

# **Maplewood Marine Restoration Project**

## ***Construction Environmental Management Plan***

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**List of Abbreviations and Acronyms**

Abbreviation or Acronym	Definition
BMP	Best Management Practice
CD	Chart Datum
CEMP	Construction Environmental Management Plan
CEP	Centerm Expansion Project
CRA	Commercial, Recreational or Aboriginal
D <sub>50</sub>	Average (Median) Diameter
EM	Environmental Monitor
EPP	Environmental Protection Plan
HEP	Habitat Enhancement Program
IM	Independent Monitor
MBCA	Migratory Birds Convention Act
MMRP	Maplewood Marine Restoration Project
PER	Project and Environmental Review
Project	Maplewood Marine Restoration Project
QEP	Qualified Environmental Professional
VFPA	Vancouver Fraser Port Authority
VHF	Very High Frequency

## 1.0 INTRODUCTION

The Maplewood Marine Restoration Project (MMRP, or “Project”) is a habitat enhancement project proposed by the Vancouver Fraser Port Authority (VFPA) Habitat Enhancement Program (HEP). HEP is a VFPA program whose goal is to balance a healthy environment with infrastructure development opportunities. HEP creates and enhances fish and wildlife habitat for habitat banking purposes, use as offsetting for port infrastructure projects, or a combination of both. MMRP is a proposed HEP project anticipated to enhance approximately seven hectares of low-value marine habitat into higher-value marine habitat for fish, birds, and other wildlife. Proposed habitat enhancements include creation of a tidal channel, subtidal rock reef habitat, eelgrass habitat, and intertidal flat habitat.

The following Construction Environmental Management Plan (CEMP) was developed with reference to VFPA’s *Project and Environmental Review Guidelines – Construction Environmental Management Plan* (PMV 2015). This CEMP, prepared by Qualified Environmental Professionals (QEPs), describes how the Project will be managed during construction to avoid adverse impacts to the environment. This CEMP is based on the design and Project details outlined in the 60% Design Report (AECOM 2018).

Once the Project is awarded, the selected Contractor will be responsible for developing a Project-specific Environmental Protection Plan (EPP) to avoid potential adverse environmental impacts based on specific equipment and refined construction methodologies. The Contractor’s EPP will be reviewed by VFPA’s HEP and will be provided to VFPA’s Project and Environmental Review (PER) team to confirm that it conforms to the requirements of this CEMP and any conditions of regulatory approvals/permits. Throughout construction, the Contractor will ensure that all Project construction activities adhere to this CEMP and the Contractor’s EPP, in addition to applicable regulatory requirements.

## 2.0 PROJECT INFORMATION

### 2.1 LOCATION

The Project lies within VFPA jurisdiction on the north shore of Burrard Inlet, approximately two kilometres east of the Ironworkers Memorial Bridge. The Project is immediately south of a wildlife conservation area (the Maplewood Flats Conservation Area), which is leased to Environment and Climate Change Canada and is managed by the Wild Bird Trust of British Columbia Figure 1.

The Project site covers approximately seven hectares and consists of two distinct areas: The Northeast Basin, centered at approximately 49°18’10” N and 123°00’05” W; and, the Southwest Channel area (located in the Southern Intertidal Area), centered at approximately 49°17’55” N and 123°00’25” W (Figure 1).



Figure 1    Project Site Location and Layout

## 2.2 PROJECT DESCRIPTION

Habitat in the Northeast Basin will be created by beneficially using approximately 87,000 m<sup>3</sup> of dredge material from the Southern Intertidal Area (resulting from the creation of the proposed Southwest Channel), and approximately 95,000 m<sup>3</sup> of imported clean fill material, to raise the elevation of the existing substrate. Fraser River sand, or a suitable clean alternate (e.g., approved Sechelt sand), is proposed as the additional fill material. This imported material is anticipated to be placed over the dredge material from the Southwest Channel to form the upper sediment layer in the Northeast Basin.

The newly created intertidal flat habitat and shallow subtidal eelgrass habitat in the Northeast Basin will be located between approximately +2.0 m and -2.0 m chart datum (CD). Construction of a rock dyke is required to contain the fill material needed to establish the intertidal and shallow subtidal areas in the Northeast Basin. Subtidal rock reef habitat south of the rock dyke, at the southernmost end of the Northeast Basin, will be constructed by placing appropriately sized rock material between approximately -3.0 m and -4.0 m CD. The rock reef habitat will be constructed using rock of varying diameter, with an average (median) diameter (D<sub>50</sub>) of approximately 600 mm. A total of approximately 8,500 m<sup>3</sup> of rock material is anticipated to be placed in the Northeast Basin.

