



**Construction Environmental
Management Plan**

Fraser Surrey Canola Oil Transload
Facility Project
Version 1.4

February 17, 2023

Prepared for:

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Project Number: 123222054

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

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ACRONYMS / ABBREVIATIONS

µPa	Pascal
AOA	Archaeological overview assessment
BC	British Columbia
BMPs	Best Management Practices
CCME	Canadian Council of Ministers of the Environment
CEMP	Construction Environmental Management Plan
cm	centimeter
CO ₂	Carbon dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
DP World	DP World Ltd.
ECCC	Environment and Climate Change Canada
EM	Environmental Monitor
EMBC	Emergency Management BC
HADD	Harmful Alteration, Disruption, or Destruction
LOA	Letter of Advice
m	meter
m ²	Squared meters
MMEZ	Marine mammal exclusion zone
NRDE	Non-road Diesel Emissions
NTU	Nephelometric turbidity units
PER	Project Environmental Review
PPT	Parts Per Thousand



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QEP	Qualified Environmental Professional
RFR	Request for Review
SEL	Sound exposure level
SSEL	Single-strike sound exposure level
Stantec	Stantec Consulting Ltd.
TSS	Total suspended solids
VFPA	Vancouver Fraser Port Authority



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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by DP World Ltd. (DP World) to prepare the following Construction Environmental Management Plan (CEMP) to support the planning and permitting process for the Fraser Surrey Canola Oil Transload Facility Project (the Project). The Project is located at the northeast end of the DP World Fraser Surrey multi-use terminal in Surrey, British Columbia (BC) and will be upgraded and will use Berth 10 for vessel transloading.

The CEMP provides the Project Contractor with guidance on best management practices (BMPs) to maintain regulatory compliance and to avoid and limit potential adverse environmental effects during construction activities. The CEMP is a living document and is intended to be updated and refined with input from the Contractor through specific definition of the Project work and site activities and schedules.

The objectives of the CEMP are to:

- Enable compliance with Vancouver Fraser Port Authority (VFPA) Project Environmental Review (PER) conditions, and other Project-related legislative requirements and regulations.
- Protect valued ecological features within and adjacent to the Project during construction.

The CEMP will be re-issued for construction as Project conditions (e.g., VFPA PER conditions), execution plans, and schedules are established. The CEMP will be reviewed and updated as required prior to mobilization by the Contractor and throughout construction of the Project.



CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

Project Information
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2.0 PROJECT INFORMATION

2.1 LOCATION

The Project is located within the VFPA's Fraser River Central Planning Area 5¹, on the south shore of the Fraser River in Surrey, BC (Figure 1). The Project is situated on VFPA-owned lands, including water lots, in Surrey, BC. The land-based section of the Project area is zoned as "Port Terminal" under the VFPA Land Use Plan (Port Metro Vancouver 2014).

2.2 PROJECT DESCRIPTION

The Project is located at the former Fraser Surrey Docks terminal, situated on the south bank of the South Arm of the Fraser River, Surrey, BC (Figure 1). Historically, the terminal at berth 10 has been marginally used as a transload facility for agriproducts, breakbulk steel, and container operations. The present configuration of the berth limits access on and off calling vessels. In 2020, DP World acquired the long-term lease from the VFPA for the Fraser Surrey Docks marine terminal, now renamed DP World Fraser Surrey.

The objective of the Project is to redevelop a portion of the terminal to function as a canola oil transload facility using the Berth 10 for mooring and loading vessels, and existing ancillary infrastructure, including an existing dock and dolphin. The Project will require the development of several in-water infrastructure components at Berth 10 to upgrade the berth for mooring and loading vessels in addition to upgrades to upland infrastructure.

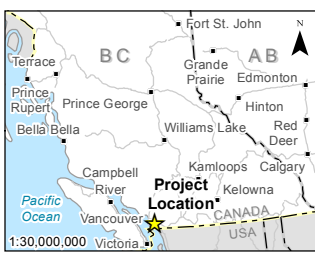
The Project occupies Schedule A and B federal land and water lots within the VFPA leased DP World Fraser Surrey terminal area. The Project is non-designated under the federal *Impact Assessment Act* but requires VFPA PER under the Canada *Marine Act*.

The Project will be developed to support an annual throughput capacity of 1,000,000 tonnes per year. Key in-water and over-water components of the Project at Berth 10 to support vessel loading include:

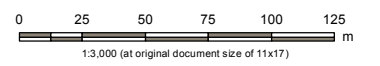
- Construction of a concrete loading arm and elevated berthing platform at Berth 10, 26 meter (m) long by 14 m wide supported 1.2 m diameter steel piles
- Loading arm access trestle, 67 m long by 4 m wide supported by 1.2 m diameter steel piles
- Walkway connection to Berth 9,
- Precast concrete boxes above water

¹ <https://www.portvancouver.com/wp-content/uploads/2018/12/Planning-Area-5-2018.pdf>





- Highway
- Railway
- Watercourse
- - - Municipal Boundary
- ▭ Project Boundary



Stantec DP WORLD
Canada

Project Location: Surrey, BC
NTS 50K Grid: 092 G02

Project Number: 12322054
Prepared by KWONG on 20220915
Requested by BBOOTH on 20220915
Checked by LTRUPELL on 20220930

Client/Project/Report
DP World (Canada)
Fraser Surrey Canola Oil Transload Facility
Construction Environmental Management Plan

Figure No. **1** Revision No. **2**

Title
Site Location

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia, Natural Resources Canada
3. Imagery: ESRI World Imagery

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Additionally, ancillary infrastructure above water at Berth 10 will include:

- On-deck articulating marine loading arm
- Upgraded marine bollards and fenders
- Equipment supported on foundations and supports
- Fire water hydrant at the jetty area

Key components of the Project that are not in water or over water include:

- Development of a storage tank and rail offload area adjacent to Timberland Road, consisting of:
 - Rail receiving facilities including:
 - o Two rail spurs from the existing intermodal yard branch
 - o Railcar bottom offloading stations, unloading pumps, piping, and control cables
 - o 32 rail car unloading capacity
 - Storage tank area:
 - o Three 15,000 megaton capacity tanks (approx. 37 m diameter, 18 m height to American Petroleum Institute 650 standard)
 - o Tank foundations including required ground improvements
 - o Vessel loading pumps including required piping and controls
 - o Containment area including liners, precast walls, and associated foundations
 - o Fire water loop with approximately six hydrants
- Below grade canola oil transmission and recycle lines connecting the storage tanks to the marine trestle
- A new canola operation building to support electrical distribution and a Motor Control Centre, a control room, and security center with breakroom, and critical spares storage

The Project will not require additional dredging. The berths along the terminal as the vessel mooring are currently dredged under the Vancouver Fraser River annual maintenance dredging program dredging to maintain a draft of 11.5 m, removing volumes of sediment in the range of approximately 300,000 cubic meters per year (Broś 2007).



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2.3 PROJECT SCHEDULE

The Canola Oil Export Terminal – General Works Schedule has been provided in Table 1.

Table 1 Proposed Canola Oil Project Schedule

Canola Oil Export Terminal - General Works Schedule										
Year	2022		2023				2024			
Quarter	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Preliminary Works										
Engineering & Tender Preparation	■	■								
Project Permitting	■	■	■							
Design Build Contract Award			■							
Site Mobilisation				■						
Detailed Design & Procurement				■	■	■				
Marine Loading Area										
Piling and structural works					■	■	■			
Marine platform fit out							■	■		
Canola Storage Area										
Ground improvements					■	■				
Tank foundations						■	■			
Tank construction							■	■		
Underground services								■		
Tank containment walls								■	■	
Above ground services and process piping									■	
Rail Unloading Area										
Remove track 6					■					
Ground improvements					■	■				
Foundation works							■			
Underground services and process piping							■			
Canola rail - IY Track 6 and 7								■		
Top access catwalk								■		
Above ground services and process piping									■	
Canola Pumping & Conveyance Corridor										
Trenchless crossing of Timberland Road and intermodal yard					■	■				
Cut fill crossing of Yard 10							■	■		
Substantial Completion									■	
Commissioning										■



CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

Contacts and Responsibilities
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3.0 CONTACTS AND RESPONSIBILITIES

The design-build process planned for the project will be undertaken in early 2023 and may alter the project contacts and ownership of specific environmental responsibilities. The anticipated roles and the responsibilities associated with environmental management of the Project are described as presently understood.

3.1 KEY CONTACTS

The key Project personnel involved with the planning and implementation of the CEMP are listed in Table 2, followed by a description of their roles in the subsections.

All onsite personnel must work in accordance with applicable permits (e.g., VFPA PER, Fisheries and Oceans Canada [DFO] conditions, etc.) and engineering specifications. In addition, personnel must comply with the site-specific mitigation measures identified in this CEMP and/or provide suitable alternative approaches that have been approved by DP World and/or their environmental designate. Onsite crews and staff will be introduced to the CEMP and required to implement it properly as part of standard operating procedures.

The Project owner, DP World, is responsible for the protection of the environment and public health and safety. Environmental leadership is supported by senior management across the Project. DP World directs and is accountable for the environmental activities and verifying compliance with Project conditions and commitments. DP World will provide oversight and guidance to environmental staff supporting the contractor regarding implementation of the CEMP.

Table 2 Key Project Contacts

Role	Organization	Name	Phone and/or Email
Project Team			
Senior Manager Infrastructure	DP World	Hamish Fairweather	Hamish.Fairweather@dpworld.com 604-803-5678
Project Coordinator	DP World	Bill Kalmakoff	Bill.Kalmakoff@dpworld.com 604-612-4487
Environmental Manager	Stantec	Mark Johannes	mark.johannes@stantec.com 604-418-1095
Environmental Monitor	Contractor to be determined		
Construction Manager	Contractor to be determined		
Regulatory Contacts			
Navigable Water Protection Officer	Transport Canada	TBD	TBD
Project and Environmental Reviewer, Senior Planner	VFPA	Jessica Mehigan	604-665-9627



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Contacts and Responsibilities
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Table 2 Key Project Contacts

Role	Organization	Name	Phone and/or Email
Compliance Officer	VFPA	Andrew Otto-Artavia	andrew.otto-artavia@portvancouver.com
Port PER Correspondence	VFPA	PER Monitoring Reports Submission	per@portvancouver.com
Fisheries Protection Officer	DFO	Oliver Franklin	Oliver.Franklin@dfo-mpo.gc.ca

3.1.1 Responsibilities of the Environmental Manager

The Environmental Manager will monitor the Contractor on behalf of DP World and provide direction on compliance with the VFPA PER permit conditions, regulations and guidelines, advice and permits, this Project CEMP, and industry BMPs. They will report to the DP World Senior Manager Infrastructure and regularly communicate with the VFPA PER reviewer/contact. They will assess potential risks during pre-construction planning and construction and will review, observe, and report on environmental issues and mitigation related to construction activities.

