APPENDIX 28-A

Roberts Bank Terminal 2 Technical Report, Archaeological Overview Assessment

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ROBERTS BANK TERMINAL 2
TECHNICAL REPORT
Heritage and Archaeology
Archaeological Overview Assessment

Prepared for:
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Non-Permitted Report

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Project #MR1320

November 2014

Technical Report/Technical Data Report Disclaimer

The Canadian Environmental Assessment Agency determined the scope of the proposed Roberts Bank Terminal 2 Project (RBT2 or the Project) and the scope of the assessment in the Final Environmental Impact Statement Guidelines (EISG) issued January 7, 2014. The scope of the Project includes the project components and physical activities to be considered in the environmental assessment. The scope of the assessment includes the factors to be considered and the scope of those factors. The Environmental Impact Statement (EIS) has been prepared in accordance with the scope of the Project and the scope of the assessment specified in the EISG. For each component of the natural or human environment considered in the EIS, the geographic scope of the assessment depends on the extent of potential effects.

At the time supporting technical studies were initiated in 2011, with the objective of ensuring adequate information would be available to inform the environmental assessment of the Project, neither the scope of the Project nor the scope of the assessment had been determined.

Therefore, the scope of supporting studies may include physical activities that are not included in the scope of the Project as determined by the Agency. Similarly, the scope of supporting studies may also include spatial areas that are not expected to be affected by the Project.

This out-of-scope information is included in the Technical Report (TR)/Technical Data Report (TDR) for each study, but may not be considered in the assessment of potential effects of the Project unless relevant for understanding the context of those effects or to assessing potential cumulative effects.

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ACKNOWLEDGEMENTS

Fraeser Bak, Tsawwassen First Nation, for his participation in the field study and his valuable knowledge of the project area.

EXECUTIVE SUMMARY

The Roberts Bank Terminal 2 Project (RBT2 or Project) is a proposed new multi-berth container terminal intended to provide additional container shipping capacity on the west coast of Canada. The Project is part of the Container Capacity Improvement Program (CCIP), Port Metro Vancouver's long-term strategy to deliver projects to meet anticipated growth and demand for container capacity in the coming decades.

Port Metro Vancouver has retained Millennia Research Limited to undertake an Archaeological Overview Assessment (AOA) as part of the environmental studies related to the Project. This technical report describes the results of the AOA and includes:

- A review of existing heritage conditions within subtidal, intertidal, and onshore areas;
- An ethnographic overview of the study area; and
- A review of the potential for undocumented heritage sites in the study area including a Preliminary Field Reconnaissance (PFR).

To avoid duplication of archaeological and ethnographic research conducted in the vicinity of the project area, a brief summary of previous research was compiled that includes a description of known past land uses by several First Nations groups. The study area is located within the traditional lands of the Tsawwassen First Nation and other First Nations also claim an interest to parts of the study area. All available completed archaeological studies are mentioned which relate to recorded archaeological sites within four kilometers of the study area.

A PFR was conducted by Millennia and an environmental technician from Tsawwassen First Nation on the morning of October 30, 2013. The subtidal zone was not inspected during the PFR due to its low potential. Northeast of the historic shoreline, the onshore zone was observed to have been capped by fill related to rail facilities. A judgemental pedestrian survey took place in the intertidal zone within a 100 meters buffer of the Project footprint up to 2 kilometers from shore. Recently deposited silts were found covering the area, which were particularly deep near the Roberts Bank causeway. During the PFR, no archaeological or historic material was identified.

The onshore, subtidal, and intertidal zones were evaluated for their archaeological potential. The onshore and subtidal zones were both assessed as having very low archaeological potential. The intertidal zone is slightly more complex. A moderate potential for wood stake fish trap elements has been identified in the vicinity of a historic drainage channel which the existing causeway crosses.

A preliminary impact assessment suggests nil to low impacts on archaeological features for the onshore and subtidal portions of the Project. Any intertidal archaeological features would be impacted negatively by Project related construction activities. Fish trap stakes could be directly destroyed if excavation was involved, or could be indirectly impacted through sediment compaction and drying. Compaction of capped sediments could change subsurface conditions from anaerobic to aerobic, thereby causing the wooden stakes to rot away.

No further archaeological work is recommended for the onshore or subtidal portions of the Project with the exception of putting in place a Chance Find Procedure applicable to the entire project.

A conventional Archaeological Impact Assessment (AIA) is not considered a necessary step ahead of the Project initiation as several of the outcomes that an AIA is designed to address are already known. These known outcomes include the type of archaeological remains expected, the likely level of impact, and an appropriate strategy for mitigating impacts if any archaeological materials are located during the Project.

If construction of the causeway involves simply capping existing deposits, mechanical trenching in the vicinity of a historic intertidal channel could be used to intercept and expose lines of wooden fish trap stakes. As part of mitigation, stakes would be exposed and their locations mapped. The stakes could then be collected, and radiocarbon dated. Mechanical trenching could be conducted on the tidal flats prior to construction using a machine such as an excavator on pontoons working at low tide. However, prior approval from the Department of Fisheries and Oceans would need to be obtained prior to works. A less expensive alternative would be to conduct work following the construction of a perimeter dyke and draining of the area, allowing a conventional excavator to work between the dyke and the existing causeway. If construction involved excavation of materials prior to filling (which is not expected at this time) then this strategy could be followed by simply monitoring excavation. Because the mitigation of fish trap stakes is simple and very quick to undertake, no significant disruptions of construction excavation would occur.

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1.0 INTRODUCTION

The Roberts Bank Terminal 2 Project (RBT2 or Project) is a proposed new multi-berth container terminal intended to provide additional container shipping capacity on the west coast of Canada. The Project is part of the Container Capacity Improvement Program (CCIP), Port Metro Vancouver's long-term strategy to deliver projects to meet anticipated growth and demand for container capacity in the coming decades.