Rock reef habitat will also be created in the Southern Intertidal Area following dredging of the Southwest Channel. The Southwest Channel will improve tidal flushing in the Maplewood Basin and enhance nutrient transport, improve water quality, reduce siltation of marine vegetation, and facilitate suspension and distribution of eggs and larvae of pelagic spawning fish and invertebrates, including marine vegetation spores. A total of approximately 14,000 m<sup>3</sup> of rock material will be placed in the Southwest Channel, both along the base of the channel to function as subtidal rock reef habitat, and along the side slopes of the excavated Southwest Channel to protect against scour from tidal currents as well as to function as rock reef habitat. The rocks along the side slopes will have a D<sub>50</sub> of approximately 500 mm, and the rocks on the base of the channel will have a D<sub>50</sub> of approximately 600 mm. The rock in the Southwest Channel will be placed between approximately +2.0 m and -4.0 m CD.

Barge-mounted construction equipment will be required to cross over the shallow Southern Intertidal Area during a high tide before the start of dredging. It is anticipated that the Southwest Channel will be dredged using a barge-mounted clam-shell dredge. To facilitate placement of material from the Southwest Channel into the Northeast Basin, it is anticipated that dredging will start from the inner (i.e., northeastern) end of the channel to avoid transporting and potentially grounding loaded, or partially-loaded, scows on the shallow Southern Intertidal Area. Once the Southwest Channel is dredged to design grade (i.e., -4.0 m CD), it is anticipated that loaded material scows will be able to enter/exit the Project site during low tides (utilizing the Southwest Channel). Construction methodology details will be refined as the Project advances to a procurement-ready stage.

Following construction, stabilization, and a final survey of the eelgrass bed location, native common eelgrass (*Zostera marina*) will be transplanted from suitable donor beds into the Northeast Basin.

## 2.3 PROJECT SCHEDULE

Detailed design, permitting, and consultation and engagement will be undertaken throughout 2018 and 2019. Construction is anticipated to commence in mid- to late-2019. A preliminary proposed construction schedule (AECOM 2018) is provided in **Table 1**. A detailed schedule will be determined following procurement and Contractor selection.

**Table 1 Proposed Construction Schedule**

Task	Proposed Dates
Mobilization	Q3 2019
Southwest Channel Dredging and Rock Placement	Q3 2019 to Q1 2020
Fill Placement in Northeast Basin – Dredged Material	Q3 2019 to Q1 2020
Construction of Containment Dyke	Q3 2019 to Q1 2020
Subtidal Rock Reef Construction at Toe of Containment Dyke	Q3 2019 to Q1 2020
Fill Placement in Northeast Basin – Imported Fill	Q3 2019 to Q1 2020
Habitat Establishment (e.g., Eelgrass Transplantation)	Q1 2020 to Q4 2021

### 2.3.1 Timing Windows

The annual marine/estuarine timing window of least-risk for Burrard Inlet is August 16<sup>th</sup> to February 28<sup>th</sup>. This refers to the time period of reduced risk for important commercial, recreational or Aboriginal (CRA) fish species. The majority of the construction work is scheduled to occur during this least-risk timing window to mitigate risk of negative effects to juvenile salmonids. However, due to the potential material settlement time required for sediment placement in the Northeast Basin, material placement may extend beyond the end of the least-risk timing window (e.g., post-February 28<sup>th</sup>). Any work outside the window would occur with appropriate mitigation in place.

The federal *Migratory Birds Convention Act, 1994* (MBCA) exists to protect and conserve migratory birds—as populations and individual birds—and their nests. Under the MBCA, no person shall, without lawful excuse, be in possession of a migratory bird or nest, or, buy, sell, exchange or give a migratory bird or nest or make it the subject of a commercial transaction. This Act restricts the deposit of harmful substances in waters or areas frequented by migratory birds. As there is minimal anticipated overlap between birds covered under the MBCA and Project construction activities, either spatially (i.e., no construction activities proposed in the upland) or temporally (i.e., the majority of construction is proposed

outside the general nesting period of migratory birds<sup>1</sup> in the region: mid-March to mid-August), contravention of the MBCA is not anticipated.

However, the Project site is located adjacent to upland areas where there is potential to indirectly affect birds and their active nests (e.g., due to noise). Should construction activities overlap with the general nesting period of migratory birds in the region, extra precaution will be exercised to avoid causing harm to birds and/or their active nests and eggs.

