains or natural drainages, or if surface street runoff exceeds prescribed quality levels due to materials being tracked off-site. The costs of any consequential remedial measures or time delays to be to the account of the Contractor.
- 3.3.11 Modify the control system(s) at Contractor's expense if after installation and while in operation, they cause or threaten to cause damage to adjacent properties, existing buildings, utilities, cause a sewage spill, or release of water.

3.4 Environmentally Harmful Products

- 3.4.1 Store and handle fuels, oils, bitumen, cement, paints, solvents, cleaners, used fuel and oil filters, and other Work materials that may be environmentally harmful, in a way to eliminate leakage and spillage, and to allow containment and recovery in the event of a spill.
- 3.4.2 Should the Work involve the storage, handling, or use of any environmentally harmful products, or should hazardous wastes be generated, or be likely to be generated, by the use of such products, include relevant details thereof in the Environmental Protection Plan. The terms "environmentally harmful products" and "hazardous wastes" are collectively referred to as "hazardous materials" hereinafter.
- 3.4.3 Fertilizers, if permitted by the Corporation, to be inorganic/synthetic commercial slow release type.
- 3.4.4 No insecticides, herbicides, or other biocides to be used on the Work Site with the exception of household insecticides and insect repellents for personal use.
- 3.4.5 The disposal of hazardous wastes to be governed by the Environmental Management Act, the Special Waste Material Regulation thereto, and any other relevant regulation to the Act.

- 3.4.6 Designate and use specific areas for the transfer and limited temporary storage of hazardous materials. Clearly label these areas and appropriately control in accordance with the Workplace Hazardous Material Information System (WHMIS) program.
- 3.4.7 Include in the Environmental Protection Plan the details and location(s) of any proposed Work Site-situated Contractor's Plant and Equipment maintenance facilities. Confine such facilities to a specific area of the Work Site that poses no risk of contamination to soils, and is more than 50 metres away from the nearest watercourse. Details of containment facilities for fuels, oils, antifreeze, and other harmful products, to be shown in the plan. Design containment facilities so that spills can be contained and collected before causing contamination to soil or water.
- 3.4.8 Wood preservatives, paints, stains, or other similar chemicals, applied to components destined for burial underground, to be applied on the ground surface and be allowed to dry completely before burial.
- 3.4.9 Environmentally harmful products not in use, or earmarked for use, and/or hazardous materials, must be removed promptly from the Work Site by the Contractor.
- 3.4.10 The Contractor is not permitted to place petroleum storage containers on the Work Site, neither underground nor above ground.

3.5 Solid Non-Hazardous Waste

- 3.5.1 Include in the Environmental Protection Plan a written site-specific solid waste management plan appropriate to the scale of the Work. Include a list of approved locations to receive the anticipated solid wastes and demolition/land clearing waste materials that may be generated during the Work. Describe the nature and quantities of materials requiring disposal, the names of waste material haulers, and approved destinations to receive the various types of solid waste.
- 3.5.2 Dispose of demolition, land clearing, and construction waste in accordance with the intent of the provincial Environmental Management Act, and with the applicable bylaw requirements of the Corporation, and the Corporation of Delta.
- 3.5.3 Do not dump or burn garbage or any other waste associated with the Work. Should garbage or Work-related waste be dumped, within 60 minutes act to clean up and remove the waste material to an approved location. The costs of the clean up and removal of garbage and dumped materials to be paid by the Contractor.

3.6 Soils

- 3.6.1 Include in the Environmental Protection Plan written Work Site management procedures, appropriate to the scale of the proposed Work activities, to address the

handling of excavated soils, imported soils and granular materials that are intended for use or reuse at the Work Site. Include measures to control runoff from such soils, as well as the protection of the soils from precipitation, accidental discharge and/or co-mingling with other materials.

- 3.6.2 The Corporation may from time to time check excavated materials for contaminants such as fuel, oil, or other chemicals. If contaminated material is encountered or suspected, immediately cease Work in that area and notify the Engineer and the Corporation. The Engineer may prepare a plan or direct the Contractor to prepare a plan for identification, safe handling, use or disposal of contaminated soil.

3.7 Spill Prevention and Emergency Response Planning

- 3.7.1 Undertake regular scheduled inspections of all hazardous materials, and equipment containing hazardous materials, for signs of leakage. During such inspections, ensure that all personal protective clothing and equipment, and other emergency response items, are in place and in good working order.

- 3.7.2 Include in the Environmental Protection Plan a written Work Site emergency response plan appropriate to the scale of the proposed construction activities. The plan to include:

- .1 The probability and severity of an adverse effect to health, property, or the environment, of a spill of sewage, chlorinated water, or hazardous materials, used, handled, or stored on the Work Site.
- .2 Spill/release notification and alerting procedures.
- .3 Spill containment, recovery, and clean-up procedures.
- .4 On-site spill/release clean-up materials, equipment, and locations.
- .5 Names and telephone numbers of persons and organizations that may be contacted in the event of a potential environmental incident.

- 3.7.3 The emergency response plan to be available for inspection by the Corporation, Engineer, and regulatory agency personnel, and be posted at conspicuous locations throughout the Work Site.

- 3.7.4 Maintain a readily available supply of spill prevention and emergency response equipment on the Work Site at all times in effective working condition, and ensure that personnel are adequately trained in its use to deal with environmental emergency situations.

- 3.7.5 In the event of an environmental emergency, notify the Corporation and the Engineer within 60 minutes. If the environmental emergency is a spill to land of a hazardous material in quantities equal to or greater than those listed in the Spill Reporting Regulation under the Environmental Management Act, immediately

notify the Provincial Emergency Response Program (PEP) at 1-800-663-3456. Spills of any hazardous material, or any other material, which could be deleterious to fish, must be reported to Environment Canada at 604-666-6100.

- 3.7.6 Submit written incident reports to the Corporation and the Engineer within 24 hours of any environmental incident or spill/release. The incident report to identify the reporting organization, date, time, location, hazardous materials involved, source and persons or organizations notified. In addition, the report must describe how the spill or release occurred, remedial action taken or planned, and actions necessary to prevent recurrence.