Port Metro Vancouver has retained Millennia Research Limited (Millennia) to undertake an Archaeological Overview Assessment (AOA) as part of the environmental studies related to the Project. This technical data report describes the results of the AOA and includes:

- A review of existing heritage conditions within subtidal, intertidal, and onshore areas;
- An ethnographic overview of the study area; and
- A review of the potential for undocumented heritage sites in the study area including a Preliminary Field Reconnaissance (PFR).

Background research for the review was conducted by Millennia and the supporting PFR took place on the morning of October 30, 2013. The PFR was conducted by Roger Eldridge and Ryan Blackburn of Millennia and assisted by Fraeser Bak, Tsawwassen First Nation field technician.

The following report first provides a description of the Project and a brief description of the features within the study area relevant to the AOA findings. Following this, the Methodology section describes the research plan and the methods and equipment used in the field. The Results section discusses the findings of background research and the PFR, and informs the Evaluation of Archaeological Potential and Implications for Further Work and Recommendations section, which includes an assessment of archaeological potential. Finally, recommendations are included to ensure heritage concerns are appropriately and effectively addressed should the project proceed as planned.

1.1 PROJECT DESCRIPTION

The RBT2 includes development of a number of components at the existing Roberts Bank terminals (**Figure 1**). These developments include terminal expansion onto newly created land west of the existing Roberts Bank terminals, and expansion and associated upgrades of the Roberts Bank causeway (Port Metro Vancouver 2013).

A number of smaller zones make up the total project area. The total Project footprint will be an area approximately 180 ha and expansion will primarily be in deep water and subtidal zones. A basin called the berth pocket will measure 1.7 kilometers by 62 meters and is to be created by dredging to a depth of 30 meters on the offshore, southwest side of the proposed terminal expansion. Expansion of the existing tug basin at the eastern corner of the Roberts Bank terminals is also proposed. The Roberts Bank

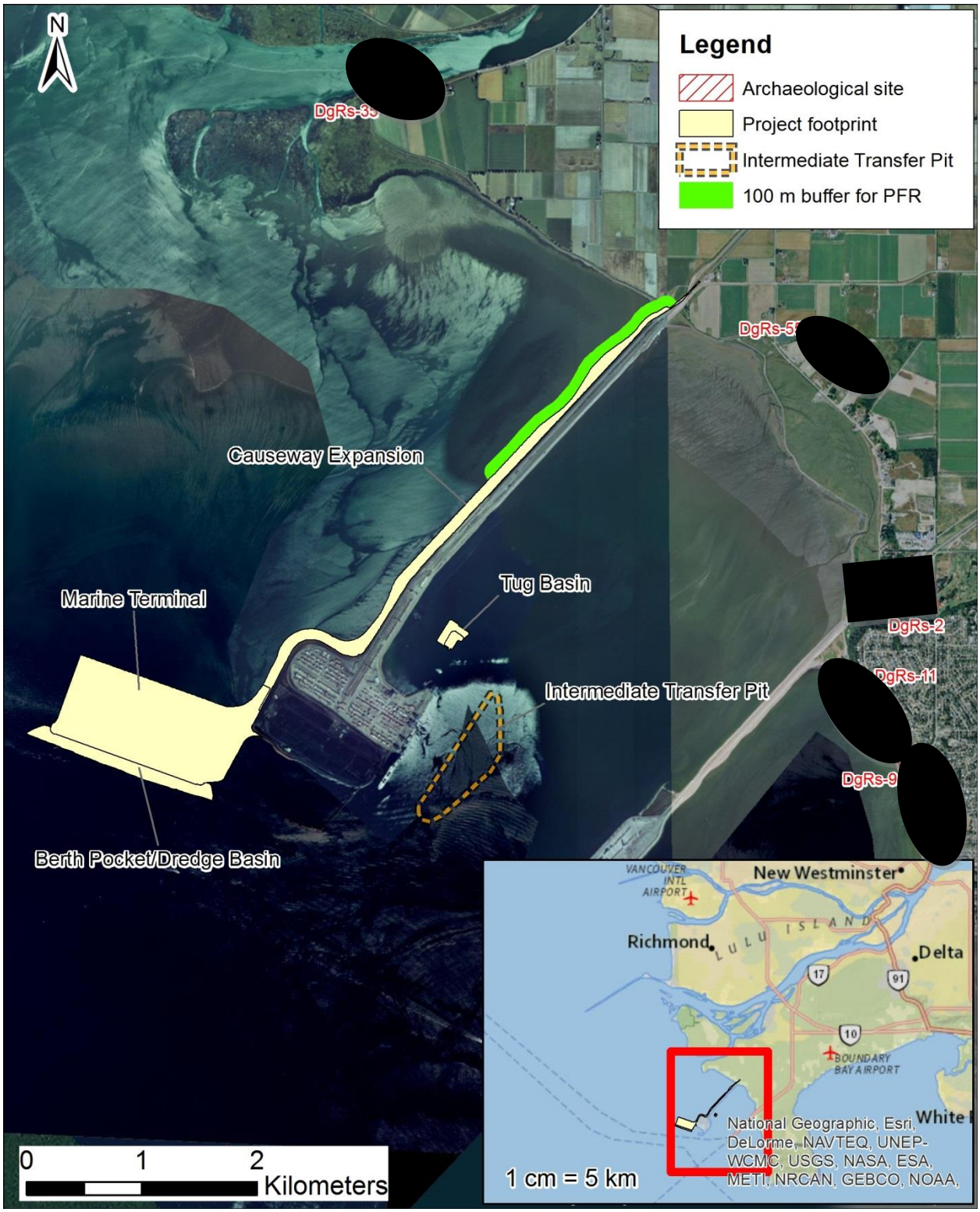
causeway is also proposed to be expanded to the northwest from the existing causeway in the intertidal zone between the shoreline and the terminal facilities offshore. Construction techniques are preliminary but could include constructing a perimeter dyke parallel to the causeway with barged-in sediment, and filling and compacting the space between the dyke and existing causeway with dredged sand fill. Dredged fill may be temporarily stored in an underwater intermediate transfer pit southeast of the existing Deltaport Terminal. The width of the proposed causeway expansion will vary but the final area is expected to be approximately 43 ha. A narrow strip of the Project footprint extends east onto the shoreline that includes the tie-in of a lead track serving the Project to the existing rail network.