## **2.4 SITE DESCRIPTION**

The Project site was historically an intertidal flat. Throughout the 1900s it was altered by activities associated with dredging, gravel extraction, logging operations, and industrial use, resulting in the development of the relatively deep Maplewood Basin (comprising the Northeast Basin and larger Main Basin), and an intertidal area to the south of the Maplewood Basin, where the Southwest Channel is proposed. Due to the depth, the lower portions of Northeast Basin (approximately -9.0 m CD) and Main Basin are subject to poor flushing. Biological surveys have shown that, generally, the Project site has relatively low habitat value with low diversity and abundance of marine life (Balanced 2017). The basins are dominated by fine sediments. There is also some wood debris accumulation present in the Northeast Basin from historic log handling operations.

A biophysical survey of the Project site was conducted in the fall of 2017 and consisted of both underwater dive surveys and land-based assessments. Additional information on the assessments and existing biological conditions is available in the Biophysical Survey (Balanced 2017) and the Ecological Conditions Report (Hemmera 2018a). Archaeological assessments of the Project site (including an Archaeological Overview Assessment and a Preliminary Field Reconnaissance) were undertaken in early 2018 (ILP 2018).

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<sup>1</sup> The general nesting period for migratory birds in Canada (Government of Canada 2017) covers most federally protected migratory bird species; raptor nesting windows are more varied, and are described in *Guidelines for Raptor Conservation During Urban and Rural Land Development in British Columbia* (MOE 2013).

### 3.0 CONTACT INFORMATION AND RESPONSIBILITIES

#### 3.1 KEY PROJECT PERSONNEL

The following table (**Table 2**) provides the contact information of some of the key Project personnel. As the Project has not yet been awarded, this list is preliminary only and will be updated in the Contractor's EPP following tender and award of the Project.

**Table 2 Project Contact List**

Name	Company	Role	Phone Number
Charlotte Olson	VFPA HEP	Project Manager	604-665-9590
Lisa McCuaig	VFPA PER	Regulator	604-665-9527
TBD	TBD	Construction Manager	TBD
TBD	TBD	Construction Foreman	TBD
TBD	TBD	Environmental Monitor	TBD
TBD	TBD	HEP Environmental Monitor (Independent Monitor)	TBD

#### 3.2 ENVIRONMENTAL MONITOR RESPONSIBILITIES

To ensure adherence to the environmental protection objectives and conditions of Project permits and the requirements of this CEMP and the Contractor's EPP, the Contractor will be required to retain a QEP in the role of the Project's Environmental Monitor (EM), who will work on behalf of the Contractor. The EM will need to be approved by VFPA's HEP prior to Project commencement to ensure they meet the qualifications as outlined in the Project procurement documents. The EM will be responsible for ensuring that mitigation measures are properly implemented by the Contractor and are functioning as intended. The EM may indicate that the mitigation measures be adapted if the need arises. Typical responsibilities of the EM include those identified below; however, specific items may be updated based on refinements to the construction methodology following selection of the Contractor and throughout construction.

- The EM will review the Contractor's work procedures to ensure functionality and compliance with this CEMP, the Contractor's EPP and applicable regulations, standards and best management practices (BMPs).
- The EM will communicate the requirements of Project permits, this CEMP and the Contractor's EPP to the Project construction team members during pre-job and tailgate meetings.
- An appropriate schedule for environmental monitoring will be established between the EM, Project Manager and regulatory agencies. The EM will be on-site as per the schedule established between parties prior to Project start. However, the monitoring frequency may be adapted depending on specific site conditions and work progress.

- Monitoring events will be undertaken throughout construction at an appropriate frequency based on the specific work tasks (e.g., dredging and fill placement), and potential for adverse effects to occur.
- Monitoring will be conducted with greater frequency during periods of inclement weather (e.g., heavy precipitation, and rough oceanic conditions).
- Full-time monitoring will be undertaken during start-up of any new phases of the Project and during installation of environmental protection measures (e.g., installation of a silt curtain).
- The EM will remain on-call during non-critical work periods to respond to emerging environmental issues.
- The EM will support and liaise directly with the Contractor to provide technical advice for the purpose of resolving situations that may affect the environment. The EM will advise the Contractor if construction activities have caused, or are likely to cause, an environmental incident and make recommendations for corrective action.
- The EM will have the authority to modify and/or halt any construction activity at any time if deemed necessary for the protection of the environment.
- The EM will maintain complete records of activities related to the implementation of the CEMP and Contractor's EPP. This will include any measurements taken (e.g., pH, turbidity, temperature, conductivity, etc.), photographs, analyses, and incident reports. The EM will document any potential adverse effects to the environment and will include the nature of the effect, its cause, mitigation and/or remediation measures implemented, and whether a work stoppage was ordered. This will be used by the EM to complete and submit environmental monitoring reports to the Contractor, which will subsequently be submitted to VFPA's HEP.