3.8 Sedimentation and Water Handling

- 3.8.1 Silts and fine materials introduced into water systems can have adverse effects to the aquatic environment. Controlling sediment and run-off during construction will be of high priority during this Work. Suspend operations there is evidence that site water is entering the storm drains or natural drainages, or if surface street runoff surrounding the Work Site and entering the storm drainage system, exceeds the following criteria:

| Criteria | Level | Reference |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Total Suspended Solids, milligram per litre | 25 milligrams per litre over background during normal conditions | Land Development Guidelines |
| Total Suspended Solids, milligram per litre | 75 milligrams per litre over background during any storm event where rainfall is measured as greater than 25 millimetres in a 24-hour period. | Land Development Guidelines |
| Nitrate, milligram per litre as Nitrogen | Less than 200 | BC Approved Water Quality Guidelines |
| Total Ammonia Nitrogen, milligram per litre as Nitrogen | 1.64 | BC Approved Water Quality Guidelines |
| Total Zinc, milligram per litre | 0.03 | BC Approved Water Quality Guidelines |
| pH for general water release | No less than pH 5.8 No restriction on increase in pH except for discharge to boggy areas | BC Approved Water Quality Guidelines |

| Criteria | Level | Reference |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------|
| pH for water containing concrete or Portland cement or lime – containing materials | No less than pH 5.8 pH must be less than 9.0 and turbidity less than 25 nephelometric turbidity units | BC Approved Water Quality Guidelines |

3.8.2 Should these criteria be exceeded, construction will be stopped until the situation is rectified to the satisfaction of the Corporation's Environmental Monitor. The Contractor must control silt-laden runoff from the working and stockpile areas.

3.9 Sensitive Areas

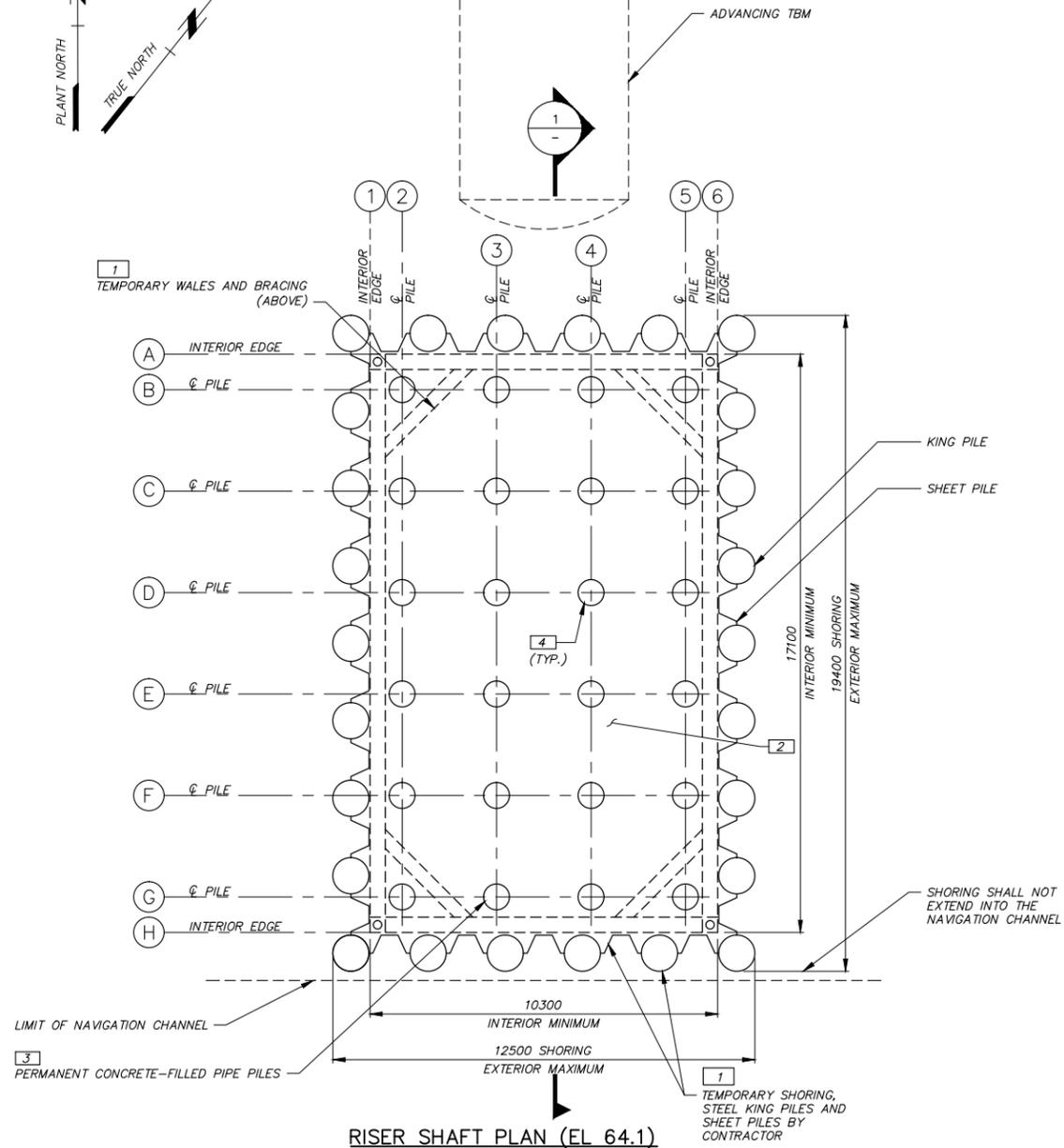
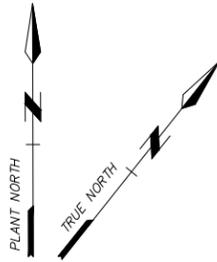
3.9.1 Provide flagging to limit access and impact to sensitive areas prior to commencement the Work.