For the purposes of this report, the heritage considerations within the proposed terminal expansion, intermediate transfer pit, and berth pocket areas will be discussed as the subtidal area; the causeway expansion and tug basin expansion areas will be discussed as the intertidal area; finally, the rail upgrade area will be referred to as onshore area.

The primary focus of this report is the intertidal area in the vicinity of the causeway expansion. The area includes the intertidal mud flats within a 100 meters buffer of the Project footprint and up to 2 kilometers southwest of the existing shoreline.

The Project footprint is located primarily on federal lands managed by Port Metro Vancouver and a deep water portion is Provincial Crown Land. The onshore and intertidal lands surrounding the project area are primarily Tsawwassen First Nations land, or Crown Federal land that may eventually be transferred, assigned, or subleased to Tsawwassen First Nation (Port Metro Vancouver 2013).

Figure 1 Study Area and Nearby Archaeological Sites



2.0 METHODOLOGY AND APPROACH

The approach consisted of an initial prefield assessment and a subsequent preliminary field reconnaissance (PFR). These dual assessment tools were used in conjunction in order to form an assessment of archaeological potential within each of the three zones.

The prefield assessment consisted of background research and a literature review which informed the archaeological potential assessment prediction of site variability, density, and distribution as per the British Columbia Archaeology Branch's Archaeological Impact Assessment Guidelines (BC Archaeology Branch 1998). Background research was conducted to provide a review of existing heritage conditions in the vicinity of the study area and an ethnographic overview for the Project shoreline, intertidal and subtidal areas. A search for relevant reports within both the BC Archaeology Branch's Provincial Archaeological Report Library (PARL) and Millennia's in-house library was undertaken. The Archaeology Branch's Remote Access to Archaeological Data (RAAD) was used to access archaeological and historical site forms (BC Archaeology Branch 2013), and to provide mapping resources. Several online archival resources were examined including the Delta Museum and Archives Society webpage (accessed November, 2013), as well as documents regarding the early historic period in the Millennia library. Similar background research was used to inform a review of the archaeological potential within the Project area, and a number of sources on intertidal geomorphology (Barrie et al. 1998, NHC-Triton 2004) were consulted as well as recent LiDAR data of the intertidal zone, which was used as the base map in **Figure 3**.

Following the prefield assessment, a PFR was conducted to supplement the background research with an on-the-ground assessment of archaeological potential. The PFR included pedestrian survey of areas within the intertidal zone that contained the highest potential for archaeological material as indicated by the prefield assessment and observations made during survey. Survey coverage employed a judgemental strategy, as defined by the BC AIA guidelines where "Under certain circumstances, it is appropriate to survey a sample of the project area based entirely on professional judgement regarding the location of sites. Only those areas which can reasonably be expected to contain archaeological sites are surveyed" (BC Archaeology Branch 1998).

The survey, as a continuous transect crossing the intertidal zone from the high tide line to a point 2 kilometers from the shoreline, was judged to be representative of the assessed potential area. The survey was limited to a 100 meter buffer on the project footprint and was conducted at low tide by three crew members spaced between 10 and 50 meters apart. Two surveyors carried handheld GPS units that recorded survey tracks. All drainage channels were inspected for the possibility that buried archaeological material could be exposed. All accessible wood or stone objects were inspected and particular attention was paid to alignment of objects.

Subsurface testing was not part of the PFR, and the saturated sediments encountered would have made testing any large area unfeasible.

3.0 STUDY AREA

This section provides a description of the environmental, geomorphological, ethnographic, and archaeological landscape of the study area and provides a local and regional context for the findings of the current AOA.

3.1 ENVIRONMENT

Roberts Bank generally lies in the vicinity of the physiographic boundary between the Fraser River delta and the Tsawwassen upland, a region that has been subject to both past and ongoing change. The study area crosses several local environment zones including the deep water subtidal area, the deltaic intertidal mudflats incised with dendritic channels, and the onshore uplands that contain a mix of intensive farming and transportation corridors. A comprehensive summary of the past and present local environment is presented in Eldridge and Anaya-Hernandez (2004), while the Arcas Consulting Archaeologists Limited (Arcas, now AMEC) series of reports on archaeology site DgRs-2 (the Tsawwassen site), a few kilometres south of the present study area contain a summary of the environmental and archaeological record (Arcas Consulting Archeologists Ltd. 1991a, b, 1994, 1999). Further notes on the palaeoenvironment, sea level and shoreline changes are also presented in Millennia's 2004 AOA and Archaeological Impact Assessment (AIA) report (Eldridge and Anaya-Hernandez 2004).

3.2 GEOMORPHOLOGICAL CONSIDERATIONS

The creation of the Fraser Delta began prior to 8,000 Before Present (BP), and continuous sedimentation resulted in the growth of the delta from the upriver end of the delta about 80 kilometers upstream (Clague, et al. 1983). Thus, the growth has averaged roughly 10 meters per year, although this rate probably slowed through time as the delta became wider. Regardless, the present day shoreline is only expected to have at most a few hundred years of existence as an above-tide feature. Detail on the geomorphology of the intertidal area is provided in NHC-Triton (2004) and is briefly summarised here to provide context relevant to the AOA.