Environmental reporting is an integral part of environmental management compliance and adaptive management during construction. The Environmental Manager will review reports prepared by the Environmental Monitor (EM) (e.g., daily and monthly), providing feedback to the EM prior to submission to regulatory agencies.

Tasks assigned to the Environmental Manager include, but are not limited to, the following:

- Update the CEMP as needed and communicate updates to Project personnel, including review of mitigation measures and controls to adaptively manage implementation, maintenance, and function of controls.
- Review construction schedules and procedures.
- Provide leadership to Project personnel about the importance of meeting regulatory requirements and complying with industry and company BMPs and standards.
- Update Project personnel on the environmental conditions, approvals, and regulatory requirements where required (e.g., in the event of changes to approvals).
- Implement monitoring programs and protocols in coordination with the EM.
- Review monitoring reports to the applicable regulatory bodies and DP World.

3.1.2 Responsibilities of the Environmental Monitor (EM)

The EM will report to the Environmental Manager and will monitor construction for compliance with the VFPA PER permit conditions, authorizations and permits, contract documents, applicable regulations and guidelines, and this CEMP.



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Contacts and Responsibilities

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The primary tasks to be performed, and the responsibilities of the EM and supporting personnel, will include, but not be limited to, the following:

- Set a prescribed monitoring schedule prior to Project start; this may be based on conditions outlined in regulatory approvals (e.g., VFPA PER, DFO conditions).
- Verify required permits, licenses, and approvals are in place prior to the start of construction activities.
- Monitor compliance with the VFPA PER permit conditions, the CEMP, and other regulatory conditions issued for the Project (e.g., DFO) as applicable.
- Prepare and submit environmental monitoring reports to the applicable regulatory bodies and DP World (if required) and report any non-compliance issues or unanticipated adverse effects to the environment.
- Update Project personnel on the environmental conditions, approvals, and regulatory requirements where required (e.g., in the event of changes to approvals).
- Coordinate with the Contractor staff in the implementation and maintenance of mitigation measures used to avoid and limit potential environment effects.
- Remain on-call during non-critical work activities and be able to respond to environmental issues in a timely manner.
- Advise the Project Team (Table 2) if Project activities have caused or are likely to cause an environmental incident and make recommendations for proactive corrective actions and maintenance of mitigation measures.
- Communicate directly with Project members and provide technical advice to proactively resolve or address immediate environmental issues to maintain compliance with the CEMP and the VFPA PER conditions.
- Provide technical assistance and communication on environmental matters to VFPA, DP World and the Contractor.
- Check construction equipment and vehicles for hydrocarbon leaks, including for fuel delivery and refueling procedures.
- Verify that emergency spill and fire equipment caches are adequately supplied.
- Report construction activities in monthly environmental compliance reports, supplemented with field notes and photographs.
- Provide daily data reports and monitoring summaries to the internal Project Team (Table 2).
- Provide guidance to the Construction Manager or Site Superintendent regarding spill response and provide notification to the internal Project Team (See Table 2), including an incident report write-up.

Environmental monitoring personnel will have the authority to enforce modifications or to STOP work to ensure compliance with appropriate mitigation measures and controls to avoid and limit potential adverse environment effects from construction activities.



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3.1.3 Responsibilities of the Contractor

Tasks and responsibilities associated with the Contractor include, but are not limited to:

- Retain the services of a qualified professional and an environmental monitor(s) for the duration of the planning and construction phase of the Project.
- Hire environmental monitors to monitor, check, and periodically audit work activities.
- Engage qualified professionals to support development of environmental management plans or permit applications where required.
- Make available, to staff and contractors, adequate equipment, and supplies to administer regulatory and legislative requirements.
- Undertake construction activities in compliance with permits, approvals, licenses, management plans, this CEMP, environmental protection plans, and applicable federal, provincial, and municipal laws, statutes, by-laws, regulations, order, and policies.
- Keep a copy of current versions of the Project management plans, this CEMP, permits, and documentation accessible and legislative requirements.
- Train and oversee employees, suppliers, and subcontractors consistent with regulatory and legislative requirements.
- Investigate and report measures to implement permits and management plans and make original files available to DP World.
- Inform DP World and the EM if conditions vary significantly from anticipated for the applicable management plan or environmental work plan.

3.1.4 Responsibilities of the Construction Manager

Tasks and responsibilities associated with the Contractor's Construction Manager include, but are not limited to, the following:

- Review of construction schedules and procedures for potential implications on worker health and safety, site security, and environmental effects.
- Developing Project-specific Work Procedures that comply with requirements of applicable regulatory authorities and recognized best practices in construction safety.
- Restricting site access to authorized personnel.
- Reviewing this CEMP with their staff and subcontractors before construction and implementing the mitigation measures listed herein.
- Verifying required permits, licenses, and approvals are in place prior to the start of the construction activities.
- Complying with and ensuring that personnel and subtrades/contractors will comply with the Project permits and agency permits, or licenses issued for the Project, as well as other applicable laws, this CEMP, and applicable policies and standards.



CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

Relevant Environmental Legislation, Permits and Environmental Management Plans
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4.0 RELEVANT ENVIRONMENTAL LEGISLATION, PERMITS AND ENVIRONMENTAL MANAGEMENT PLANS

A Category C PER application and Request for Review (RFR) application have been submitted to the VFPA and DFO, respectively, as part of this Project. The CEMP will be updated once the applications for this Project have been submitted and a permit granted.

A Marine Mammal and Underwater Noise Monitoring and Mitigation Plan (Appendix A) has been prepared for this Project and will be updated to reflect the conditions and advice within each of these permits.

Environmental legislation and requirements applicable to the Project are provided in Table 3.



CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

Relevant Environmental Legislation, Permits and Environmental Management Plans
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Table 3 Relevant Environmental Regulations

Act, Regulation or Bylaw	Description	Applicability	Management
<i>Impact Assessment Act and Marine Act</i>	The <i>Impact Assessment Act</i> , 2019 (IAA 2019), <i>Marine Act</i> and their regulations establish the legislative basis for the federal environmental assessment process.	Under Section 82 of the <i>Marine Act</i> , the VFPA's authority has implemented the Project and Project Environmental Review process to permit all projects occurring on Federal Land under the authority of the VFPA.	The Project is being assessed by the VFPA (PER#22-017)
<i>Canadian Navigable Waters Act</i>	The <i>Canadian Navigable Waters Act</i> is an Act respecting the protection of navigable waters.	The Project is located on the Fraser River which is a scheduled navigable water.	DP World has opened a file with the Navigation Protection Program (2022-506592) in accordance with the CNWA.
<i>Canadian Environmental Protection Act</i>	An Act respecting pollution prevention and the protection of the environment and human health to contribute to sustainable development.	Fueling, emissions, and potential spills from construction equipment and vehicles have the potential to release pollution and wastes into the environment.	Procedures and protocols to manage spills and equipment emissions will be implemented by the Contractor; Should spills occur, they will be reported to the VFPA by DP World.
<i>Fisheries Act</i>	The 2019 <i>Fisheries Act</i> contains two key provisions that are aimed at conserving and protecting fish and fish habitat, including restoring the previous prohibition against the harmful alteration, disruption, or destruction (HADD) of fish habitat. Section 35(2) requires an Authorization for works that will result in HADD to fish and fish habitat. Section 36 prohibits the discharge of deleterious substances into the aquatic environment.	This Project is subject to a Request for Review to determine the need for a <i>Fisheries Act</i> Authorization under section 35(2).	The construction of the Project will be conducted such that no deleterious substances are introduced to the aquatic environment (Fraser River) under section 36. DP World has submitted a RFR of the Project to DFO under file number 22-HPAC-00562.
<i>Species at Risk Act</i>	This Act addresses the protection of wildlife, fish, and plant species at risk in Canada.	Species such as eulachon (<i>Thaleichthys pacificus</i>), white and green sturgeon (<i>Acipenser transmontanus</i> and <i>Acipenser medirostris</i> , respectively) and mountain sucker (<i>Catostomus platyrhynchus</i>) have populations that potentially overlap with the Project location. Note the Lower Fraser white sturgeon population currently has no standing under SARA (No Status) and is listed as threatened on the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). In 2012, the Lower Fraser River population of white sturgeon was identified as under consideration for SARA listing ² . Mountain sucker (Pacific populations) is listed as Special Concern under SARA and COSEWIC.	Mitigation measures and monitoring procedures for at risk species will be implemented by the Contractor and the EM as detailed in Section 3.1.1 to 3.1.4 and of this CEMP. An aquatic habitat assessment has been completed in conjunction with permitting for the Project to identify potential impacts and mitigation measures. Further iterations of the CEMP will be updated with these mitigation measures when available.
<i>Migratory Birds Convention Act</i>	This Act prohibits the "killing, capturing, injuring, taking or disturbing of migratory birds or the damaging, destroying, removing or disturbing of nests." This prohibition includes "incidental take" which is defined as the inadvertent harming, killing, disturbance, or destruction of migratory birds, nests, and eggs (ECCC 2017).	The Project is not expected to require a permit under this Act but will consider the guidance from Environment and Climate Change Canada (ECCC) and the Environmental Monitor.	Vegetation clearing for the project will be limited and completed during appropriate timing windows. Encounters of bird nests may be possible with the removal of existing infrastructure. A pre-construction nest survey is recommended and shall be completed by a qualified environmental professional (QEP) to check for nests on the piers.
<i>Transportation of Dangerous Goods Act and regulations</i>	The <i>Transportation of Dangerous Goods Act</i> and associated regulations govern the handling and transportation of dangerous goods.	If substances listed in Schedule A of the Act are transported to or from project sites, applicable requirements under the Act will be followed.	Applicable requirements related to documentation, safety markings, means of containment, training, and reporting will be addressed as required.

² https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=123



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Project Mitigation Measures and Environmental Specifications
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5.0 PROJECT MITIGATION MEASURES AND ENVIRONMENTAL SPECIFICATIONS

Construction activities associated with the Project have the potential to affect terrestrial and aquatic habitat and cause adverse environmental effects. Through the implementation of appropriate mitigation measures, potential effects associated with the Project can be avoided or limited.

Environmental protection measures are based on BMPs, standard industry procedures, and recommendations from the Management and Monitoring Plans described in Table . Additional BMP documents used to develop the environmental protection measures in this CEMP include, but are not limited to:

- Field Guide to Fuel Handling, Transportation, and Storage (MWLAP 2002)
- DFO *Best Management Practices for Pile Driving and Related Operations* (DFO 2018)
- Environment and Climate Change Canada's General Nesting Periods of Migratory Birds in Canada (ECCC 2018)
- Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia (MOE 2014).