3.9.2 Bird nesting is typically active between April 1st and July 31st; however, some birds may commence nesting as early as January. During this period, if clearing, grubbing, or stripping is required, the Contractor must minimize the amount of Work and avoid the Work if possible. If the Work cannot be altogether avoided, retain a qualified environmental professional to conduct a nest search and pre-clearing bird nest survey prior to clearing. This requirement applies for all bird species, and is not limited to the aforementioned dates. The environmental professional's recommendations for protection of active nests must be followed. A migratory bird survey and associated written report is mandatory no sooner than one week in advance of clearing and grubbing activities conducted between April 1st and August 31st.

END OF SECTION

Attachment B: River Construction Drawings

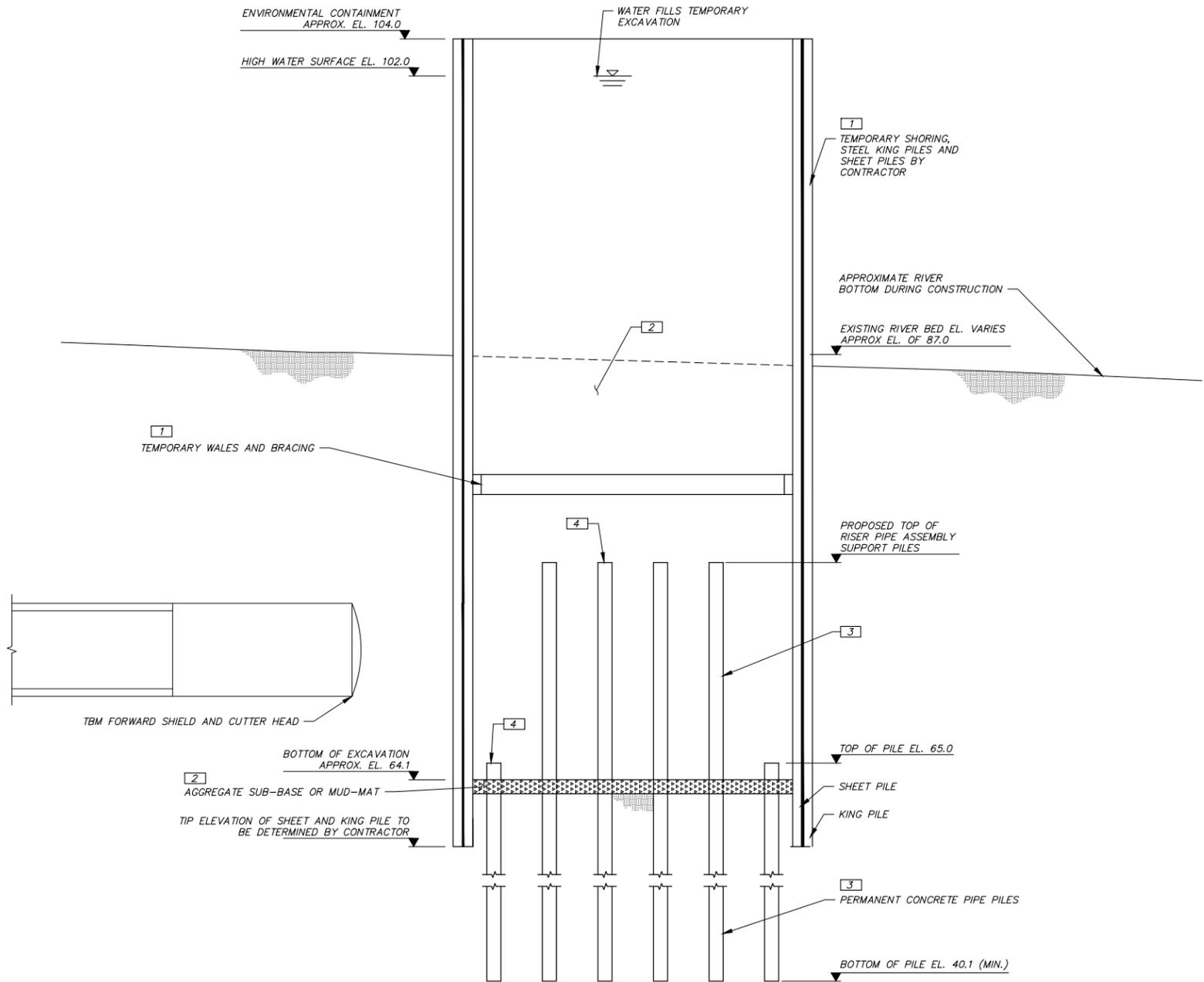
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RISER SHAFT PLAN (EL 64.1)
1:100

PROPOSED STEPS 1 THRU 4

- 1 INSTALL TEMPORARY SHORING AS REQUIRED TO MEET MINIMUM EXCAVATION LIMITS. TEMPORARY SHORING TO BE DESIGNED AND CONSTRUCTED BY THE CONTRACTOR.
- 2 EXCAVATE SOIL TO THE LIMITS SHOWN. CONTRACTOR TO PROVIDE A LAYER OF AGGREGATE OR A CONCRETE MUD-MAT TO PREVENT INTERMIXING OF LOOSE SOILS WITH STRUCTURAL TREMIE CONCRETE.
- 3 DRIVE PILES. THE REQUIRED PILE CUT-OFF ELEVATION IS 65.0. TOP OF PILES ELEVATIONS MAY BE INCREASED AT CONTRACTORS OPTION TO TEMPORARY SUPPORT THE INSTALLATION OF THE RISER PIPE. PILE 1C, 1D, 1E, 1F, 5C, 5D, 5E & 5F ARE SHOWN EXTENDED TO SUPPORT THE RISER PIPE ASSEMBLY. PILES WITHIN THE PATH OF THE TBM SHALL TERMINATE AT ELEVATION 65.0.
- 4 FILL PIPE PILES WITH CONCRETE AS REQUIRED PER DESIGN.