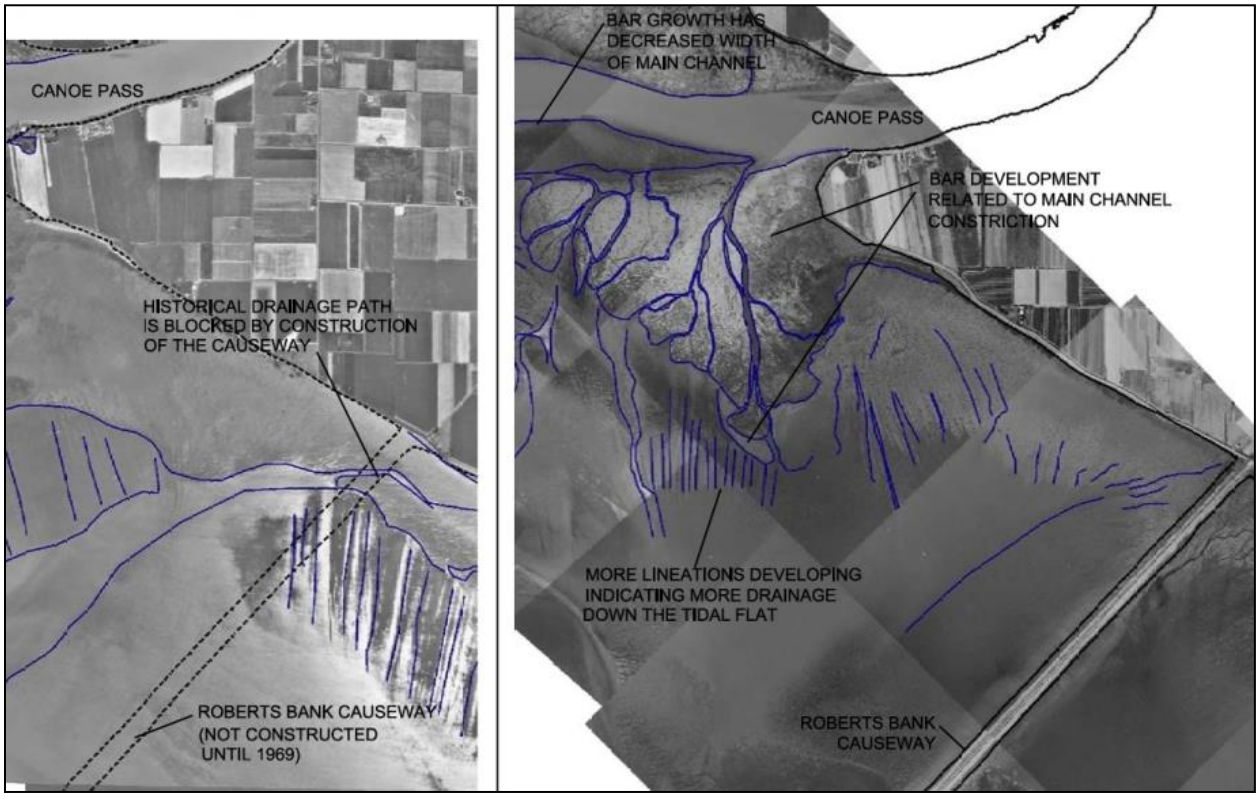
The sediments within the intertidal area are a primary influence on its geomorphology. Historically, sediment from the Fraser River was carried from the northwest to the southeast, and sediment sourced from the bluffs to the south was carried north via longshore drift, with both sources creating a dynamic depositional environment (Barrie et al. 1998, NHC-Triton 2004).

Historic drainage of fresh and salt water in the intertidal area included small channels perpendicular to the shoreline and deeper channels that likely migrated over time. Pre and post-causeway drainage patterns are substantially different (**Figure 2**). Currently, the interaction of tidal movement with the causeway creates a clockwise tidal gyre which creates a depositional environment on the northern side of the causeway (**Figure 2**) (Barrie et al. 1998). Most of the modern sediments in the intertidal zone are believed to be redeposited, rather than imported from outside systems (NHC-Triton 2004). These

redeposited fine sediments have capped the original surface. Directly adjacent to the causeway, imported fill material associated with causeway construction, including cobbles and boulders, overlies intertidal sediments.

The seaward growth of the delta is a geomorphological process that has been ongoing for many thousands of years. While the shoreline and major channels and sloughs at the mouth of the river have not changed greatly since the first European observations (e.g., Great Britain Hydrographic Office 1857; Simpson 1827, 1858; U.S. Coast Survey 1854; Wilkes 1844, 1861).

Figure 2 Comparison of Intertidal Drainage Patterns Pre and Post Causeway (from NHC Triton 2004:16)



3.2.1 Ethnography and Archaeology

To avoid duplication of archaeological and ethnographic research conducted in the vicinity of the Project area, a brief summary of previous research is provided below that includes a description of known past land uses by several First Nations groups. All available completed archaeological studies are mentioned which relate to recorded archaeological sites within 4 kilometers of the study area. Ethnographic references are used in the report in order to make interpretations of archaeological potential but are not intended to be a comprehensive report on ethnography or traditional use. Other reports for the Project describe in more detail the various aboriginal statements of interest in the area.