5.1 GENERAL PRACTICES

Many environmental mitigation measures are common to all components of the Project. Table 4 provides general mitigation measures applicable to all Project activities.

Table 4 Project Mitigation Measures

Category	Mitigation Measure
Permits	<ol style="list-style-type: none">1. Copies of all issued permits will be readily available.2. Construction-related restrictions, conditions, or mitigation measures that are part of the regulatory permits will be communicated to the field crew(s).3. All work shall comply with requirements of all applicable laws, legislation, the VFPA PER conditions, and the CEMP.
CEMP	<ol style="list-style-type: none">4. A copy of the VFPA PER permit conditions and this CEMP will be on site and readily available.
Timing	<ol style="list-style-type: none">5. Pile installation will occur from June 16 to February 15, at the assumed recommendation of DFO and based on earlier timing for upstream spawning migration for eulachon.
Training	<ol style="list-style-type: none">6. Personnel will be adequately trained and will use appropriate personal protective equipment.
Tailgate Meetings	<ol style="list-style-type: none">7. The VFPA permit conditions, CEMP, and environmental regulatory permit requirements will be reviewed by the Contractor and EM, followed by a briefing to crews.



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Project Mitigation Measures and Environmental Specifications
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Table 4 Project Mitigation Measures

Category	Mitigation Measure
Stop work	8. Crews will stop work and contact the EM for assistance prior to commencing or continuing any activities that may pose any environmental or archaeological risk not addressed in this document. 9. The EM will have authority to issue a Stop Work order where activities are adversely affecting, or will adversely affect, the environment or archaeological resources. The EM will also make recommendations in the field for avoiding and mitigating effects.
Site Cleanliness	10. Sites will be kept in good order, tidy during activities, and left in a good condition at the end of the Project. Solid waste will be managed to avoid conflicts with wildlife.
Waste Disposal	11. The Contractor will collect all construction debris and other waste materials and dispose of it at an approved upland facility, where applicable.
Contractors/ Subcontractors	12. The Contractor and subcontractors will comply with the mitigation measures outlined in the VFPA permit conditions, the CEMP, and measures/controls identified within Project regulatory permits. 13. The Contractor and the EM will implement appropriate work procedures, instructions, and controls to prevent and/or reduce adverse environmental impacts.
Reporting	14. The EM will establish and maintain effective environmental reporting protocols. 15. Environmental Monitoring personnel will provide daily email updates along with weekly monitoring reports to DP World. DP World will distribute environmental incident reports where required by regulations.
Concrete Management	16. All work associated with the Project involving the use of concrete (e.g., filling of forms or piles with concrete) shall be conducted to prohibit sediment, debris, concrete (cured or uncured), and concrete fines from being deposited into the aquatic environment, either directly or indirectly. 17. Water that has contacted uncured or partly cured concrete shall not be permitted to enter the aquatic environment. Containment facilities shall be provided at the site for wash-down water from concrete delivery, concrete pouring, and other equipment as required.
Ambient Noise	18. The Contractor will monitor and control construction noise to approved levels and within hours that are permitted by the VFPA.
Containment and Spill Management	19. An appropriate spill prevention, containment, and clean-up contingency plan for hydrocarbon products, sediment, and other deleterious substances shall be put in place prior to work commencing. 20. Appropriate spill containment and clean-up supplies shall be kept available on site whenever the works are underway. Personnel working on the Project must be familiar with implementing the spill clean-up plan and deployment of spill response materials. A large spill kit will be on site during construction activities which will contain enough booms to contain a spill. Biodegradable hydraulic fluid will be used, where possible. 21. Vehicles, equipment and machinery should be inspected (by the contractor or EM) daily (particularly fuel and hydraulic lines). 22. The EM and Contractor will provide immediate response to emergencies and incidents. DP World will notify the VFPA and other agencies of spills of deleterious substances and other emergencies. 23. Preventative and corrective measures will be undertaken in response to non-conformance with regulatory approvals, the VFPA permit conditions, the CEMP, and/or, procedures and plans.
Hazardous Materials	24. Chemical products will have their applicable material safety data sheets onsite and readily available.



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Table 4 Project Mitigation Measures

Category	Mitigation Measure
	25. Hazardous materials kept on Site will be stored as per BMPs and applicable regulations, including the use of lockable cabinets and secondary containment when required.
Soils, Erosion, and Sediment Control	26. Silt curtains will be used and maintained, where feasible, to isolate in-water works and contain suspended sediments. 27. A sediment and erosion control plan, outlining measures to prevent soils from being exposed and mobilized into the nearby aquatic environment, will be completed by the contractor prior to construction
Water Quality: Oil and Grease	28. Before allowing water to leave the work site, the Contractor's EM will verify that water does not have detectable oil and grease (detectable by sight or smell).
Air Quality/ Emissions	29. Equipment will be shut off when not in use. 30. Low sulphur fuel (below 15 ppm) will be used in construction equipment. 31. Work will be planned to optimize efficiency. 32. Equipment will be well-maintained and in accordance with manufacturers' guidance.
Operation of Machinery	33. Machinery will arrive clean and will be maintained free of fluid leaks and invasive species. 34. No vessel will ground on the riverbed. To the extent possible, machinery will operate on land above the high-water mark or from a floating barge, in a manner that will limit disturbance to the riverbed. 35. Machinery will be washed, refueled, and serviced at a designate upland location where possible; fuel and other materials will be stored in a manner to prevent deleterious substances from entering the water.
Excavated Soils	36. Excavated soils will not be deposited into the aquatic environment. 37. Suspected contaminated soils will be segregated for assessment and determination of handling, transport, and disposal requirements per applicable regulations and contract specifications.

5.2 AIR QUALITY

Air emissions from vehicular/equipment exhaust and dust associated with construction related activities will be limited and managed to avoid nuisance and environmental effects during construction.

Requirements to reduce emissions and general measures related to air quality are outlined in Table 5.

Table 5 Air Quality Mitigation Measures

Category	Mitigation Measure
General Measures	1. Contractors responsible for overseeing non-road diesel equipment usage will follow the VFWA Non-road Diesel Emissions (NRDE) program guidelines.
Dust	2. Material loads entering or exiting the site that could create dust will be covered, as appropriate. 3. Fugitive dust will be controlled such that it is not visible beyond the property line and not tracked out beyond 8 m on roadways. 4. Where traffic because of the Project creates a hazardous or irritating level of dust to nearby receptors, dust control on existing access roads will be achieved through the application of water, as practicable or via sweeper truck. Chemical dust suppressants will not be used.



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Table 5 Air Quality Mitigation Measures

Category	Mitigation Measure
Vehicles & Equipment	<ol style="list-style-type: none"> 5. There will be no idling of vehicles and construction equipment when not in use; idling is allowed for a period of 3 minutes when equipment is in use. Some exemptions to this can be referenced in the VFPA NRDE policy if reviewed and approved by DP World. 6. Equipment, vehicles, and stationary emission sources will be maintained properly prior to use. 7. Non-road diesel equipment must use Low Sulphur (<15 ppm) diesel fuel. 8. Discharge of air contaminants from non-road diesel engines will not exceed 20% opacity. 9. Stationary emission sources such as diesel generators will only be used as necessary and will be shut off when not in use.

5.3 FISH PROTECTION

Fish species and fish habitats that exist within the Fraser River and have the potential to overlap with Project activities include Pacific salmon species (Chinook, chum, coho, sockeye, pink, trout, and char species (coastal cutthroat, steelhead/rainbow, Dolly Varden, and bull trout), mountain sucker, eulachon, and white and green sturgeon. Sturgeon have been observed upstream and downstream of the Project location. The mitigation measures outlined in Table 6 will be applied to protect fish and fish habitat.

Table 6 Fish and Fish Habitat Protection Mitigation Measures

Category	Mitigation Measure
Permits	<ol style="list-style-type: none"> 1. Works will be conducted in accordance with VFPA permit conditions and the LOA from DFO.
Timing	<ol style="list-style-type: none"> 2. Pile installation will occur during the least risk timing window, between June 16 to February 15.
Fish Protection	<ol style="list-style-type: none"> 3. Works shall be carried out in such a manner to avoid any adverse impacts on fish and fish habitats, with specific attention associated with habitat use for white sturgeon foraging, salmon migration (adults and smolts), and eulachon upstream spawning migration. These measures include preventing the release of concrete into the aquatic environment (section 5.5), adhering to underwater sound pressure levels (5.4), preventing the discharge of sediment and deleterious substances (section 5.5, 5.11, 5.12) and having an appropriate spill and prevention response plan (section 5.12). 4. In-water activities or associated in-water structures will not interfere with fish passage or result in the stranding or death of fish. A QEP will verify that appropriate protocols are applied, and applicable permits are obtained to capture and safely relocate fish, if necessary.
Deleterious substances	<ol style="list-style-type: none"> 5. Deleterious substances (e.g., fine sediments, hydrocarbons, contaminants) will not be deposited into fish habitat. These measures include preventing the release of concrete into the aquatic environment (section 5.5), adhering to sound pressure levels (5.4), preventing the discharge of sediment and deleterious substances (section 5.5, 5.11, 5.12) and having an appropriate spill and prevention response plan (section 5.12). 6. Work will be conducted such that no contaminated water or other effluent potentially harmful to aquatic life enters the aquatic environment.



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Table 6 Fish and Fish Habitat Protection Mitigation Measures

Category	Mitigation Measure
Monitoring	<p>7. A fish and fish habitat monitoring protocol will be defined and confirmed associated with the Contractor's schedule and specific in-water Project work activities. Monitoring will be undertaken by the Contractor and their QEP to inventory and assess the presence of sturgeon, salmon, and eulachon in the Project work area. The fish presence monitoring protocol includes active hydroacoustic and/or side scan sonar monitoring prior to and during construction activities to identify fish species presence. A fish and fish habitat monitoring plan will be developed between DP World and the Contractor and will be provided for review to VFPA and DFO prior to the initiation of in-water activities.</p> <p>8. Underwater noise monitoring will be conducted during pile driving activities by the EM as outlined by permit conditions.</p> <p>9. Water quality monitoring will be conducted during construction activities by the EM.</p> <p>10. As noted above, EMs will have the authority to enforce modifications or to STOP work to ensure compliance with appropriate mitigation measures and controls to avoid and limit potential adverse environment effects to fish and fish habitats from construction activities.</p> <p>11. Dead white sturgeon found in the lower and middle Fraser River should be sampled following the Lower & Middle Fraser White Sturgeon Monitoring and Assessment Program Mortality Sampling Protocol (BC Government, 2020) to attempt to determine cause of death, and if and where sturgeon have been previously tagged for research.</p>

5.4 PILE INSTALLATION

The Contractor may use an impact hammer for installation of permanent piles and, where possible, a vibratory hammer will be utilized to install the temporary piles to support the falsework frames where ground conditions allow.