SECTION 1-1
1:150

ISSUED FOR PERMIT REVIEW
NOT FOR CONSTRUCTION



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Phone: 604-431-0242

Professional Seal

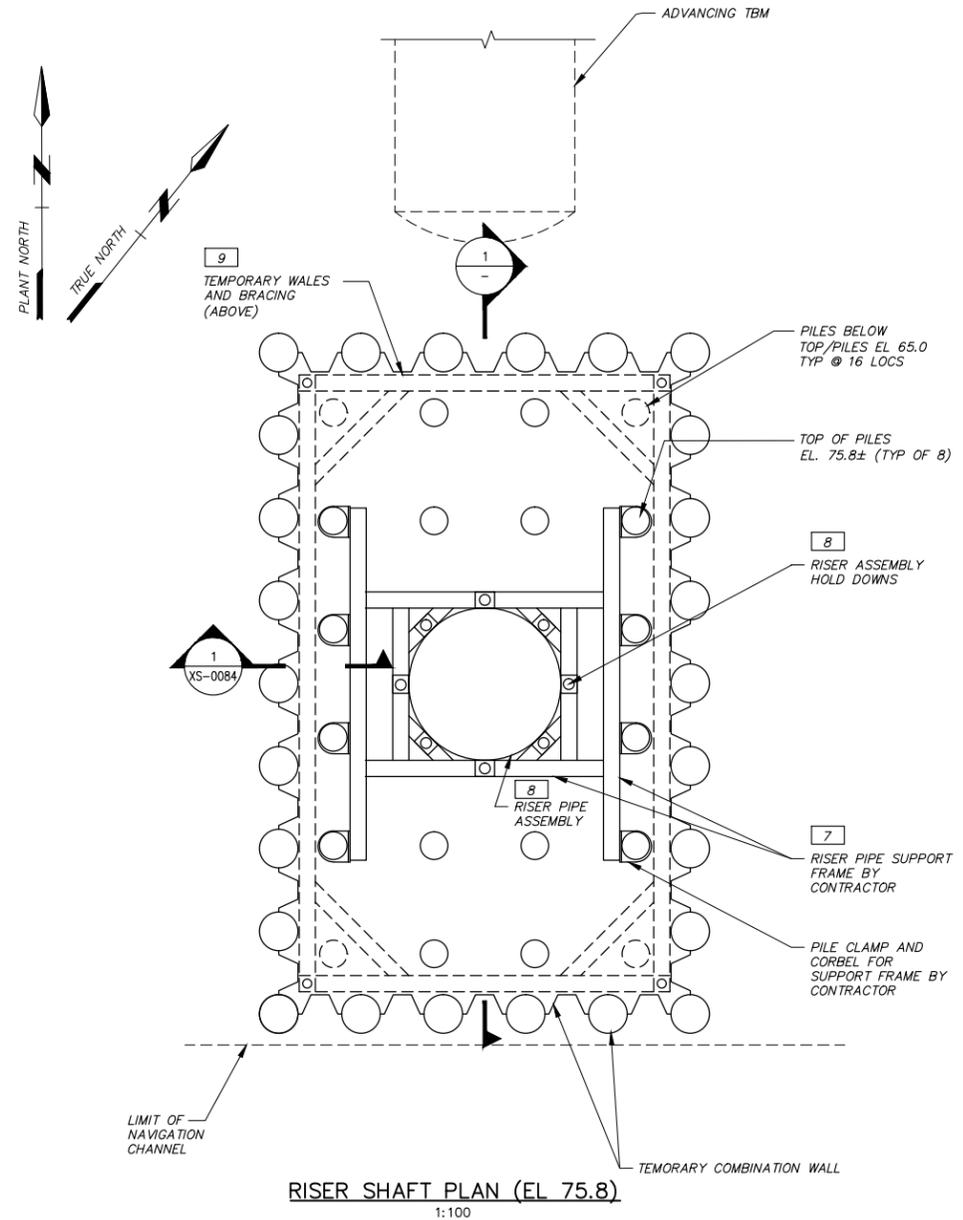
| Issue | Date | Desn | Dr'n | Chkd | App'd | Description |
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| P3 | NOV. 2017 | CSC | CEB | PFB | JNC | ISSUED FOR PERMIT REVIEW |
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| P1 | SEP. 2017 | CSC | CEB | PFB | JNC | ISSUED FOR INTERIM LCS DESIGN REVIEW |

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| DESIGN: CSC | | GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT ANNACIS ISLAND WWTP NEW OUTFALL SYSTEM CONSTRUCTION SERVICES FOR THE OUTFALL RISER SHAFT CONSTRUCTION SEQUENCE 1 | SCALE: AS NOTED |
| DRAWN: CEB | | | DISTRICT FILE SF-1933 |
| CHECKED: PFB | | | DRAWING NUMBER X-A61S0081 |
| APPROVED: JEN Manager | | | |