The study area is located within the traditional lands of the Tsawwassen First Nation, but other First Nations also claim an interest to parts of the study area. According to GeoBC's Consultative Areas Database (CAD), the Hul'qumi'num Treaty Group including the Cowichan Tribes, Halalt First Nation, Lake Cowichan First Nation, Lyackson First Nation, Penelakut Tribe, and the Stz'uminus First Nation claim an interest; as do the Sto:lo Nation including Seabird Island Band, Soowahlie First Nation, Sto:lo Tribal Council, Shxw'owhamel First Nation, Skawahlook First Nation; the Semiahmoo First Nation, and the Tsleil-Waututh Nation. The Musqueam First Nation does not include the area in their Statement of Intent but are being included in discussions with the Port Authority due to the proximity of their claim. The Hwlitsum First Nation have also expressed an interest in the Study Area.

3.2.1.1 Ethnography

In 1991, Arcas conducted a large scale investigation at archaeological site DgRs-2 as part of upgrades to Highway 17 for the Ministry of Transportation and Highways (Arcas Consulting Archeologists Ltd. 1991a). As part of the project, a detailed ethnographic study of the Tsawwassen Reserve was compiled by Bouchard and Kennedy (1991). The Tsawwassen First Nation does not endorse this publication, but it contains information of direct relevance to the current study, and so those parts are used. Most relevant to the current report are the descriptions of sturgeon fishing off the Tsawwassen Reserve. The study describes how sturgeon were harvested in a variety of manners including in tidal traps or '*tqep'*, gaff hooked, netted and harpooned. The tidal trap involved expansive triangular weirs up to 200 yards wide created by rows of wooden stakes pushed into the intertidal sediment. As the tide receded, sturgeon were drawn along the weirs into a small pool from which they could be harpooned from a canoe. Barnett, an early-mid 20th century ethnographer, states that traps were family owned. He did not specify exactly where the traps were located, only that they were positioned "quite a ways from shore" (Barnett 1955). While Barnett mentions the location of the traps at the mouth of Canoe Passage in the vicinity of the current Roberts Bank causeway, four or five traps were noted to be present in front of the Tsawwassen Village (Arcas Consulting Archeologists Ltd. 1991a). The Arcas study notes that the traps were last seen around the turn of the 20th century, at which time they had fallen into disrepair.

A Traditional Use Study conducted by the Tsawwassen First Nation and the Ministry of Forests in 2008 (Tsawwassen First Nation 1998) also identified fishing activities. The study notes that, "sturgeon traps were used in the channels near the mouth of Canoe Pass (near the causeway for the Robert Bank Superport)" (Tsawwassen First Nation 1998:24).

Review of historic documents including the Fort Langley journals have many references to aboriginal peoples from all over the lower mainland, Southern Vancouver Island, the southern side of Juan de Fuca, Puget Sound and beyond, transiting the lower river or fishing the waters between Canoe Passage and Point Roberts (e.g., Suttles 1998). Fishing used two common technologies. One (for both salmon and sturgeon) involved bag or 'trawl' nets suspended between two canoes drifting with the river current in

deep water (Suttles 1998). At least as common as the bag nets was harpooning from drifting canoes, with harpoons affixed to shafts an extraordinary 60 to 80 feet (18 to 24 meters) long. Both these technologies would appear to be restricted to the larger outlets of the Fraser and neither would ordinarily leave any archaeological evidence where they were used.

Two specific examples of on-shore activities in the proximity of the study area were noted in historic literature. The Hudson Bay Company mounted an expedition from the Columbia River to identify a suitable location on the Fraser River for a trading fort (Fort Langley). During their return home on December 18, 1824 they met a canoe carrying a Cowichan chief and followers at sea a short distance south of the mouth of the Fraser River (Elliot 1912). These people had just crossed from Vancouver Island, despite the season. (Thousands of island people made the crossing regularly in warmer seasons). The chief went ashore here; the Hudson Bay people also went ashore somewhere near the mouth of the river and remarked on the great quantities of geese, especially white ones, which could be easily hunted (Elliot 1912:224). The Fort Langley Journal of April 17, 1829 recounts a deadly attack by northern Lekwiltok people on a Kwantlen family. The journal gives the unusual details of how the father "rather imprudently threw himself in among numerous small channels generally overflowing with the tide and wholly secreted with reeds and high grass from the eye of any one passing by the river". The family was there to hunt beaver and collect shellfish and wapato (Maclachlan 1998:109). This reference gives a valuable indication of the types of activities conducted and the environmental setting prior to flood control measures. These types of hunting and gathering expeditions would leave at least a low density of archaeological remains along the foreshore. A map of Musqueam settlement pattern drawn from ethnographic sources (and likely applicable in the study area also to multiple First Nations use), shows considerable exploitation of various fish, sea mammal, land mammal, birds, and berries both on the shore and on the land in the vicinity of the study area (Ham 1998).

A little further south near Point Roberts, Saanich, Lummi, Semiahmoo and others had major villages associated with reef netting in the 19th century (e.g., Suttles 1951). Reef netting requires specific configurations of rock reefs and currents, both missing from the study area, so no archaeological remains from this activity are expected in the study area.

3.2.1.2 Archaeology

No previously recorded archaeological sites were identified in the development area using the Archaeology Branch's online heritage registry (BC Archaeology Branch 2013). Previously recorded archaeological sites in proximity to the Project area are discussed below.

DgRs-2, the Tsawwassen Site, is a large shell midden site located approximately three kilometers to the southeast on the Tsawwassen First Nation Lands (**Figure 1**). The site was first recorded in 1975 by the Archaeology Sites Advisory Board (ASAB) during the Lower Mainland Survey (Kenny 1975). A large

scale excavation at the site was led by Arcas, and DgRs-2 was noted to contain a very large shell midden component (400 meters by 600 meters and up to 5 meters in depth), artifacts, and a considerable number of human remains (Arcas Consulting Archeologists Ltd. 1991a). Dating of the site suggests occupations from 2,200 BP to the historic period (Arcas Consulting Archeologists Ltd. 1991a).