Pile installation next to Berth 10 is anticipated to generate underwater noise (as sound pressure waves) which could negatively affect fish and marine mammals. Table 7 details mitigation measures for the protection of fish and marine mammal species during pile installation activities.

Table 7 Mitigation Measures for Pile Installation

Category	Mitigation Measure
General Measures	<p>1. Pile installation will follow the BMPs developed by DFO (2018).</p> <p>2. The contractor will develop a SOP for the operation of a bubble curtain for sound attenuation, including the following information:</p> <ul style="list-style-type: none"> • Roles and responsibilities • A description of the equipment • Installation procedure • Operation, testing procedures, and proper storage requirements



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Table 7 Mitigation Measures for Pile Installation

Category	Mitigation Measure
Sound Pressure	<ol style="list-style-type: none"> 3. Bubble curtains or underwater noise barriers are assumed to be required as technically feasible to attenuate sound pressure levels and reduce potential harm to fish because of in-water impact pile driving. 4. Peak pressure sound levels (Single-strike Sound Exposure Levels [SSEL]) will be monitored using a hydrophone. 5. If underwater noise levels exceed criteria established through project permitting, or if dead or injured fish are observed, pile driving will be stopped, and mitigation measures implemented and/or enhanced as required to achieve compliance. 6. The underwater acoustic energy output of the impact pile driving will commence from a lower energy level and build steadily and gradually to full output over a period of 5 minutes, or, as an alternative, a series of lower powered hammer strikes (dry-fires) can be used to confirm sound pressure mitigation measures are effective prior to high energy strikes.
Marine Mammal Exclusion Zone	<ol style="list-style-type: none"> 7. A marine mammal exclusion zone (MMEZ) will be determined and monitored by a QEP during the first week at the beginning of the Program. The process of determining the MMEZ is outlined in section 6.1.3.2. 8. Pile driving will not start if marine mammals are sighted within the MMEZ up to 30 minutes prior to the commencement of impact pile driving. 9. The Contractor will not start operations until after the animal(s) has(have) been observed to leave the exclusion zone or has not been re-sighted within the exclusion zone for 30 minutes.

5.5 CONCRETE WORK

Table 8 identifies environmental mitigation measures to be implemented to avoid or mitigate against potential environmental effects during concrete works.

Table 8 Concrete Control Mitigation Measures

Category	Mitigation Measure
Concrete Pour Timing	<ol style="list-style-type: none"> 1. Work that occurs within the intertidal area of the Fraser River and that involves pouring concrete will occur at low tide to avoid pouring over water except when water depths are necessary to stage marine equipment. Operators must be familiar with spill response procedures, including standard containment methods, in case of an environmental emergency to help avoid and limit deleterious substance effects on the surrounding environment. 2. Once pouring has ceased, forms will be wrapped in plastic for 72 hours or until cured, to isolate the wet/setting concrete from weather (e.g., rain and snow).
Concrete Pour	<ol style="list-style-type: none"> 3. Spills of fresh concrete must be prevented. Proper sealed chutes must be constructed to avoid spillage. If the concrete is being placed with a concrete pump, hose and pipe connections must be sealed and locked properly so that the lines will not leak or uncouple. 4. Crews will not fill concrete forms or piles to overflowing.



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Table 8 Concrete Control Mitigation Measures

Category	Mitigation Measure
Concrete Forms	5. Concrete forms will be constructed and sealed in a manner which will prevent fresh concrete or cement-laden water from leaking into the surrounding water. 6. The integrity of the form work will be routinely inspected prior to, during, and immediately after the pour. Deficiencies that may leak will be addressed immediately by the Contractor.
Onsite Concrete Tests	7. Onsite concrete tests (e.g., slump tests) will be conducted in a contained area (e.g., a leak proof tray) to prevent the deposition of deleterious substances into the aquatic environment.
Runoff	8. Any water that contacts uncured or partly cured concrete will be captured for appropriate management and disposal as directed by the EM. 9. Prevent any water (e.g., rain/snow) that contacts uncured or partly cured concrete (during activities like exposed aggregate wash-off, wet curing, or equipment washing) from entering the aquatic environment.
Tools/ Equipment Cleaning	10. The cleaning of concrete and cement laden materials (e.g., tools and equipment) must be conducted in a contained area to prevent the release of deleterious substances (e.g., wash water) into the aquatic environment. 11. At no time is it permitted to rinse concrete and cement laden materials in the aquatic environment.
Wash water	12. Tools, pumps, pipes, hoses, and trucks used for finishing, placing, or transporting fresh concrete must be washed off in such a way as to prevent the wash off water from entering the aquatic environment. 13. Sealed, leak-proof containment facilities for wash water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment must be provided to prevent the release of deleterious substances into the receiving environment. 14. Concrete wash water will be contained and removed offsite to a designated facility or at the manufacturer's place of business. If the wash water is disposed of on site, the wash water must be neutralized (e.g., carbon dioxide [CO ₂] tank with regulator, hose, and gas diffuser) and filtered through a sediment control device. 15. Do not completely fill the wash water containment basin. Allow for sufficient freeboard. 16. Untreated wash water will not be disposed of into the aquatic environment.
Wash water Treatment	17. Water quality parameters (e.g., pH and turbidity) will be sampled in wash water prior to treatment, after treatment, and prior to disposal. Wash water is assumed not to meet CCME water quality guidelines. 18. Wash water must be appropriately treated to water quality guidelines described herein prior to the release to the receiving environment. 19. When treating wash water with CO ₂ , diffusers should be placed on the bottom of the tank, this will allow CO ₂ to bubble up through the water and diffuse more evenly. 20. Where practical, neutralization of wash water should be conducted separately from concrete sludge. 21. When releasing the treated/neutralized wash water, be sure not to release any sludge that may have accumulated on the bottom of the containment basin.
Materials Containment	22. If concrete is to be mixed on the worksite, store cement bags in a leak-proof, covered container to provide protection from wind or rain/snow and other influences (e.g., waves). 23. During mixing operations once cement bags are opened take all necessary precautions to limit dispersal of dry cement by the wind.



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Table 8 Concrete Control Mitigation Measures

Category	Mitigation Measure
Excess Concrete/Sludge	<p>24. Excess/unused concrete will be removed from the site and disposed of/recycled offsite appropriately at an approved facility.</p> <p>25. Collect and dispose of all collected waste concrete at an approved disposal site. Other waste materials collected during the concrete pouring operations will be retained for disposal at a municipal landfill. Waste materials must not be deposited into watercourses or riparian areas.</p>
Spills	<p>26. Any accidental release of concrete will be removed prior to curing.</p> <p>27. Spill clean-up materials, such as tarps and shovels, will be readily available.</p> <p>28. Immediately report any spills of uncured concrete, concrete fines, wash or contact water of reportable quantities to the onsite EM. DP World or their representative will notify VFPA and Emergency Management BC if a spill occurs.</p> <p>29. Immediately implement emergency mitigation and clean-up measures, such as the use of CO₂ bubbles and immediate removal of the material, shall be implemented in the event of a concrete spill.</p>

5.6 CONSTRUCTION NOISE AND VIBRATION

Construction noise and vibration is expected during construction, particularly during in-water impact pile driving. Construction activities will consider BMPs and mitigation measures to address noise and vibration emissions as detailed in Table 9.

Table 9 Construction Noise and Vibration Mitigation Measures

Category	Mitigation Measure
Construction Hours	<p>1. Adherence to standard VFPA construction hours, and restriction of pile driving activity to Monday to Saturday between 7:00 am to 8:00 pm, excluding Sundays and public holidays. If work outside these hours is required, the Contractor will inform DP World and a request in accordance with the VFPA guidelines will be submitted to the VFPA.</p>
Equipment and Machinery	<p>2. Piling noise and vibration levels may also be controlled using alternative techniques (e.g., above-ground noise-dampening shroud), or a saddle/pad to cushion hammer impacts on the pile.</p> <p>3. Turn off idling equipment such as diesel engines when not in use for more than 30 minutes.</p> <p>4. Fit gas or diesel-powered equipment with intake (if appropriate) and exhaust silencers (mufflers) meeting manufacturer's recommendations for optimal attenuation and maintain these silencers in effective working condition.</p> <p>5. Where more than one type/model of equipment or construction technique can be used to do a particular job with similar efficiency, use the quietest.</p> <p>6. Fit air-powered equipment with mufflers on the compressed air ports as per manufacturer's recommendations and consider using hydraulic-powered equipment.</p> <p>7. Supply and operate equipment with appropriate covers, hoods, shields etc., in place and latched shut.</p> <p>8. Carry out regular maintenance on equipment, including lubrication and replacement of worn parts, especially exhaust systems.</p> <p>9. Operate equipment at minimum engine speeds consistent with effective operation.</p>



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Table 9 Construction Noise and Vibration Mitigation Measures

Category	Mitigation Measure
	10. Limit use of back-up beepers where feasible and safe to do so. Consider use of lights, and/or radio communications or human spotters as alternatives to audible warning devices. 11. If a noise source has pronounced directivity (e.g., the exhaust stack or intake air louvres of a fixed piece of equipment such as a generator) direct the noisy side away from potentially sensitive local receptors. 12. Where feasible, use a close-fitting enclosure or shroud to partially contain noise emissions from the contact of the pile and hammer during piling operations.
Underwater Noise Pressure	13. Underwater noise levels during in-water impact pile driving will be mitigated where technically possible by using bubble curtains (see Section 7.1.2). 14. A hydrophone will be used by a qualified professional to measure and monitor underwater peak pressure sound levels (see Section 7.1.2).
Stop Work Procedure	15. If noise monitoring levels are exceeding 80 decibels (dBA) over any 15-minute rolling window, the Environmental Monitor will have authority to issue a Stop Work order, then work is required to stop, and suitable noise mitigation options will need to be considered by the Contractor so that noise levels remain below the threshold.

5.7 VEGETATION AND TERRESTRIAL WILDLIFE MANAGEMENT

The Project area is generally flat, industrial, and disturbed with little native vegetation present. Vegetation comprises native trees and shrubs, such as black cottonwood, Pacific crab apple, red-osier dogwood, hardhack, and salmonberry. Non-native species, including Himalayan blackberry, wild chervil, reed canary grass and mullein are present. One noxious weed (yellow flag iris) is present along the Fraser River (Stantec 2022).