### **3.3 HEP ENVIRONMENTAL MONITOR RESPONSIBILITIES (INDEPENDENT MONITOR)**

VFPA's HEP will also retain a QEP in the role of the Project Independent Monitor (IM) to provide auditing level environmental services for the Project. The IM will be responsible for:

- Reviewing the Contractor's EM reports.
- Conducting periodic spot checks of the Project site to verify compliance with this CEMP, the Contractor's EPP and applicable regulations, standards and BMPs. If deemed necessary for the protection of the environment, the IM will have the authority to issue stop work orders.
- Submitting reports to VFPA's HEP.

### 3.4 APPLICANT/CONTRACTOR RESPONSIBILITIES

The Contractor will be responsible for ensuring that the Project is undertaken in accordance with the conditions of the permits/approvals, this CEMP and the Contractor's EPP as well as any applicable federal, provincial and municipal regulations. The environmental responsibilities of the Contractor are identified below; however, specific items may be updated based on refinements to the construction methodology following selection of the Contractor and throughout construction.

- The Contractor will review conditions of the CEMP and their EPP with their field staff and sub-contractors prior to commencing work. The Contractor will be responsible for ensuring that their field staff and sub-contractors understand the BMPs for this Project and know how to properly install protection measures.
- The Contractor will comply with written or verbal instructions from the EM with respect to conducting activities in compliance with the mitigation measures outlined in this CEMP and Contractor's EPP, and per applicable regulations, standards and permits.
- The Contractor will correct deficiencies and any non-compliance issues upon direction from the EM whether written or verbal. Corrections should be made as soon as reasonably possible, ideally within 24 hours.

### 3.5 RELEVANT ENVIRONMENTAL PERMITS

Environmental permits, documents and/or exemptions that are anticipated to apply to the Project are highlighted in **Table 3**. Note that obtaining other construction-related permits (e.g., scientific fish collection permits) will be the responsibility of the Contractor conducting the works and these have not been accounted for in **Table 3**.

**Table 3 Main Permits, Documents, and/or Exemptions and Approvals Anticipated**

Name	Agency	Comments
Category C Project and Environmental Review Permit	Vancouver Fraser Port Authority	This CEMP is included as part of a formal application submission to VFPA. Note: As the Project is within VFPA's jurisdiction, it is not anticipated that Transport Canada will play a role in the navigation permitting process.
Centerm Expansion Project (CEP) <i>Fisheries Act</i> Authorization	Fisheries and Oceans Canada	VFPA is proposing to use a portion of MMRP as a fisheries habitat offsetting site for the proposed CEP. Conditions of the CEP <i>Fisheries Act</i> Authorization may include requirements applicable to the construction of MMRP.
Disposal at Sea Exemption for Beneficial Use	Environment and Climate Change Canada	The Project will be reviewed by the Disposal at Sea Program due to placement of material within their jurisdiction.

## **4.0 MITIGATION MEASURES AND ENVIRONMENTAL SPECIFICATIONS**

The following section outlines environmental standards, guidelines and BMPs applicable to the Project. Additional mitigation measures may also be outlined in the VFPA PER permit or may be provided by other regulatory agencies. These will be incorporated into the Contractor's EPP developed for the Project.

### **4.1 GENERAL PRACTICES - MARINE WORKS**

Marine construction-related activities may take place from marine-based barges, derricks and scows. Potential negative effects to aquatic resources during construction-related activities will be mitigated by implementing appropriate measures as outlined below.

- The majority of the construction work is scheduled to occur during the Burrard Inlet least-risk timing window (i.e., August 16<sup>th</sup> to February 28<sup>th</sup>). Any work outside the window would occur with appropriate mitigation in place.
- During severe weather conditions (e.g., >70 km/h winds), work may be suspended if the effectiveness of mitigation measures is reduced (e.g., silt curtain application during dredging activity).
- Barges and other vessels will not ground on the foreshore or seabed, or otherwise disturb the foreshore or seabed (including disturbance as a result of vessel propeller wash), excepting only such disturbance as is reasonably required resulting from the use of barge spuds and anchors.

### **4.2 SITE ACCESS, MOBILIZATION AND LAYDOWN AREAS**

Prior to construction, the method by which the Contractor plans to access the Project site and mobilize construction-related equipment will be clearly described. Any challenges for site access or mobilization will be identified. It is currently anticipated that construction equipment will need to mobilize to access the Maplewood Basin during high tidal conditions at commencement of construction. However, additional information including a drawing/figure showing access points and anchoring areas at the Project site, is anticipated to be incorporated into the Contractor's EPP. Mobilization will be planned to minimize the number of trips to and from the Project site.