DgRs-9, the Tsawwassen Beach site, is located at [redacted], 3.8 kilometers to the southeast of the Project area (**Figure 1**). The site was originally recorded in 1969 by the B.C. Provincial Museum and includes human burials, shell midden, artifacts, and a culturally modified tree (CMT). The site is also extensive with a width of 135 meters and a length of 1,350 meters. The presence of a burial showing frontal occipital cranial deformation suggested that the site predates ca. 900 BP (DgRs-9 site form). The absence of flaked stone artifacts suggests that the site may post date circa 1,200 BP, however radiocarbon date revealed a minimum age of 1,200 years BP.

DgRs-11, the Tsawwassen Bluff site, is located approximately [redacted] northeast of DgRs-9 and 3.7 kilometers to the southeast of the Project area (**Figure 1**). It was originally recorded in 1970 by the Archaeology Sites Advisory Board (ASAB) during the Lower Mainland Survey (Kenny 1975). The site is heavily disturbed and contained surface and subsurface shell midden, as well as human remains. The artifact assemblage suggests that the site is part of the Marpole Phase (1600-2000 BP) (DgRs-11 site form).

DgRs-35 is the Beach Grove Spoil Site, located 2.8 kilometers northwest of the Project area (**Figure 1**). The site contains redeposited midden and human burials from DgRs-1. DgRs-1 is located 7.5 kilometers to the southeast.

DgRs-55 is the Brunswick Cannery No. 2 site, situated 1.2 kilometers southeast of the Project area (**Figure 1**). It was originally recorded in 1897 by the B.C. Underwriters Association. In 2006, the site was determined to be of historic significance only, as no archaeological materials were ever identified (RAAD).

Some archaeological work that has not resulted in finding archaeological material in the vicinity is relevant to a discussion of archaeological potential of the study area. In 1996, Arcas Consulting Archeologists Ltd undertook an AIA for Superport Expansion that included remote sensing and dive inspection, without finding any archaeological evidence (Arcas Consulting Archeologists Ltd. 1996). In 2004, Millennia conducted an AOA and an AIA of Roberts Bank for the Vancouver Port Authority (Eldridge and Anaya-Hernandez 2004). The report contains archaeological, historical, and traditional use information of the Tsawwassen area. Descriptions of the palaeoenvironment, sea level and shoreline changes, as well as historical and ethnographic reviews of the area are also provided in this report. The AIA project surveyed the north eastern shore line and the south side of the Roberts Bank causeway during low tide. No archaeological material was discovered along either the rail track right-of-way or on the tidal flats to the south of Roberts Bank causeway. The report stated that no archaeological sites were in conflict with the

project, but suggested a high potential for sturgeon fish traps in the intertidal flats areas. Millennia also conducted an AOA and AIA for the Vancouver Island Transmission Reinforcement (VITR) project (Mathews 2005; Mathews and Pawlowski 2006). The study included work related to a subsurface transmission line segment running between the Tsawwassen Substation and the English Bluff Terminal, and testing identified one new archaeological site, DgRs-81, on the high land of Tsawwassen. Limited underwater diving surveys along the proposed power line were also undertaken without finding any archaeological materials.

4.0 PFR RESULTS

The PFR results are presented below separated into onshore, subtidal, and intertidal zones. The relationship of PFR survey coverage to the Project footprint and 100 meters buffer is presented in **Figure 3**.

Figure 3 Survey Coverage in Intertidal Zones. Incised modern drainage channels shown on LiDAR basemap used for intertidal zone.

4.1 ONSHORE ZONE

Previous development of Roberts Bank rail facilities has capped the onshore zone with fill. No archaeological or historical material was observed within the onshore footprint of the proposed rail development area.

4.2 SUBTIDAL ZONE

The subtidal zone including the berth pocket and intermediate transfer pit was not inspected during the PFR. The prefield potential assessment found this zone to have low potential for archaeological material. Underwater surveys are not routinely undertaken in subtidal areas with low archaeological potential; however, an underwater archaeological survey was conducted as part of previous Deltaport expansion which included remote-sensing and inspection of subtidal targets (Arcas Consulting Archeologists Ltd. 1996). The project did not identify any precontact or protected historical material and found there to be little potential for subtidal sites to exist in the vicinity of the development. The current available methods for direct underwater archaeological investigation include grab sampling, vibracore sampling, direct observation by diving, or inspection by submersible vehicles. These are not considered feasible under the scope of the current study, and are considered unnecessary based on the assessment of low potential.

4.3 INTERTIDAL ZONE

During the PFR, no archaeological or historic material was identified in the intertidal portions of the causeway expansion area. The PFR confirmed that the project area is covered with a drape of sediment which has obscured or reworked the historic surface where archaeological material could be present. This observation is consistent with Millennia's inspection of mudflat areas to the south of the Roberts Bank causeway in 2004 (Eldridge and Anaya-Hernandez 2004). Some mudflat areas were higher and better drained, while low areas retained pooled water (**Figure 4** and **Figure 5**).

A direct evidentiary-based approach was not possible for fish traps specifically due to the lack of surface visibility and the inability to subsurface test at the level of study, and the difficulty for testing posed by the mud flats.

Instead, the assessment of potential for fish trap remains was based on three factors (p15), and the potential is considered moderate.

Section 7.3.2, **7.3.3**, and **7.3.4** discuss possible methods of inventory and mitigation for fish traps. The inventory aspects represent direct evidentiary-based testing for fish trap remains. The area with the greatest potential is the historic drainage channel.