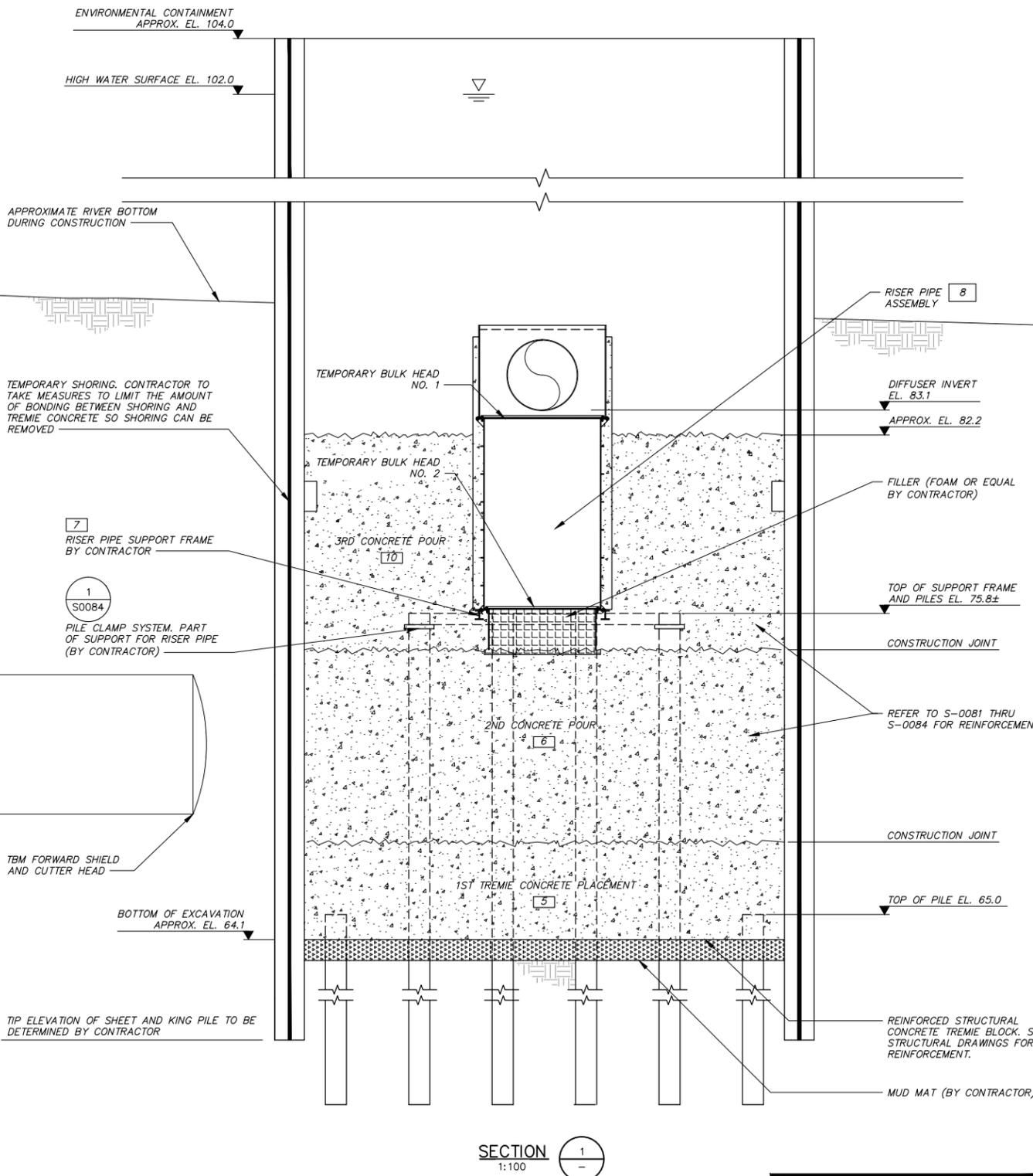
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SUPERSEDES PRINTS OF THIS DRAWING NUMBER WITH LETTERS PREVIOUS TO P.3

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RISER SHAFT PLAN (EL 75.8)
1:100



SECTION 1
1:100

GENERAL NOTES:

1. CONTRACTOR TO DESIGN, FABRICATE AND INSTALL TEMPORARY FRAMING AND OTHER COMPONENTS FOR SUPPORTING THE RISER PIPE ASSEMBLY DURING THE PLACEMENT OF THE TREMIE CONCRETE. THIS SUPPORT FRAMING WILL BE ABANDONED IN-PLACE AND WILL BE ENCAPSULATED IN TREMIE CONCRETE.
2. THE TEMPORARY FRAMING MAY BE SUPPORTED BY ANY OTHER STRUCTURAL ELEMENT THAT THE CONTRACTOR DETERMINES IS STRUCTURALLY SUFFICIENT TO SUPPORT THE TEMPORARY LOADS OF THE RISER PIPE ASSEMBLY. THE RISER PIPE ASSEMBLY INCLUDES THE PRECAST CONCRETE RISER PIPE/TEE AND FILLER THIS INCLUDES BUT IS NOT LIMITED TO THE STEEL PIPE PILES, TOP OF CONCRETE PLACEMENTS, AND TEMPORARY SHORING.
3. THE CONTRACTOR HAS THE OPTION TO EXTEND ANY PIPE PILE NOT LOCATED WITHIN THE PATH OF THE TBM TO A HIGHER ELEVATION TO ACT AS A GUIDE POST OF LOWERING THE TEMPORARY SUPPORT FRAMING AND RISER PIPE ASSEMBLY INTO POSITION. ANY PILE EXTENDING ABOVE THE FINAL TOP SURFACE (APPROXIMATELY ELEVATION 82.2) OF THE STRUCTURAL TREMIE CONCRETE SHALL BE CUT BACK TO AT LEAST 1 METER BELOW THE TOP SURFACE AND FULLY FILLED WITH CONCRETE.
4. THE DETAILS AND SEQUENCES OF THE FOLLOWING DETAILS SHALL BE COORDINATED BY THE CONTRACTOR WITH THE METHOD CHOSEN TO TEMPORARILY SUPPORT THE RISER PIPE ASSEMBLY:
 - A. LOCATIONS OF CONSTRUCTION JOINTS IN THE STRUCTURAL TREMIE CONCRETE.
 - B. PLACEMENT OF THE CONCRETE REINFORCING STEEL.
 - C. PLACEMENT OF THE CONCRETE ENCASED RISER PIPE ASSEMBLY.
 - D. PLACEMENT OF THE CONCRETE AND THE LOCATIONS OF THE TREMIE PIPES.
 - E. REMOVAL OF THE TEMPORARY SHORING.

PROPOSED STEPS 5-9

- PROPOSED SEQUENCED DRAWINGS ASSUME 8 PILES ARE EXTENDED UP TO ELEVATION 75.8 AND A SUPPORT FRAME IS SUPPORTED OFF THE PILE SYSTEM. THE PROPOSED SEQUENCE IS AS FOLLOWS:
5. INSPECT MUD-MATT SURFACE, PLACE CONCRETE REINFORCEMENT WITHIN 1ST CONCRETE PLACEMENT ZONE AND PLACE TREMIE CONCRETE.
 6. INSPECT PREVIOUS POUR SURFACE, PLACE CONCRETE REINFORCEMENT WITHIN 2ND CONCRETE PLACEMENT ZONE AND PLACE TREMIE CONCRETE.
 7. INSTALL SUPPORT FRAME FOR RISER PIPE ASSEMBLY
 8. SET THE RISER PIPE ASSEMBLY ONTO THE TEMPORARY SUPPORT FRAME AND INSTALL/TIGHTEN HOLD-DOWNS. THE RISER PIPE ASSEMBLY INCLUDES THE PRECAST CONCRETE RISER PIPE/TEE AND FILLER. AT CONTRACTOR'S OPTION THEY MAY FLOOD THE SPACE BETWEEN THE BULKHEADS, HOWEVER THEY MUST EVACUATE THE WATER BETWEEN THE BULKHEADS AFTER STEP 9 AND BEFORE STEP 11
 9. REMOVE TEMPORARY WALES AND BRACING.
 10. INSPECT PREVIOUS POUR SURFACE, PLACE CONCRETE REINFORCEMENT WITHIN 3RD CONCRETE PLACEMENT ZONE AND PLACE TREMIE CONCRETE.