### **4.3 SEDIMENT CONTROL AND MANAGEMENT**

The Contractor will not permit sediment, sediment-laden waters, or other deleterious substances to enter the water during the Project. As described below, the Contractor will carry out all physical activities in a manner that prevents induced sedimentation and induced turbidity of local waters, and the release of sediment, sediment-laden waters, and turbid waters to the aquatic environment.

- Appropriate dredging equipment will be selected and operated in a manner that reduces spillage.

- The direct or indirect release or deposit of sediment or sediment-laden water into the aquatic environment outside the active work area (e.g., outside any silt curtains used for the Project), will be minimized during the works. In this regard, reference will be made to the water quality criteria described in the British Columbia Water Quality Guidelines (MOE 2018).
- Rock and fill materials (i.e., sand/silt) used for the Project will be demonstrated to be clean and free of environmental contamination.<sup>2</sup>
- The placement of rock and fill material will occur in a controlled manner to limit generation of suspended sediment and increased turbidity.
- While it is anticipated that dredged and placed sand will settle out of suspension relatively quickly due to the high settling velocity of sand and the relatively low velocity of waters at the Project site (AECOM 2018), it is anticipated that silt curtains will be used (e.g., Type III silt curtains that are designed to withstand current velocities of up to 1.5 m/s (AECOM 2018)). Silt curtains will be used, where technically feasible, to limit the release of turbid waters during dredging of the Southwest Channel and placement of fill in the Northeast Basin.

#### **4.4 MACHINERY AND EQUIPMENT**

For machinery and equipment working on the Project site, the Contractor will ensure that:

- All machines and equipment are in good operating condition and meet applicable requirements for serviceability and exhaust emissions. Equipment will be free of leaks, excess oil and grease.
- Equipment is cleaned off, and visually inspected for, invasive species and noxious weeds prior to arriving on, and leaving, the Project site.
- Daily inspections are undertaken for all equipment used on the job.
- Equipment used around water is equipped with biodegradable hydraulic fluid, as is practical.
- Equipment maintenance occurs off-site, where and when possible. If equipment maintenance is required on-site, activities will be undertaken overtop an impermeable layer.
- No equipment is washed within the Project area or near open water.
- Equipment is operated at optimum rated loads and is turned off when not in use to minimize exhaust and noise emissions. Equipment producing excessive exhaust or noise will be repaired or replaced.
- Refueling of equipment occurs in a contained area as far away from the water as possible. Funnels and drip trays will be used to control on-ground spillage of fuel. The refueling area will have a spill containment kit immediately accessible and personnel will be knowledgeable in the use of the kit.

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<sup>2</sup> Physical and chemical characterization of the potential Source Sites (Southwest Channel and Fraser River sands) and the Receiving Site (Northeast Basin) sediments was completed by Hemmera in 2018. The analyses indicated that sediment from the Source Sites is of better quality than the Receiving Site, and placement of material from the Source Sites is not likely to degrade the receiving environment since the concentrations of potential contaminants of concern appear to be less than the Receiving Site sediments (Hemmera 2018b).

#### **4.5 AIR QUALITY**

The Project will be undertaken from water by barge. Upland activities (e.g., excavation with potential to result in dust generation and/or track out of vehicles) are not anticipated. However, air emissions such as equipment exhaust and vapours associated with marine construction-related activities will be minimized and managed to avoid adverse health, safety, nuisance and other environmental effects on- and off-site. The following standard BMPs for air quality will be applied for machinery working on the Project site:

- All equipment, vehicles and stationary emission sources will be well-maintained and used at optimal loads to minimize emissions.
- Vehicles or equipment producing excessive exhaust will be repaired or replaced prior to being used on the Project.
- Once a diesel engine/generator has reached its operating temperature, the engine will not be left idling when no work is required.
- Stationary emission sources (e.g., portable diesel generators, compressors, etc.) will be used only as necessary and turned off when not in use.
- Equipment and vehicles will be turned off when not in active use.

#### **4.6 NOISE**

Work is anticipated to occur outside VFPA's standard regular working hours (i.e., Monday to Saturday between 7:00 am and 8:00 pm, excluding holidays). The affected surrounding community will be notified (as appropriate) of the nature and duration of noisy operations in advance of work taking place and/or when work is required outside regular working hours.

Noise generation and vibrations resulting from equipment and associated activities during construction will be addressed through appropriate noise management practices. The following BMPs will be implemented to minimize noise generation:

- All equipment will be properly maintained to limit noise emissions and fitted with functioning exhaust and muffler systems. Machine covers and equipment panels will be well-fitted and will remain in place to muffle noise. Bolts and fasteners will be tight to avoid rattling.
- Engines will be turned off when not in use.

#### **4.7 AQUATIC SPECIES AND HABITAT**

Aquatic species such as fish, marine mammals and marine invertebrates have potential to be encountered and/or affected by Project works.