Figure 4 Intertidal Survey with Roberts Bank Causeway in Background

Note: Photo faces south**.**

Figure 5 Well Drained Areas of Mudflats Crossed During Intertidal Survey

Note: Photo faces northwest to the Strait of Georgia.

A single piece of wood was spotted protruding from the mud 200 meters from the edge of the causeway and approximately 1 kilometer from shore (**Figure 6**). The wood was encrusted in barnacles and it was determined to be square cut and of recent origin. A single, unmodified, well-rounded boulder was present nearby that was probably transported in on machinery rather than by natural processes. Similar sized boulders are present along the causeway in imported fill. A small number of driftwood logs represented the only other detritus in the intertidal area.

Figure 6 The Only Wooden Object in the Intertidal Zone

All drainage channels observed were shallow (up to 30 cm depth), and not well established. Their orientation perpendicular to the Roberts Bank causeway maintains that drainage patterns are interacting with the causeway which is consistent with the research mentioned in the Study Area (**Section 3.2**). No incised channels or exposures were observed beyond 2 kilometers from shore, and the mudflats showed much less relief. As channels or exposures represent the only areas where fish trap remains could have been visible, survey was ended. Orthophotos and LiDAR data was observed for this area as part of the desktop review. No other exposure types were present in the surveyed area where deeper sediments could be inspected for archaeological material.

No archaeological or historical materials were observed along the Roberts Bank causeway shoreline in the Project area, and it was confirmed to consist of imported fill and reworked sediments which have formed a beach that probably deeply caps the pre-causeway surface elevation (**Figure 7**).

Figure 7 Intertidal Sediments to Left and Roberts Bank Causeway Beach Consisting of Imported Fill and Redeposited Silt and Sand to Right

Note: Photo faces northeast towards shore.

5.0 EVALUATION OF ARCHAEOLOGICAL POTENTIAL

The assessment of archaeological resource potential in the study area is based on the findings of background research and the preliminary field reconnaissance. While archaeological potential models for parts of B.C. are made available by the BC Archaeology Branch, to the best of our knowledge no model has yet been completed for the Project area and surrounding lowlands. Therefore, professional judgement has been used to make an assessment of potential for the onshore, subtidal, and intertidal zones.

The expected site types for each zone, based on the literature review and findings of the PFR are as follows.

5.1 ONSHORE ZONE

The narrow corridor of the Project area footprint that follows the northern edge of the existing Roberts Bank causeway has low potential for archaeological material. This area has previously undergone development for the existing causeway and rail yard facilities and it is not expected that any cultural materials are present in this area. Even without the effects of previous development, the potential would have been low to moderate because of the very small area of footprint, combined with the expected low density of cultural materials due to a limited number of precontact activities here. It would be further reduced by a relatively brief geological existence of this area due to deltaic growth. Archaeological data potentially present would consist of small lithic scatters or small shallow shell middens left from short term resource use and camping in the late prehistoric and historic periods, as known from the early historic observations and ethnographic sources referenced in **Section 3.2.1**.

5.2 SUBTIDAL ZONE

The sub tidal areas have a very low potential for archaeological material due to distance from shore and active depositional nature. Deep water archaeological sites are uncommon locally but consist of occasionally dropped or lost items or the remnants of reef-net fisheries. A documented subtidal reef netting station utilised by several Straits Salish groups is present off Point Roberts approximately 8 kilometers southeast of the project area, but no reef netting has been reported to exist within the Project area and is not possible without the presence of underwater reefs.

While the geomorphology report cited suggests that sedimentation along the foreslope is minimal, (NHC-Triton 2004) which could provide conditions in which underwater archaeological features are visible, we have assessed the subtidal areas as low potential for expected site types, an assessment that is consistent with the findings of the Arcas Consulting Archeologists Ltd. (1996). The vast majority of the subtidal zone within the project area is located on the delta foreslope which is composed of sloping mud and sand. Dropped or lost items from the prehistoric period would be obscured by even minimal

sedimentation. The delta foreslope feature does not represent an area where early coastal sites would be submerged following sea level changes because it is not a submerged shoreline, it is a feature created late in the Holocene underwater by sedimentation, some related to Fraser River sediment plume. This feature was not present in its current form when sea level was at a maximum 12 metres lower than today (Clague and Bobrowski 1990; Clague, et al. 1983; James, et al. 2002; Wilson, et al. 2009) .

5.3 INTERTIDAL ZONE

The exclusive site type that is expected in the intertidal area is the wooden remains of tidal sturgeon (and possibly other species) traps. These would be represented by continuous or discontinuous lines of spaced wooden stakes. Two or more lines of stakes would converge and form a large V-shaped feature, possible hundreds of yards across. Basketry traps or staked ponds would be placed at the apex. Isolated artifacts that were dropped or lost might also be present, but the potential is considered very low for this site type.

The potential for fish trap elements to be present in the project footprint depends on three factors.