No listed at-risk plant species were observed at the site. However, three SARA-listed species (Roell's brotherella, Vancouver Island beggarticks and streambank lupine have a potential to occur in the area and there are historical records of their occurrence within a 5 km radius of the Project (Stantec 2022).

Habitat values for wildlife are limited to vegetated shoreline and local structures, except for relatively mobile species and species with high tolerance for human-related activities (Hemmera 2018a).

Waterbirds may use shoreline areas of the Fraser River and Gunderson Slough for roosting and feeding, and forested portions of the site provide suitable habitat for songbirds, raptors, and waders. Thirteen wildlife species at-risk are considered to have potential to occur within the study area (Hemmera 2018a).

The mitigation measures for vegetation and terrestrial wildlife management are outlined in Table 10.



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Table 10 Vegetation and Terrestrial Wildlife Management Mitigation Measures

Category	Mitigation Measures
Staking/Flagging	1. The construction footprint must be flagged to delineate all boundaries where physical works will occur.
Tree Disturbance	2. Prior to construction, an International Society of Arboriculture (ISA) certified arborist retained by the contractor will conduct a risk tree assessment. 3. An ISA certified arborist will advise the contractor regarding selective tree removal, tree protection fencing specifications for retained trees, and selective pruning of retained trees if and where necessary. 4. Monitor and maintain tree protection fencing.
Breeding Birds	5. Bird nest searches will be undertaken from one to seven days before commencement of clearing during the bird nesting window (approximately mid-March to mid-August for the Project area) to reduce the risk of contravention of the <i>Migratory Birds Convention Act</i> or the <i>BC Wildlife Act</i> if vegetation clearing is unavoidable. 6. Maintain appropriate buffer zones around active bird nests. An appropriate setback from active nests (e.g., 30–100 m) is recommended, depending on the species, environmental setting, and Project activity.
Species at Risk and Protected Nests	7. Observations of Species at Risk (e.g., barn swallow [<i>Hirundo rustica</i>], barn owl [<i>Tyto alba</i>], and protected nests (e.g., bald eagle stick nests), will be documented, geo-referenced and appropriately delineated prior to construction to avoid disturbance. Should disturbance be unavoidable, a QEP will be consulted, and consultation may occur with the ECCC (barn swallow and streambank lupine) and the VFPA (bald eagle stick nests). 8. Prior to construction, a rare plant survey will be conducted to search for red-, blue-, and SARA-listed plant species that could occur in and/or around the Project footprint. If any are found, additional mitigation measures may be required. The survey will be based on provincial standards (i.e., Inventory and Survey Methods for Rare Plants and Lichens [RISC 2018]).
Bald Eagle Management	9. A pre-construction survey will be undertaken from one to seven days before commencement of construction during the sensitive period for bald eagles (February to July). 10. If the nest is deemed active, a minimum set back of 50 m of undisturbed vegetation buffer, plus an additional 100 m during breeding season, is recommended if construction within the recommended buffer is unavoidable, a nest monitor should be appointed. The nest monitor would document bird behavior before and during disturbance activities and may call for construction to pause or stop if the birds become visibly distressed. The monitor may recommend to cease construction for a certain period of time (likely until the birds have passed the more sensitive early nesting stages), depending on their observations and the level of distress noted.
Wildlife Management	11. The construction site must remain free of wildlife attractants (e.g., food). Food and other attractants will be kept in vehicles or other indoor storage. 12. Report incidental wildlife observations/encounters (e.g., discovery of a previously unseen nest) to the EM prior to conducting work that would disturb that wildlife. 13. A pre-construction survey for wildlife is recommended prior to construction.
Revegetation	14. Certified weed-free seed mixes will be used for revegetation efforts. 15. Seeding will follow vegetation clearing as soon as possible, pending seasonal and weather requirements. 16. Restrict vehicle access over newly seeded areas. 17. Develop a revegetation plan should areas supporting trees or native shrubs be disturbed during construction in a manner that limits natural regeneration



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Table 10 Vegetation and Terrestrial Wildlife Management Mitigation Measures

Category	Mitigation Measures
Environmental Inspection and Monitoring	18. Monitor the effectiveness of post-construction revegetation establishment. Implement remedial measures if warranted. 19. Monitor for invasive plants and implement an Invasive Plant Management Plan if detected.

5.8 INVASIVE PLANT MANAGEMENT

Mitigation measures for the management of invasive plants aim to mitigate the introduction, transport, and expansion of invasive plant species, including noxious weeds and those listed as priority by the Invasive Species Council of Metro Vancouver (ISCMV 2022). The Project should be undertaken in accordance with the BC *Weed Control Act*.

Table 11 Invasive Plant Management Mitigation Measures

Category	Mitigation Measures
General Measures	1. A site-specific invasive species management plan will be prepared by the Contractor and submitted to the VFPA for review prior to construction. At minimum, the plan will include the data from a pre-construction survey for invasive plants from within the vegetated areas to be disturbed and recommendations of a QEP for management of identified species.
Equipment Management	2. Construction equipment must be cleaned before entering and leaving construction sites to prevent the movement of invasive and noxious weeds. 3. Wheel washing or a suitable alternative must prevent tracking of mud or potential invasive species off-site.
Site Management	4. Control noxious weed species (i.e., yellow flag iris) in the Project footprint and temporary construction areas according to guidance from the Invasive Species Council of BC (ISCBC 2017) prior to commencing construction. 5. Control other invasive species on the ISCMV priority list in areas planned for vegetation clearing and construction works, following guidance from the Invasive Species Council of BC (ISCBC 2022). 6. If invasive plant species removal should entail grubbing of roots, then seed bare ground following clearing and grubbing. 7. If placing fill and/or utilizing stockpiles, monitor the stockpiles (fill) for invasive and noxious weed growth during construction, and implement corrective measures such as spraying, mowing, or hand pulling to avoid further infestation.



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5.9 ARCHAEOLOGICAL RESOURCES

An archaeological overview assessment (AOA) of the Fraser Surrey Docks (now DP World Fraser Surrey terminal) was completed Kleanza Consulting Ltd. In 2018 (Kleanza 2018). The AOA did not identify any archaeological materials or isolated areas of high archaeological potential within the study area. However, ethnographic and archaeological research suggests that the DP World Fraser Surrey terminal area is situated in an area of high archaeological potential, for areas above the former shoreline. These areas above the former shoreline contain a lens of preserved organic material. The AOA outlined the following recommendations:

- An archaeologist and First Nations representatives will monitor and be invited to monitor, respectively, any activities that may disturb this preserved layer.
- Any disturbance greater than 2 m, and above the former shoreline of the DP World Fraser Surrey terminal will be monitored by a QEP.
- Archaeological monitoring be completed for all ground disturbances deeper than 2 m below the current surface. Monitoring should continue until maximum excavation depth is reached or a minimum of 50 centimeter (cm) of non-organic, sterile sediments have been observed by the supervising archaeologist, whichever occurs first. Once a minimum of 50 cm of non-organic, sterile sediments have been observed by the supervising archaeologist, monitoring can be discontinued.
- Further archaeological work will be required if the terminal development area is altered to include locations not initially assessed.
- Ongoing communication with all involved First Nations for the duration of the Project.



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5.10 WASTE MANAGEMENT

Waste from Project activities has the potential to adversely affect aquatic and terrestrial environments through ineffective onsite management and inappropriate disposal. To reduce this risk, the mitigation measures outlined in Table 12 will be implemented.

Table 12 Waste Control Mitigation Measures

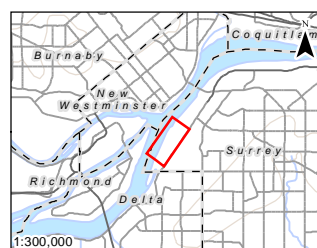
Category	Mitigation Measure
Waste	<ol style="list-style-type: none">1. Waste or any miscellaneous unused materials will be recovered for either disposal in a designated facility or placed in storage. Under no circumstances will materials be deliberately thrown into the aquatic or terrestrial environment.2. On-site personnel will make best efforts to prevent debris from entering the aquatic environment.3. Litter in the form of coffee cups, lunch wrappers, cigarette butts, and other such items will be placed in covered trash containers.4. Construction debris/waste will be collected, transported, and disposed of off-site and in accordance with applicable legislation, guidelines, and BMPs.
Portable Toilets	<ol style="list-style-type: none">5. Portable toilets will be located a minimum of 30 m from any waterbody. Sewage from portable toilets will be disposed of in an approved sewage disposal facility on an as-needed basis.6. Portable toilets will be placed and secured in a manner to prevent them from tipping or falling over.
Hazardous Waste	<ol style="list-style-type: none">7. Sorbent materials or soils saturated with hydrocarbons (greater than or equal to 3% by weight) are classified as hazardous waste under the British Columbia <i>Environmental Management Act</i> and will be managed accordingly.8. Used petroleum products, including their empty containers, will be collected and transported to a licensed recycling facility in approved storage containers following applicable regulations.9. Other hazardous wastes will be disposed of as per their MSDS directions.

5.11 SOIL AND GROUNDWATER MANAGEMENT PLAN

Due to the history of the terminal (land infilling) and rail operations, areas of soil contamination or other material may be encountered during ground-disturbance activities such as installation of underground utilities and foundations.

A Supplemental Site Investigation and a Confirmation of Remediation adjacent to the Project sites was conducted in 2021 by SNC-Lavelin Inc (SNC). Soil and groundwater samples were submitted for analysis of the following potential contaminants of concern (PCOCs) total Metals in soil and dissolved metals and polycyclic aromatic hydrocarbon (PAH) in groundwater (SNC 2021). Soil and groundwater sample locations, and areas of potential concern (APECs), identified by SNC, are shown on Figure 2.





- Railway
- Watercourse
- Project Components
- Project Boundary
- Area of Potential Environmental Concern (APEC)
- Monitoring Well

Notes
 1. Coordinate System: NAD 1983 UTM Zone 10N
 2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
 3. Imagery: ESRI World Imagery 2021



Project Location: Surrey, BC
 Project Number: 12322054
 Prepared by: KWONG on 20220915
 Requested by: BBOOTH on 20220915
 Checked by: LTRUPELL on 20220930

Client/Project/Report: DP World (Canada) Fraser Surrey Canola Oil Transload Facility Construction Environmental Management Plan

Figure No. **2** Revision No. **2**

Borehole / Monitoring Well Locations and Areas of Potential Environmental Concern

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SNC integrated soil analytical results from the stage 2 preliminary site investigation (PSI) report completed by SNC in 2013 and as such Table 13 provides a summary of soil samples with soil concentrations that exceeded the applicable federal guidelines/criteria and/or provincial standards prior to remediation.