CHECK PRINT

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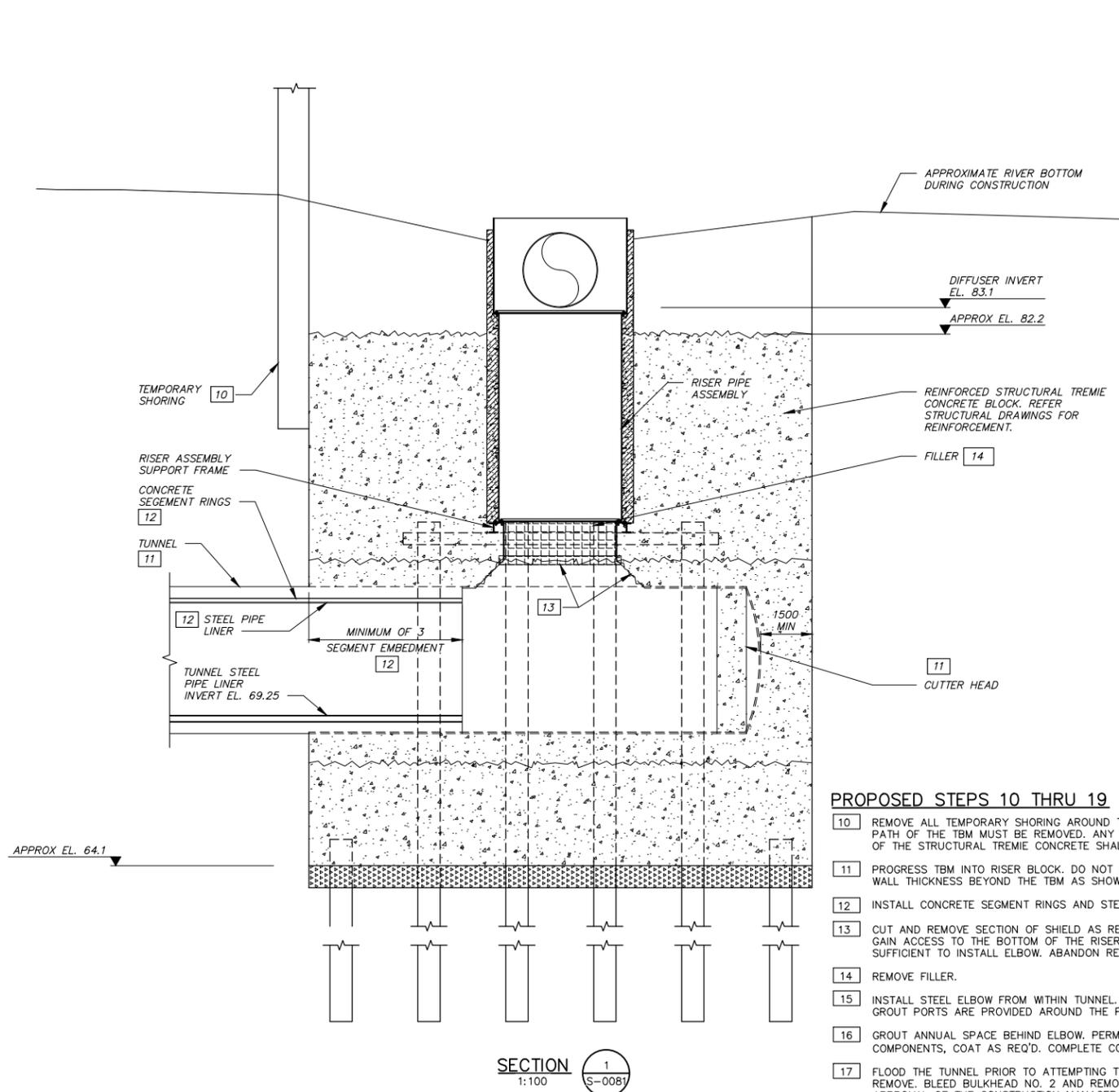
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| P3 | NOV. 2017 | CSC | CEB | PFB | JNC | ISSUED FOR PERMIT REVIEW |
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| P1 | SEP. 2017 | CSC | CEB | PFB | JNC | ISSUED FOR INTERIM LCS DESIGN REVIEW |