- To minimize the risk of direct or indirect effects on fisheries species, the heavy construction work (dredging activities and placement of materials) will take place during the applicable annual least-

risk timing window (i.e., August 16<sup>th</sup> to February 28<sup>th</sup>), where possible. However, due to the potential material settlement time required for sediment placement in the Northeast Basin, material placement may extend beyond the end of the least-risk timing window (e.g., post-February 28<sup>th</sup>). Any work outside the window would occur with appropriate mitigation in place.

- In the Northeast Basin, a pre-construction dive survey will be conducted in advance of fill placement to inform the appropriate level of mitigation and salvage effort required (e.g., to assess the density of crabs in the fill area). An aquatic life salvage (e.g., for crabs with the use of perimeter crab traps) may subsequently be conducted in the Northeast Basin prior to the placement of rock and fill materials. Salvaged organisms will be relocated to similar habitat outside the Northeast Basin.
- In advance of dredging of the Southwest Channel a salvage of marine organisms will be undertaken either during a low tide and/or during high tide via divers. Salvaged marine organisms will be relocated to nearby appropriate habitats not affected by construction.
- Species to be targeted with salvage efforts in the Northeast Basin and Southwest Channel will be CRA invertebrate species that may be present within the Project area including, but not necessarily limited to, Dungeness crab (*Metacarcinus magister*), red rock crab (*Cancer productus*), California sea cucumber (*Parastichopus californicus*) and urchins (*Strongylocentrotus* spp.). Fin fish will not be targeted by the salvage as they are likely to move out of the work area as construction activities begin.
- Sensitive marine habitats (e.g., existing nearby kelp and eelgrass communities) will be appropriately marked (e.g., with buoys), georeferenced, and avoided during in-water works.
- Slow commencement of in-water construction activities is recommended to encourage mobile aquatic species to leave the construction area.
- Mitigation measures as outlined in the sections above (e.g., in relation to noise, sediment control and machinery/equipment) will be implemented to minimize negative effects to aquatic species and their habitat.
- Marine mammal safety zones will be established around the Project site, including a 1,000 m safety zone for cetaceans (whales, dolphins, and porpoises) and a 150 m safety zone for pinnipeds (seals and sea lions). If a marine mammal enters its respective safety zone during in-water construction activities, a work stoppage will be implemented if the marine mammal is at risk of physical harm or is observed to be disturbed by construction activities. Construction activities may only resume once the marine mammal has been confirmed to have left the safety zone or has not been sighted for 30 minutes. While it is not anticipated that construction activities will result in noise levels that exceed the acoustics thresholds of fish and marine mammals (i.e., no pile driving is proposed as part of the Project), if activities are anticipated to result in the generation of loud underwater noises, a marine mammal observer will be required to monitor the noisy work and implement an underwater noise monitoring program.

- Dependent on the specific construction methodology proposed, additional mitigation measures will be incorporated into the Contractor's EPP, as appropriate.

#### **4.8 TERRESTRIAL VEGETATION AND WILDLIFE MANAGEMENT**

Terrestrial vegetation is not anticipated to be affected as a result of the Project. In general, Project-related effects to local terrestrial wildlife surrounding the Project areas are anticipated to be minimal and are primarily limited to possible interactions with bird species that may use the Project area for foraging and/or the surrounding area for nesting purposes. As such, negative construction-related effects to terrestrial species will generally be limited to noise disturbance (see **Section 4.6**). To avoid attracting wildlife to the Project site, an effective garbage management system will be implemented during construction.

The majority of work is anticipated to occur during the fisheries least-risk timing window, outside of the general nesting bird window. However, should construction activities extend into the general nesting period of migratory birds in the region, extra precaution will be exercised to avoid causing harm to birds and/or their active nests and eggs.

A known osprey nest (protected under the BC *Wildlife Act* (s.34b)) is located on a piling approximately 130 m southeast of the Northeast Basin. Due to the sensitivity of the Project being located adjacent to a conservation area, it is recommended that a 100 m buffer plus 1.5 tree lengths (conservatively considered 20 m for this osprey nest on a marine pile) be implemented during Project construction as a best management practice. Land contouring, dredging, construction, or any other unusual or sudden loud activity will not be conducted within this 120 m buffer during the osprey breeding window (i.e., March 21 to September 5). This is in accordance with *Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia* (MOE 2013).

#### **4.9 ARCHAEOLOGICAL RESOURCES**

A recorded archaeological site (a fishweir) is situated in the existing intertidal flats immediately southeast of the Northeast Basin. To mitigate potential effects to this archaeological resource during habitat enhancement initiatives in the Northeast Basin, a 25 m buffer (archaeological site work avoidance zone) will be implemented around the archaeological site. Crews will be briefed on the location of this work avoidance zone (ILP 2018).