Table 13 Summary of Soil Results That Exceeded Applicable Federal Guidelines/Criteria and Provincial Standards

Depth (meters below ground surface - mbgs)	Parameter Soil concentration >Federal Guidelines	Parameter Soil concentration >CSR
0.0 – 0.2 (2013)	Chromium , Copper, Phenanthrene, Index of Additive Cancer Risk	Chromium, Iron, Manganese
0.6 – 0.8 (2013)	Arsenic, Chromium, Copper	Arsenic, Chromium, Copper, Iron
0.7 – 0.8 (2021)	N/A	Arsenic

In 2021, SNC has completed a confirmatory sampling during remediation at interim intervals to minimize the amount of soil removed from site. SNC's Confirmation of remediation has identified residual contaminated soil with concentrations of metals exceeding applicable CCME and British Columbia Contaminated Sites Regulation (BC CSR) industrial land use (IL) guideline. Based on the confirmatory soil samples collected during remediation program and from the SSI program the extent of residual soil contamination was successfully delineated. The remaining confirmatory soil samples indicated soil contamination was successfully remediated to applicable guidelines/standards.

During SNCs PSI event, a groundwater monitoring and sampling event for twelve monitoring wells was completed. SNC has analyzed twelve groundwater samples for PHC, PAHs, metals and glycols. SNC has completed another groundwater assessment in 2020 and analyzed twelve samples for the same parameters.

In 2021, SNC has installed eleven monitoring wells during the SSI event to a maximum depth of approximately 2.5 m bgs. Monitoring wells from the PSI and SSI were sampled in 2021 and analyzed for PAHs and dissolved metals.

Groundwater samples had reported concentrations of PAHs during the 2020 and 2021 sampling events and had reported dissolved metals in the three sampling events.

Based on the available information including the PSI, SSI and 2020 groundwater sampling events, the concentration of dissolved metals including petroleum hydrocarbon constituents greater than the applicable CCME guidelines and CSR standards have been delineated and appear to be stable. SNCs SSI report indicated that the elevated concentrations of contaminants of concern have been confirmed not to be impacting (reaching) the Fraser River which is the closest aquatic receptors to the project. However, the identified PCOCs can't entirely be ruled out for the project as the contaminants are adjacent to the site and can be identified as an area of potential environmental concern.



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As the Project is planning limited excavations and in general, large quantities of soil and groundwater that require storage and characterization are not expected. Excavated soils are anticipated to mainly consist of previously imported materials which will be reused on site to the maximum extent possible. If suspect contaminated soil or water is encountered during ground disturbing activities, it will be handled as described in Table 14.

Table 14 Contaminated Soil and Groundwater Mitigation Measures

Category	Mitigation Measure
Soil Management Plan	<ol style="list-style-type: none"> 1. Prior to excavation, the Contractor will prepare a soil management plan that includes the following information: <ul style="list-style-type: none"> – A project description, including contaminants of concern – Regulatory Setting and Applicability – Roles and responsibilities – Estimated soil volumes, details of the soil characterization process and off-site disposal procedures – General soil management practices – Stockpile construction and management practices – Details surrounding soil transportation, tracking and approved facility disposal options – Equipment contamination protocols – Documentation requirements
Contaminated Soil	<ol style="list-style-type: none"> 2. If suspect-contaminated soil is encountered (observed free product, staining, sheen or olfactory indications, or the presence of refuse) during construction activities, the Contractor shall immediately cease work in that area and notify the EM. 3. The Contractor should manage potentially contaminated soil as follows, under the direction of the EM: <ul style="list-style-type: none"> – Segregate contaminated soil into a stockpile. The stockpile should be placed on an impermeable surface and covered to prevent infiltration of precipitation and erosion. A berm should be placed around the stockpile to prevent run-off. – Contaminated soil will be tested, classified, and sent to a facility licensed to receive the waste and transported under appropriate manifest.
Contaminated Water	<ol style="list-style-type: none"> 4. Water that infiltrates an open excavation with suspect contaminated soil should be treated as contaminated. Water should be collected and analyzed to determine the quality. Contaminated water can be treated and discharge under a Waste Discharge Authorization or can be disposed of off-site at a licensed facility.

The primary expected excavation areas include:

- The canola oil tank foundations and retaining walls
 - limited surficial excavation for foundation preparation within existing imported silty sand soils;
 - the dimensions of the tank foundation are approximately 180 m x 70 m
- The rail unloading area
 - limited surficial excavation for foundation preparation within existing imported silty sand soils;
 - the dimensions of the rail unloading track area is approximate 240 m x 10 m



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- Underground trenchless crossing for canola oil conveyance corridor through yard 10
 - Underground utility trenches will typically be less than 1.2 m deep within existing imported silty sand soils and above the existing ground water level which ranged between 1.2- and 1.5-meters depth. Water that enters the surface-exposed areas of utility trenches will be collected through a local pump system. Ground water if encountered will be tested, and treated as required prior to discharge in accordance with Table 13 and Table 14.
 - the dimensions of the trenchless crossing are anticipated to be 450 m x 1 m x 1.5 m
- Trenchless crossing of Timberland Road and existing rail
 - The launch and receiving pits for the trenchless crossing are anticipated to be up to 3 meters deep within existing imported silty sand soils and are expected to require a well point dewatering system. Groundwater will be sampled in advance of any disposal and collected groundwater will be tested, and treated as required prior to discharge in accordance with Table 13 and Table 14.

The volumes of groundwater to be managed are expected to be minimal except for the trenchless crossing. Detailed design of the anticipated groundwater volumes and treatment requirements will be the responsibility of the Contractor to ensure that the design takes into account the Contractors selected means and methods and will be subject to Contractor submission and DP World’s engineer’s review prior to implementation.

No groundwater monitoring wells are planned to be advanced as part of the preliminary and planning works given the large quantity of historical information available from past project investigation. Any groundwater monitoring wells implemented by the Contractor will be required to meet all applicable standards and will be subject to Contractor submission and our engineer’s review prior to implementation.

5.12 HYDROSTATIC TESTING

During construction, the canola oil piping systems will require hydrostatic testing to commission the facility. Water will be withdrawn from the terminal’s water supply and discharged into the terminal’s storm sewer. In order to avoid or minimize the potential impacts associated with hydrostatic testing, the following mitigation measures will be implemented.

Table 15 Hydrostatic Testing Mitigation Measures

Category	Mitigation Measures
General Measures	<ol style="list-style-type: none"> 1. Hydrostatic testing should be conducted in accordance with any applicable permit or approval requirements 2. Retain records of all hydrostatic testing activities, including water withdrawal and discharge location, rates and volumes and sample results. 3. A sufficient number of workers and equipment should be available on-site during hydrostatic testing to repair any leak or erosion that may arise.
Sampling	<ol style="list-style-type: none"> 4. Conduct appropriate testing, treatment, and de-chlorination of discharge water to comply with the CCME water quality guidelines, and the CCME water quality guidelines (CCME 2023) for reactive chlorine species (CCME 2019)
Discharge	<ol style="list-style-type: none"> 5. Discharge locations should be approved by a QEP prior to discharge.



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Table 15 Hydrostatic Testing Mitigation Measures

Category	Mitigation Measures
	6. Monitor discharge location for erosion and flooring. If conditions deteriorate, suspend dewatering and move to another approved discharge location.

5.13 SPILL PREVENTION AND RESPONSE

5.13.1 Emergency Response

A comprehensive Emergency Response Plan allows for the rapid response of emergency services and/or containment and clean-up of environmental emergencies. The following section provides an outline of the Emergency Response Plan for the Project. In addition to the EM, the Environment Manager and DP World Representative (see Table 2) will be notified of the need for a response. DP World personnel will report spills to external agencies as defined by permits and relevant legislation

Efficient and concise communication reduces potential risk to crews, the public, property, and the environment in emergencies. In case of a release of dangerous goods (as defined by the BC Spill Reporting Regulation) to water or to land that is over the volume for the listed schedule of BC Spill Reporting Regulations, the VFPA will be contacted in addition to EMBC. Phone numbers of relevant emergency contacts are listed in Table 16.

Table 16 Emergency Contacts

Authority/Company Name	Phone Number
Emergency services	911
Senior Manager Infrastructure (Hamish Fairweather)	604-803-5678
Project Coordinator (Bill Kalmakoff)	604-612-4487
Port of Vancouver Operations Centre	604-665-9086
Surrey non-emergency police (Surrey RCMP City Centre)	604-599-0502
Surrey non-emergency fire (Surrey Fire Service Hall 2)	604-543-6700
Canadian Coast Guard	604-666-6011
Emergency Management BC (EMBC)	1-800-663-3456
Surrey Memorial Hospital (Surrey)	604-581-2211
WorkSafe BC	604-276-6100



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5.13.2 Fuel Management

Mitigation measures for fuel management will be implemented to adequately protect the environment from the potential release of construction-related fuels and products at the Project site. The mitigation measures described in Table 17 will be implemented for the Project.

Table 17 Fuel Management Mitigation Measures

Category	Mitigation Measure
Spill Coordinator	<ol style="list-style-type: none"> 1. The Contractor will appoint a Spill Coordinator who has knowledge of spill mitigation, containment, and reporting procedures. 2. The Spill Coordinator will keep an inventory of hazardous materials on site.
Training	<ol style="list-style-type: none"> 3. The Contractor will provide on-site staff with training in the use of hazardous materials and the location and use of spill kits and containment booms. 4. The Contractor will confirm on-site personnel know the location of spill kits, containment berms, and other spill control materials and that they are readily accessible.
Fuel Handling Guide	<ol style="list-style-type: none"> 5. Fuel handling, storage, and labelling procedures shall be consistent with <i>A Field Guide to Fuel Handling, Transportation and Storage</i> (MWLAP 2002).
Fuel	<ol style="list-style-type: none"> 6. Where possible, fuel storage and equipment or machinery refueling, and servicing will occur a minimum of 30 m from the Fraser River. Where operational constraints require fuel storage, equipment or machinery re-fueling and servicing within 30 m of or on the water (e.g., on a barge/vessel), measures to prevent the release or spill of hazardous materials will be discussed with VFPA and approved by the EM. Refueling procedures specific to marine based equipment use will be provided by the Contractor or subcontractor(s) as part of in-water works and site-specific environmental protection plans. 7. Storage of fuels and petroleum products will comply with safe operating procedures, including containment facilities in case of a spill. 8. Portable fuel tanks and small equipment (e.g., jerry cans) will be stored within leak-proof secondary containment with absorbent pads with a capacity of 110% of its volume. 9. Fuel storage, including secondary containment, shall be kept free and clear of collected rainwater and snowfall. Accumulated water in the containment shall be removed regularly to not to diminish the capacity of the containment. 10. While refueling, the operator will stay with the fuel nozzle. 11. Vehicles and equipment will be shut off while refueling. 12. Smoking will not be allowed during refueling
Environmentally Sensitive Oil	<ol style="list-style-type: none"> 13. Where possible, environmentally sensitive (e.g., biodegradable/food-grade/ environmentally friendly) oils, hydraulic fluids, and lubricants that are non-toxic to aquatic life and that are readily or inherently biodegradable will be used in equipment and machines.