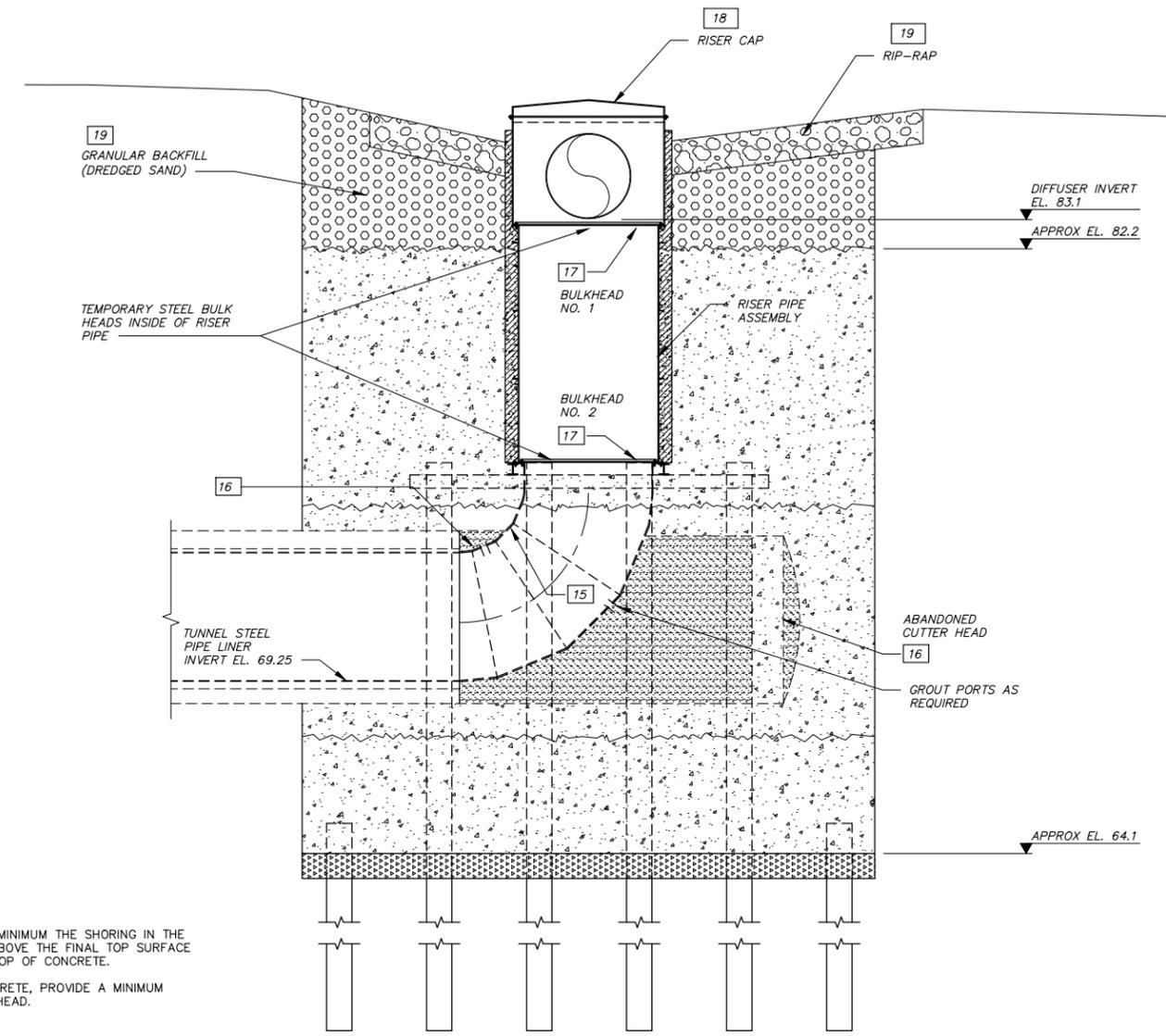
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| Design: CSC Drawn: CEB Checked: PFB JNC Approved JEN Manager | | SCALE: 1:100 DISTRICT FILE SF-1933 DRAWING NUMBER X-A61S0082 |
| GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT ANNACIS ISLAND WWTP NEW OUTFALL SYSTEM CONSTRUCTION SERVICES FOR THE OUTFALL NOS RISER SHAFT CONSTRUCTION SEQUENCE 2 | | |
| SUPERSEDES PRINTS OF THIS DRAWING NUMBER WITH LETTERS PREVIOUS TO P3 | | |

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SECTION 1
1:100
S-0081



SECTION 2
1:100
S-0081

PROPOSED STEPS 10 THRU 19

- 10 REMOVE ALL TEMPORARY SHORING AROUND THE PERIMETER. AT A MINIMUM THE SHORING IN THE PATH OF THE TBM MUST BE REMOVED. ANY SHORING EXTENDING ABOVE THE FINAL TOP SURFACE OF THE STRUCTURAL TREMIE CONCRETE SHALL BE CUT DOWN TO TOP OF CONCRETE.
- 11 PROGRESS TBM INTO RISER BLOCK. DO NOT OVERCUT TREMIE CONCRETE, PROVIDE A MINIMUM WALL THICKNESS BEYOND THE TBM AS SHOWN. ABANDON CUTTER HEAD.
- 12 INSTALL CONCRETE SEGMENT RINGS AND STEEL LINING.
- 13 CUT AND REMOVE SECTION OF SHIELD AS REQ'D AND REMOVE CONCRETE ABOVE TUNNEL TO GAIN ACCESS TO THE BOTTOM OF THE RISER PIPE. EXTENTS OF CUTTING AND REMOVAL TO BE SUFFICIENT TO INSTALL ELBOW. ABANDON REMAINING TBM SHIELD IN PLACE.
- 14 REMOVE FILLER.
- 15 INSTALL STEEL ELBOW FROM WITHIN TUNNEL. ELBOW WILL BE INSTALLED IN WELDED SECTION. GROUT PORTS ARE PROVIDED AROUND THE PERIMETER OF THE ELBOW.
- 16 GROUT ANNUAL SPACE BEHIND ELBOW. PERMANENTLY SEAL GROUT PORTS WITH WELDED STEEL COMPONENTS, COAT AS REQ'D. COMPLETE COATINGS ON INSIDE OF ELBOW.
- 17 FLOOD THE TUNNEL PRIOR TO ATTEMPTING TO REMOVE BULKHEADS. BLEED BULKHEAD NO. 1 AND REMOVE. BLEED BULKHEAD NO. 2 AND REMOVE. REMOVAL OF BULKHEADS SHALL BE AFTER APPROVAL OF THE CONSTRUCTION MANAGER.
- 18 INSTALL RISER CAP
- 19 PLACE BACKFILL AND RIP-RAP ABOVE CONC BLOCK.