If the Contractor encounters, or expects to encounter an actual or potential archaeological resource during construction activities, they will implement a Chance Find Procedure in alignment with the following:

- Immediately stop any activities that might disturb the archaeological resource or the site in which it is contained.
- Not move or otherwise disturb the artifacts or other remains present at the site.
- Mark the location of the site to prevent additional disturbances.
- Immediately notify VFPA by email and phone.

#### **4.10 NAVIGATION**

To avoid conflict with other vessels and water users, the following BMPs will be implemented:

- Prior to the commencement of any vessel-related activities, the appropriate Canadian Coast Guard and Marine Communication and Traffic Services centre will be notified regarding the issuance of a Notice to Shipping to advise the marine community of potential hazards associated with the Project.
- At least two days prior to commencing any construction or physical activities, the Harbour Master and VFPA Environmental Programs will be notified.
- All vessels and equipment will be positioned in a manner that does not obstruct the line of sight to navigational aids or markers.
- All vessels will exhibit appropriate lights and day shapes at all times.
- The Contractor will monitor the Very High Frequency (VHF) channel used for Marine Communications and Traffic Services in the respective area at all times and participate as necessary.
- The Contractor will be familiar with vessel movements in areas affected by the Project.
- The Project activities will not impede navigation or interfere with vessel operations.
- During night hours, equipment will be moored outside the navigation channel and lit in accordance with all applicable regulations.

## 5.0 FUEL MANAGEMENT PLAN

The Contractor's EPP will identify areas for equipment re-fueling and show this on a site plan. The fuel management plan will provide a bulleted list of measures being incorporated during construction to ensure the receiving environment is adequately protected from construction-related fuels and products on the Project site. The following BMPs will be used for fuel management:

- Adequate spill containment materials will be within refueling areas at all time.
- Bulk fuel will not be stored within the Project area to prevent the possibility of leaks or contamination.
- Where feasible, pre-fueling of equipment will occur prior to arrival within the Project area to reduce the potential for spills and leaks.
- For refueling of skiffs and other mobile equipment, the following refueling procedures will be implemented:
  - Make sure the vessel is secure.
  - Measure the quantity that is required, to be able to anticipate when the tank is nearly full.
  - Never leave the area unattended while refueling.
- Where possible, one area will be designated for fuel transfer (e.g., a flat area that minimizes potential for fuel spills to enter the marine environment).
- Fuel, oil, chemicals and other hazardous materials will be placed in a lockable enclosure of sufficient volume to contain a spill.
- Refueling equipment and tanks will be clean and in good working order. Fuel tanks should be situated within appropriate secondary containment (an impermeable containment facility capable of holding 110% of the storage tank contents). This may be achieved through the use of double-walled storage tanks or sit-in containers constructed out of impermeable material, such as aluminum or plastic.
- If transferring fuel from a mobile tank to large machines, sorbent material will be placed around the fuel inlet prior to dispensing. Pumping equipment with an approved hose and top-fill nozzle will be used and a proper connection between the fuel source and machine will be verified. The fill valve will be open while transferring fuel.
- Receiving tanks will not be overfilled.
- Smaller equipment will be placed in portable secondary containment and refuelled using approved jerry cans.
- Any transportation of dangerous goods (i.e., fuel and lubricating oils) for construction equipment, will be carried out in conformity with the federal *Transportation of Dangerous Goods Act*.

## 6.0 WASTE MANAGEMENT

Minimal construction waste is anticipated to be generated based on the nature of the Project. However, the Contractor will maximize opportunities to reduce, reuse and recycle waste materials generated on the Project site. All debris and waste material will be collected in the immediate working area within the Project site. Waste material will be disposed at suitable upland locations. Contractors will adhere to all applicable legislation with respect to the handling, transportation, and/or disposal of all materials related to this Project (waste or otherwise). These regulations may include (but not be limited to) the BC Hazardous Waste Regulations, Spill Reporting Regulations, Workers Compensation Board Regulations, Transportation of Dangerous Goods Regulations, etc. The following BMPs will be implemented with respect to waste management:

- Clean up of barges will be an ongoing maintenance activity.
- Any debris that is inadvertently lost overboard and deposited (floating or sinking) within the marine environment will be recovered as soon as possible.
- Hazardous wastes generated could include waste petroleum products (e.g., engine oils and lubricants) from machinery and equipment, spent batteries, solvents and cleaning agents, etc. Contractors will provide labelled separate containers for potentially hazardous waste such as oily rags and hydrocarbon absorbent pads.
- All hydrocarbon products and other hazardous wastes potentially present during construction will be identified. The associated Workplace Hazardous Materials Information System and Materials Safety Data Sheets of these products will be made available to all construction team members.
- All recyclable or compostable materials will be collected separately from general waste as per Metro Vancouver Regional District requirements.