5.13.3 Spill Response Plan

In the event of a spill, the response and reporting steps presented in Table 18 that apply to the release will be implemented.



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Table 18 Spill Response and Reporting Mitigation Measures

Category	Mitigation Measure
Spill Response Materials	<ol style="list-style-type: none"> 1. Spill response materials are required to be readily available when working on the Project. These materials include, but are not limited to: <ol style="list-style-type: none"> a. Spill kits b. Containment booms c. Personal protective equipment (e.g., nitrile gloves, safety glasses, suits) d. Fire extinguishers e. Shovels 2. The Contractor will supply an appropriate number of spill kits on site. The suggested contents of a spill kit working on or near water is as follows: <ol style="list-style-type: none"> a. 100 sorbent pads (oil, gas, and diesel) b. 100 universal sorbent pads suitable for water-based fluids (e.g., coolant) c. 25 kilograms of dry oil sorbent d. 4 x 4' (~1.2 m) sorbent linkable socks (oil, gas, and diesel) e. 4 x 4' (~1.2 m) universal sorbent linkable socks (e.g., coolant) f. 4 x 10' (3 m) sorbent linkable floating booms g. 1 roll of 25 x 4 m polyethylene sheeting (for underlay) h. 10 heavy-duty plastic garbage bags i. Personal protective gear as needed 3. In addition to the spill kits on site, each piece of mobile equipment (e.g., cranes, concrete trucks) are also to have a spill kit. The suggested contents of the spill kit are as follows: <ol style="list-style-type: none"> a. Round-nose shovel or equivalent b. 2 x 4' (~1.2 m) sorbent sock/roll c. 20 sorbent pads (oil, gas, and diesel) d. Heavy-duty plastic garbage bags e. Personal protective gear as needed 4. Spill kits will be inspected on a regular basis and refilled immediately after use and prior to continuation of work
Backup supplies	<ol style="list-style-type: none"> 5. The Contractor will have adequate spill response supplies to maintain their spill kits
Response	<ol style="list-style-type: none"> 6. The initial response to the spill may include the following: <ol style="list-style-type: none"> a. Stop work b. Maintain your own safety and the safety of others c. Wear personal protective equipment, such as nitrile gloves and safety glasses d. Identify the spilled materials and refer to the material data safety sheet to determine if human health or ignition hazards exist e. If possible and safe to do so, contain the spill by any safe means possible (e.g., plug leak, close/isolate leaking valve) f. Obtain assistance of others g. Begin containment of the spill and stop it from spreading h. Clean up the spilled substance using available supplies from the on-site spill kits i. If the spill is to water, use measures such as installing sorbent rolls as floating booms to contain the spill and sorbent pads to soak up the material j. Report the spill to Environmental Monitoring personnel, who will notify the VFPA k. DP World and the EM will determine if notification to regulatory agencies is required



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Table 18 Spill Response and Reporting Mitigation Measures

Category	Mitigation Measure
Reporting	7. The EM is responsible for notifying DP World of all hazardous spills and to work with DP World to confirm that the spill reporting meets provincial and federal requirements. 8. The Spill Reporting Regulation under the British Columbia <i>Environmental Management Act</i> identifies externally reportable quantities for certain substances.
Environmental Incident/Non-Compliance Report	9. The EM will prepare an Environmental Incident/Non-Compliance Report in the event of a spill 10. The following information will be collected as it may be required when reporting a spill to regulatory agencies to support the Environmental Incident/Non-Compliance Report: <ul style="list-style-type: none"> a. Reporting person's name and telephone number b. Name and phone number of the owner of the product that spilled or leaked c. Name and phone number of the person who caused the spill or leak d. Date and time of the spill or leak e. Description of the spill or leak f. Location of the spill or leak g. Receiving environment description h. Type of material spilled and quantity i. Source of spill or leak j. If the spill or leaked product is contained, and if not, where is it flowing k. Description of the response and when it occurred l. Percent of material recovered m. Details of further action required n. Recommendations for preventative/mitigation measures o. Names of other persons or agencies advised concerning the spill or leak

5.13.4 Canola Oil Spill Prevention and Response Plan

The project includes three large canola oil storage tanks (37 m diameter by 18 m high). The tanks will be surrounded by a single water-tight containment wall. A spill of canola oil on land that is not easily contained has the potential to flow into waterbodies, where it is much more difficult to contain and clean up (SNC Lavalin, 2012). Table 19 describes spill prevention and response procedures to be implemented by the Project.



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Table 19 Canola Oil Spill Prevention and Response Plan

Category	Mitigation Measure
General	<ol style="list-style-type: none"> 1. The Site should be well maintained, clean and tidy. 2. Proper spill equipment and materials, including PPE are to be on hand and clearly labelled. 3. An inspection and/or testing program must be implemented for all above ground bulk storage containers and piping at the facility. Records of the inspections and testing must be kept on Site. 4. Equipment used for storing, transferring, and transporting canola oil must have secondary containment and comply with all regulatory requirements including CCME PN 1326, NFPA 30, and API Standard 2610. 5. Secondary containment must be at least 110% the full capacity of the canola oil vessel (e.g. tank car, storage tank) with ability to manage and treat storm water if it is not covered.
Training	<ol style="list-style-type: none"> 6. Operating procedures will be developed to address activities such as emergency shutdown and storage, receiving and loading of canola oil. 7. Spill prevention and response training must be provided for all individuals involved in the handling, transportation, and storage of canola oil.
Spill Prevention	<ol style="list-style-type: none"> 8. Transfer areas should have berms sloped away from waterbodies and terminal drainage. 9. Spills must be prevented from entering waterways, storm drains and ditches through secondary containment at all canola oil storage and transfer areas. 10. Secondary containments, including dikes, berms, or retaining walls, must be able to contain the capacity of the largest container plus rainfall or other precipitation. 11. Impact prevention or a containment wall should be installed to protect filled canola oil tanks from vehicle collision or damage. 12. Sorbent pads, particulate, containment booms, and socks (spill kits) must be located at all pumps and canola oil storage and transfer areas as part of an on-site spill response capability. 13. Sump pumps must be available and operational to direct storm water away from shore and back to oil-water separators at the terminal 14. Scuppers on the loading platform will be closed prior to loading.
Spill Response	<ol style="list-style-type: none"> 15. Inside of secondary containment: <ol style="list-style-type: none"> a. Take all reasonable steps to contain the canola oil and prevent further migration b. Recover and remove the product c. Remove canola oil from the leaking components and repair the damaged component d. Measure the extent of the leak or spill e. Verify and document the event, including repairs and replacement. 16. On land: <ol style="list-style-type: none"> a. Build a barrier to prevent the oil from entering waterway or sewer. For large releases, a pump or vacuum truck could be used. b. Remove oily residue from the surface where the spill occurred using detergent. c. Store spill cleanup materials in drums that are sealed and properly labelled. Dispose of spent material in compliance with Provincial and Municipal Authorities.



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Table 19 Canola Oil Spill Prevention and Response Plan

Category	Mitigation Measure
Planning for Canola Oil Operations	<p>17. The Contractor will develop a spill preparedness and response plan to manage filling of canola oil Handymax vessels on water. This plan will be prepared prior to the completion of construction and include:</p> <ul style="list-style-type: none">a. Approach for primary and secondary containment on water during fillingb. Sensitive wildlife and shoreline features that require planning and protectionc. Approach for recovery of canola oild. Training, notification, and reporting of canola oil spills to watere. Coordination of canola oil spill response with Western Canada Marine Response Corporation (WCMRC), DP World, and the VFPA.



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6.0 MONITORING REQUIREMENTS

Environmental monitoring will be required during construction and may also be required by project conditions for post-construction monitoring (e.g., for establishment of vegetation). The CEMP will be updated with monitoring plans or environmental protection plans and follow-up reporting requirements in accordance with Project conditions.

6.1 ENVIRONMENTAL MONITORING

Environmental Monitoring will be a key component of the environmental management during construction activities. A QEP will be onsite full-time during in-water construction activities. Plans for fish presence monitoring and an underwater noise and marine mammal monitoring program for the in-water works are included below. The EM will have authority to issue a Stop Work order where activities are adversely affecting, or will adversely affect, the environment or archaeological resources. The EM will also make recommendations in the field for avoiding and mitigating effects.

Monitoring requirements include:

- Fish presence monitoring
- Underwater Noise and Marine Mammal Monitoring Program
- Water quality monitoring
- BMP monitoring including for erosion and sediment control and to protect water quality

6.1.1 Fish Presence monitoring

Fish species and fish habitats that exist within the Fraser River and have the potential to overlap with Project activities. A QEP will be onsite during piling and in-water works or activities to monitor the presence of fish. The approximate distance away from Berth 10 will be determined by preconstruction surveys and refined through an active fish presence monitoring protocol.

Daily observations of Project work activities will be conducted by the QEP and provided in monitoring reports as required by permit conditions. Reporting for the presence of fish species will be relayed to the construction team in the morning of each daytime shift and will be refined with ongoing information as warranted related to Project work activities.

A Fish and Acoustic Monitoring Program will be implemented prior to pile installation. The plan, outlined in Section 6.1.3, will utilize the following mitigation measures to be used during pile driving activity:

- Minimization of multiple underwater noise generating activities.
- Use of vibratory pile driving instead of hammer impact, where possible.



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- A ramp-up or soft-start technique to be used with operation of hammer impact to give adequate time for aquatic life to leave the vicinity.
- Use of a double (inner and outer) bubble curtain during impact pile driving activity. Bubble curtains can reduce sound pressure levels, sound exposure levels (SELs) and pressure waves, reducing the radius around the source within which injury from underwater noise occurs.

Fish presence monitoring will use side-scan sonar and a hydroacoustic echosounder. Should the presence of fish be confirmed within the exclusion zone around the construction site, this will be communicated to the Contractor and the EM to discuss pile driving timing, construction stop and start, and review of bubble curtain implementation and pile driving ramp-up procedures.

6.1.2 Underwater Noise and Marine Mammal Monitoring Program

Underwater construction activities will include use of impact and vibratory hammer construction methods for steel pile installation. A Marine Mammal and Underwater Noise Monitoring and Mitigation Plan (Appendix A) has been developed which describes the following:

- Marine mammals that may be present in the lower Fraser River
- Marine mammal exclusion zone development
- Sound pressure thresholds relevant to behavioural disruption of marine mammals
- Monitoring procedures

It is anticipated that diversity and abundance of marine mammals in the Fraser River are generally low, although marine mammals may transit the area if food sources are present. Harbour seals are the most abundant and frequently sighted species and have been observed year-round near the Project area.