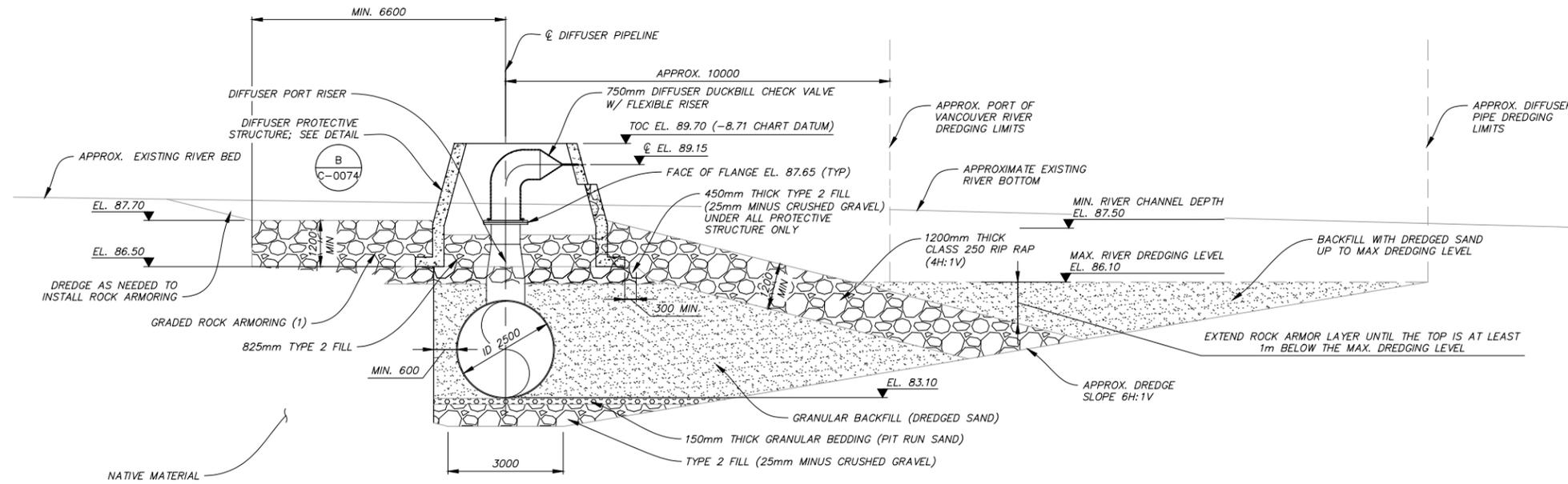
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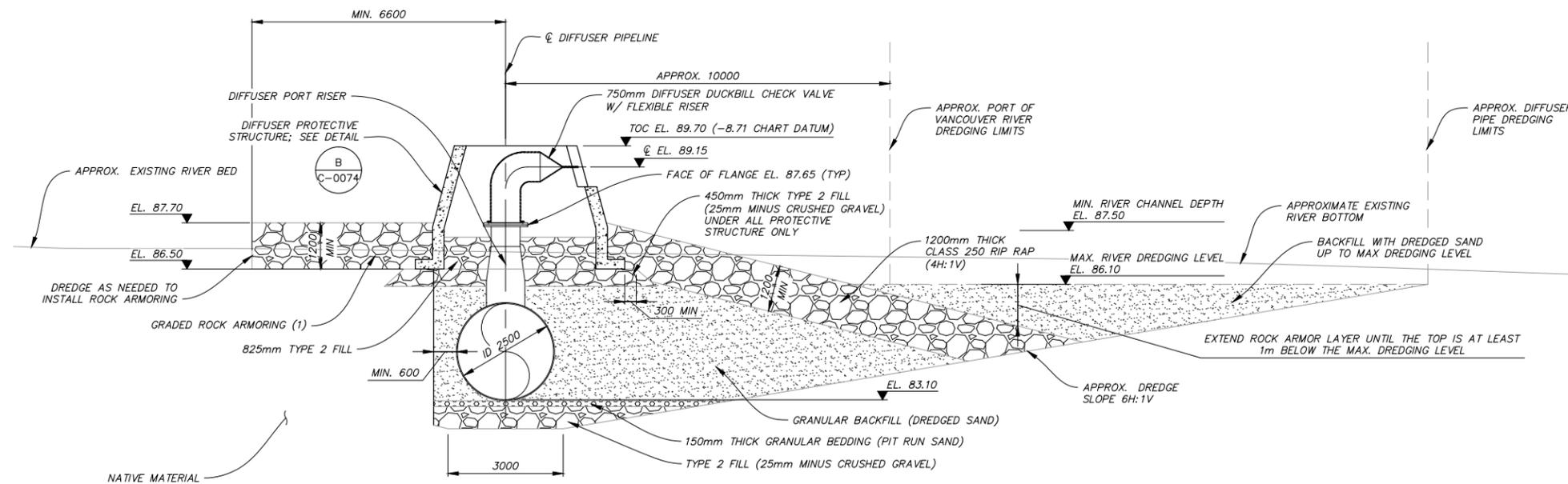
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| P3 | NOV. 2017 | CSC | CEB | PFB | JNC | ISSUED FOR PERMIT REVIEW |
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| P1 | SEP. 2017 | CSC | CEB | PFB | JNC | ISSUED FOR INTERIM LCS DESIGN REVIEW |

GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT
ANNACIS ISLAND WWTP
NEW OUTFALL SYSTEM
CONSTRUCTION SERVICES FOR THE OUTFALL
RISER SHAFT
CONSTRUCTION SEQUENCE 3
SCALE: 1:100
DISTRICT FILE SF-1933
DRAWING NUMBER X-A61S0083
DESIGN: CSC
DRAWN: CEB
CHECKED: PFB
APPROVED: JNC
JEN Manager



RIVER BED PROFILE

SECTION 1
1:75



RIVER BED PROFILE

SECTION 2
1:75

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| P4 | NOV. 2017 | SR | CEB | MSS | JNC | ISSUED FOR PERMIT REVIEW |
| P3 | AUG. 2017 | SR | CEB | MSS | JNC | ISSUED FOR 90% DESIGN REVIEW |
| P2 | MAR. 2017 | SR | CEB | MSS | JNC | ISSUED FOR 60% DESIGN REVIEW |
| P1 | AUG. 2016 | SR | CEB | MSS | JNC | ISSUED FOR PRELIMINARY DESIGN REVIEW |

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| CHECKED: MSS | | DRAWING NUMBER A61C0071 | |
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| MANAGER | | | |

GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT
ANNACIS ISLAND WWTP
NEW OUTFALL SYSTEM
CONSTRUCTION SERVICES FOR THE OUTFALL
A61 - NOS
DIFFUSER MANIFOLD
SECTIONS 1 OF 3

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