## 7.0 EMERGENCY RESPONSE

An integral part of effective environmental management during construction-related activities is a comprehensive emergency response plan, which when initiated, allows for the rapid response of emergency services and/or the containment and cleanup of environmental emergencies. The following section provides a general outline for an effective response plan. The Contractor will be responsible for ensuring a specific response plan is incorporated into their EPP.

### 7.1 EMERGENCY COMMUNICATION

The Contractor's EPP will include a communication plan, including contact information for all parties who are responsible for the Project, or are critical to the response or reporting of accidents or environmental emergencies such as spills of oil, fuel or chemicals to a receiving waterbody. VFPA, Environment and Climate Change Canada, Fisheries and Oceans Canada and the Provincial Emergency Management BC Program (formerly the Provincial Emergency Program) are to be notified of reportable incidents. Below is an example contact table (**Table 4**).

**Table 4 Emergency Contact Numbers**

Agency	Phone Number
Emergency Services	911
VFPA Operations Centre	605-665-9086
Local Non-Emergency Police	604-985-1311
Local Non-Emergency Fire	604-990-3682
Lions Gate Hospital (231 15 <sup>th</sup> Street East, North Vancouver)	604-988-3131
Vancouver General Hospital (899 W 12 <sup>th</sup> Avenue, Vancouver)	604-875-4111
BC Emergency Spill Reporting Line	1-800-663-3456
Canadian Coast Guard	1-800-889-8852 (Marine Pollution)
	1-250-363-6333 (Navigation Hazard)
	1-800-567-5111 (Search and Rescue)

## 7.2 SPILL RESPONSE PLAN

Prior to commencement, the Contractor's EPP will establish an appropriate spill prevention, containment and clean-up plan for hydrocarbon products (including fuel, oil, and hydraulic fluid) and any other deleterious substances using standards, practices, methods and procedures to a good commercial standard. The Contractor will ensure that appropriate spill containment and clean-up supplies are available at the Project site at all times, and that all personnel working on the Project are familiar with the spill prevention, containment and clean-up plan.

The EPP developed by the Contractor will include measures to be implemented as part of the spill response plan such as:

- Identification of any/all hazardous materials/products as well as waste storage and secondary containment. Materials Safety Data Sheets will be kept at the Project site and made available to all construction team members.
- Identification of the locations of spill response equipment and materials for containment and clean-up (spill kits and contents) as well as instruction on how to use them effectively. Locations of product/material storage and spill kits should be readily identified on a figure or map and posted in an appropriate location at the Project site.

The following represents the minimum scope for spill response/management procedures:

- Assess safety – ensure unnecessary people are kept clear of the area and that people with proper training and equipment deal with the spill. Put on any required personal protective equipment and consult Material Safety Data Sheets.
- Stop the source – if required, and when it is safe to do so, stop the spill at its source. This may simply be righting an overturned container or sealing a hole.
- Contain and control the spill – the spill should be prevented from infiltrating into the ground or entering a waterbody. If the spill occurs on water, booms should be immediately deployed to prevent its spread.
- Clean up the spill – utilize appropriate absorbent pads or other materials based on the type of substance spilled. The method of disposing of the waste is dependent on the amount and type of deleterious substance that was spilled.
- Notify appropriate authorities – spills of a reportable quantity will be reported to the appropriate agencies. Minor spills will be reported to the EM.
- Record the incident – make a note of what, how and where the incident happened as well as what was done to clean it up. Depending on the spill, further assessment of the effect to land and water and/or additional cleanup may be required.

When reporting a spill, the caller will provide the dispatcher with the following information, as accurately as possible:

- Name and contact phone number of the person initiating the call;
- Name and telephone number of the person who caused the spill;
- Location and time of the spill;
- Type and quantity of the substance spilled;
- Cause and effect of the spill;
- Details of action taken or proposed;
- Description of the spill location and surrounding area;
- Names of agencies/responders on scene; and
- Names of other persons or agencies advised or to be advised concerning the spill.

## 8.0 REFERENCES

- AECOM. 2018. Maplewood Marine Restoration Project: Habitat Design – 60% Design Report. Prepared for the Vancouver Fraser Port Authority.
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- Port Metro Vancouver. 2015. Project and Environmental Review Guidelines – Construction Environmental Management Plan (CEMP). Accessed April 2018 <<https://www.portvancouver.com/wp-content/uploads/2015/10/PER-Construction-Environmental-Management-Plan-CEMP-Guidelines-FINAL-2015-10-16.pdf>>.