6.1.3 Acoustic Monitoring

Acoustic monitoring by hydrophone is required for pile driving as described in the Sections 6.1.3.1.

6.1.3.1 Fish Acoustic Monitoring

The Fish and Acoustic Monitoring Program recommends the following regarding acoustic monitoring:

- Underwater acoustic noise monitoring using Lucy Software, or equivalent, and hydrophone during the start-up of impact pile driving and during pile installation.
- Underwater noise levels shall be measured at 10 m from the pile.
 - Where there is > 5 m depth within the water column, hydrophones will be placed at river bottom and mid-water column.
 - Where there is < 5 m depth within the water column, a hydrophone will be placed at least 70-80% below the water surface.



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- The EM will communicate with the Contractor regarding observed sound levels to adapt mitigation measures and implement additional mitigation measures, should noise levels exceed prescribed thresholds.

Table 20 describes generally recommended sound exposure thresholds considered protective of fish for peak underwater noise and the appropriate response should these levels be exceeded.

Table 20 Fish Acoustic Monitoring Noise Thresholds

Noise Measurement	Noise Threshold	Measured Location	Exceedance Response
Single strike	206 dB re: 1 μ Pa	10 m from bubble curtain or sound barrier mitigation	<ul style="list-style-type: none"> • Pile driving to cease • Mitigation measures to be evaluated for effectiveness and additional measures will be considered • Work will resume when the QEP determines that mitigation measures have been sufficiently adjusted to ensure noise threshold levels are not exceeded

6.1.3.2 Marine Mammal Acoustic Monitoring

Underwater acoustic noise monitoring will be conducted during pile installation to refine the extents of the MMEZ(s) and to enact measures to avoid and limit effects to marine mammals from pile driving. The MMEZ will be developed based on in-situ underwater sound measured during the first day of pile installation and specific to noise thresholds specified within permits and as described in Table 21.

Table 21 Marine Mammal Acoustic Monitoring Noise Thresholds

Marine Mammal	Noise Threshold	Exclusion Zone Required
Cetacean	160 dB re 1 μ Pa	To be measured within the field during impact pile driving
Pinniped	None specified	75 m

To establish the exclusion zone for cetaceans, the EM should take acoustic measurements at 50 m intervals from the noise source at mid-depth (3–5 m below water level). These measurements will be used to determine the distance from the sound source at which sound levels dissipate below the disturbance threshold. This would be re-evaluated during any change in activity (e.g., change in pile type or equipment type). Marine Mammals observed outside of the Fraser River training berm are assumed to be sufficiently protected from underwater noise generated by the Project.

Once the exclusion zone has been established, underwater noise monitoring will be conducted or overseen by the EM continuously at the noise source (i.e., 10 m from the pile being driven) to record peaks of underwater noise arising from the activity.



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The EM will be stationed in such a manner that they can survey the full extent of the exclusion zone with the zone centered on the underwater sound source. Positioning of the monitor will vary depending on the location of piling, positioning of the work barge, and the final size of the exclusion zone. The exclusion zone will be monitored for 30 minutes prior to the start of marine piling, including restart of piling following a shutdown lasting greater than 30 minutes, to verify that no marine mammals are present within the exclusion zone. If any marine mammals enter this zone work will immediately cease until the marine mammal(s) have left the exclusion zone or have not been re-sighted for 30 minutes. If environmental conditions prevent visual survey of the entire exclusion zone (i.e., fog, heavy rain, snow, darkness) work will cease until visibility improves.

6.1.4 Water Quality Monitoring

Water quality monitoring must be undertaken during the following construction activities:

- Impact and vibratory pile driving
- Vegetation clearing
- Upland excavation or grading exposing fill soils
- Cementitious activities

Water quality parameters to be measured include pH and NTU and compared to CCME Water Quality Guidelines for the Protection of Aquatic Life (Freshwater). A summary for each of these parameters is provided in Table 22 below.

Table 22 Canadian Council of Ministers of the Environment Water Quality Guidelines for the Protection of Aquatic Life (Freshwater) for Turbidity (NTU) and pH

Parameters	Guidelines	Relevant Construction Activity
NTU	<p>For clear flow: Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from background levels for a longer-term exposure (e.g., 30-d period).</p> <p>For high flows or turbid waters: Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs and not increase more than 10% of background levels when background is > 80 NTUs.</p>	<ul style="list-style-type: none"> • Pile driving • Pile dewatering • Vegetation clearing • Upland excavation or grading
pH	6.5–9.0	<ul style="list-style-type: none"> • Cementitious activities (i.e., concrete pouring)

SOURCE: CCME 2023. <https://ccme.ca/en/summary-table>



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Salinity within the Project area is anticipated to be low (< 0.1 Parts Per Thousand [PPT]); however, in the unlikely event that the EM records elevated salinity during water quality measurements (i.e., >10.0 PPT), they should, at their discretion, utilize pH parameters for marine aquatic life (i.e., 7.0 to 9.0 pH). The EM shall use a YSI ProDSS to confirm salinity and depth, and to confirm pH and turbidity.

Table 23 provides a strategy for water quality sampling including frequency, location of measurement, and parameters.

Table 23 Recommended Water Quality Monitoring Strategy

Construction Activity	Parameters ¹	Location	Frequency
Pile driving	NTU	Within 10 m upstream and downstream of source, and mid-way and toward the bottom of the riverbed where depth allows.	One measurement prior to pile driving commencement, additional sample during pile driving and/or should conditions change
Use of cementitious materials	NTU, pH	Within 10 m upstream and downstream of source, and within upper section of the water column	One measurement prior to cementitious activity commencement, additional sample during concrete activity and/or should conditions change
Upland construction	NTU	At the outflow of the surface drainage or water treatment location and upstream and downstream of the stormwater outfall located at berth 10	One measurement prior to upland construction and additional sample during construction and/or should conditions change
NOTE: 1. Field parameters measured using a calibrated YSI Pro Digital or equivalent field-based meter.			

6.1.5 Vegetation Monitoring

Erosion and sediment control monitoring will occur during construction to confirm that these measures are preventing sediment and erosion from affecting vegetation resources adjacent to the Project footprint and temporary workspaces.

Temporary Project workspaces that are not paved will be monitored at the beginning of, during, and after their use, for the presence of invasive plants and noxious weeds and where revegetation has been implemented.

Temporary workspaces that were seeded and/or revegetated will be monitored for growth of species and to monitor vegetation recovery in these areas.



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7.0 MONITORING REPORTS

Environmental reporting is an integral part of the environmental monitoring process. Monitoring and reporting will be used to facilitate the transfer of information between the Contractor, the Environmental Manager, the EM, and regulatory agencies as required. Table 23 below describes the reporting requirements, report content, reporting method, frequency of reports and report distribution. Table 24 provides guidance regarding incident reporting. Additional reports may include topic-specific reports (e.g., spill, waste management and environmental summary at end of the Project). DP World will be responsible for distribution of external reports to regulators.



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Table 24 Monitoring Reports

Reporting Requirements	Report Content	Reporting Method	Reporting Frequency	Responsible Person(s)	Report Distribution
Daily data reports	Includes four daily data reports: <ul style="list-style-type: none"> • Environmental Compliance Monitoring • Underwater acoustic monitoring (during in-water works) • Marine mammal monitoring (during in-water works) • Water quality monitoring 	Electronic submission via Daily Summary Reports	Daily	Environmental Monitor	Project Team (see Table 2)
Daily summary reports	Description of: <ul style="list-style-type: none"> • Construction activities • Communications on Site • Monitoring activities • Recommended follow-up • Additional observations 	Email summary	Daily	Environmental Monitor	Project Team (see Table 2)
Monthly summary reports	Includes description and summary of: <ul style="list-style-type: none"> • Construction activities • Mitigations used, best practices, non-compliances, and incident reporting • Summary presentation of data • Incident reporting if any • Recommendations and action plan • Photo log 	Electronic submission	Month following the previous reporting month	Environmental Monitor	Project Team (see Table 2) and VFPA



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Table 24 Monitoring Reports

Reporting Requirements	Report Content	Reporting Method	Reporting Frequency	Responsible Person(s)	Report Distribution
Environmental incident and corrective action reports	Includes description of: <ul style="list-style-type: none"> • Approximate volume and fluid type • Incident location • Associated construction activity including type of equipment used • Cause of spill • Spill contained • Follow-up and/or lessons learned 	Initial email notification and follow-up with written submission	Initial email notification within 4 hours of incident. Written submission within 48 hours of incident	Environmental Monitor	Project Team (see Table 2) and VFPA



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Table 25 Incident Reports

Reporting Requirements	Incident Scenario	Reporting Method	Reporting Frequency	Report Distribution	External Distribution
Environmental Incident	Spill to Water	Initial verbal notification	Within 4 hours of spill	Emergency Management BC (EMBC)	EMBC may notify other stakeholders (coastguard, DFO), as required
		Email notification	Within 4 hours of spill	Project Team	VFPA
		Written submission	Initial first draft within 48 hours	Project Team	VFPA
	Spill to Land (if unreportable spill)	Email notification	Within 4 hours of spill	Project Team	-
		Written submission	Initial first draft within 48 hours of spill	Project Team	-
	Injury or death to fish or marine mammal	Email notification	Within 4 hours of injury or fish kill	Project Team	VFPA, DFO
		Written submission	Initial first draft within 48 hours of spill	Project Team	VFPA, DFO
	Injury or death of wildlife (including birds, raptors)	Email notification	Within 4 hours of injury or fish kill	Project Team	VFPA
		Written submission	Initial first draft within 48 hours of spill	Project Team	VFPA
	Destruction of occupied nest	Email notification	Within 4 hours of injury or fish kill	Project Team	VFPA
Written submission		Initial first draft within 48 hours of spill	Project Team	VFPA	
End of Spill Report	Reportable spill to water or land	Written update and electronic submission using update to Minister/End-of-Spill Report Form	Within 30 days of initial spill	Project Team	Ministry of Environment and Climate Change Strategy (MOECCS) by submission of report to spillreports@gov.bc.ca



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8.0 CLOSURE

This CEMP has been created to assist with the protection of valued ecological features within and adjacent to the Project site during construction, and to comply with project environmental review permit conditions and approvals and legislative requirements and regulations. The CEMP may be updated as Project conditions, execution plans, and schedules are implemented or revised. The CEMP will also be reviewed as required to address updates or potential changes in the Project and permit conditions prior to mobilization of the Contractor and throughout construction of the Project.



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