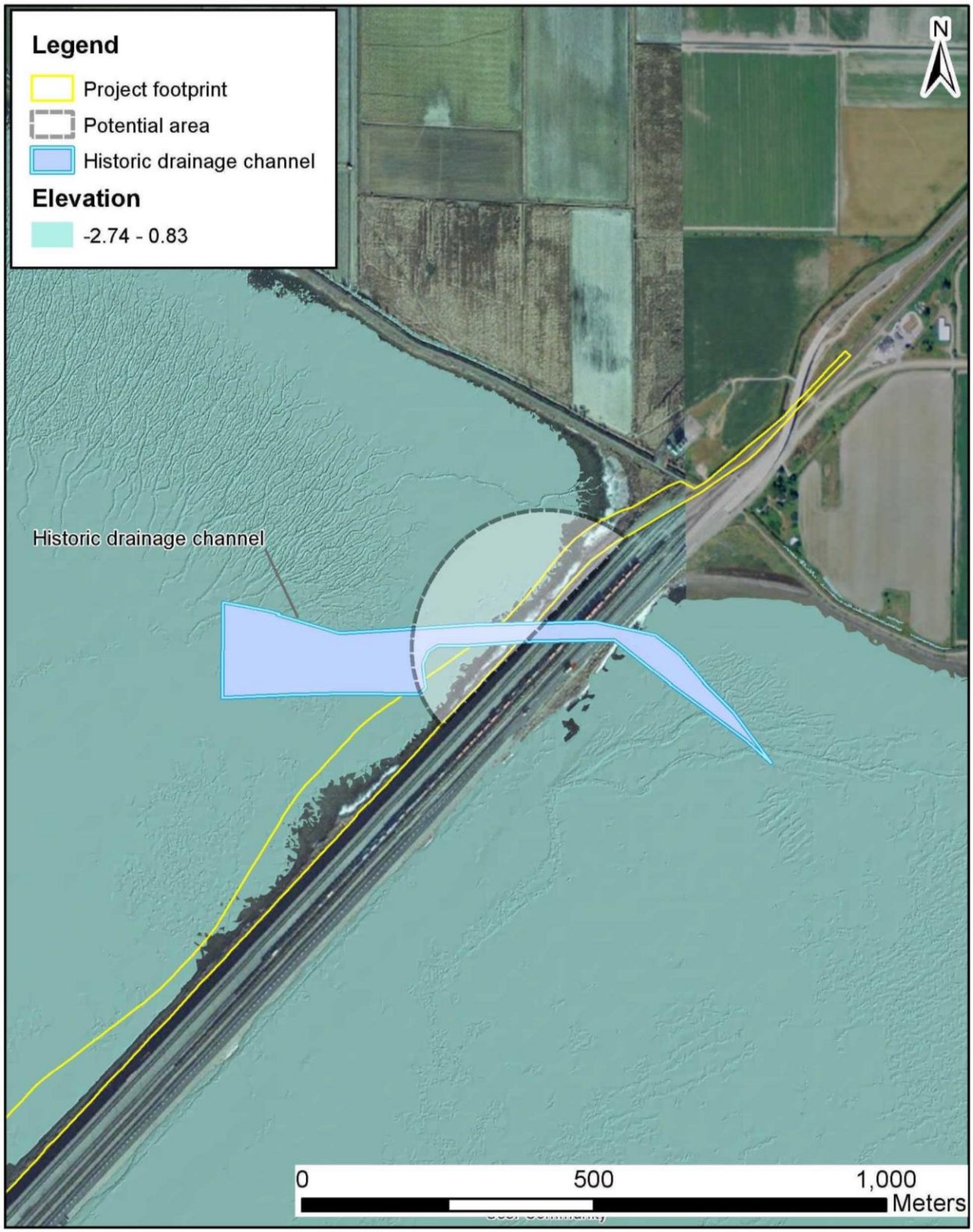
First, the fish traps would have to have been located within the footprint. While fish weirs were noted to have been expansive features hundreds of metres long and existed in the vicinity of the current causeway, it is unknown if any parts of the structures would fall directly within the current project footprint. The most likely place for them to occur is around a historic tidal channel which cut directly across the location of the Roberts Bank causeway about 300 to 400 meters from shore; this channel no longer exists and has been filled in during causeway construction and by subsequent sediment redeposition (**Figure 2** and **Figure 8**).

Second, the anaerobic conditions to preserve the stakes would need to be present in the intertidal area, and to have remained relatively constant over the last century since the fish traps were last recorded as being seen. There is a high possibility that these conditions are still present. Wooden fish trap stakes can be very well preserved for a long time, as shown by 4,500 years on the lower Fraser at Glenrose and St. Mungo archaeological sites (Eldridge 1991; Eldridge and Fisher 1997). Fish traps can also retain hundreds of thousands of stakes over a wide area, as shown by over 10,000 recorded stakes, and possibly hundreds of thousands of unrecorded ones in estuarine sand and mud in Comox Harbour (DkSf-43 siteform). The changes in drainage patterns before and after the causeways were built is significant. The drainage patterns show a stabilising and infilling pattern, so any archaeological stakes would be buried, and likely preserved, by the recent silt deposits.

Third, the fish traps in the current project footprint would have had to survive all stages of nearby causeway construction up to present, including initial construction in 1969. Dredging for sediment to construct the initial causeway took place in an area to the southeast, and not directly adjacent, such as occurred during construction of the nearby Tsawwassen Ferry terminal causeway (NHC-Triton 2004). Had dredging occurred directly adjacent to the Roberts Bank causeway there would be an extremely low possibility of fish trap stakes surviving. It is not known to what degree the subsurface was disturbed during causeway construction.

Considering these factors together, this study finds that there is moderate potential for fish trap remains to be present in the intertidal zone within the Project footprint.

Figure 8 Area of Intertidal Zone with Moderate Potential for Fish Trap Remains and Location of Historic Drainage



6.0 PRELIMINARY IMPACT ASSESSMENT

6.1 ONSHORE

As the onshore area has undergone extensive development related to causeway and rail yard construction and the footprint is very small, it is not expected that any cultural materials are present. Impacts are therefore expected to be nil for the tie-in of the lead track.

6.2 SUBTIDAL

As discussed in the Evaluation of Archaeological Potential (**Section 5.2** and **5.3**), the deep water and subtidal areas are not expected to contain archaeological deposits. Impacts are therefore expected to be nil to low.

6.3 INTERTIDAL

The level of risk that archaeological features would be impacted negatively by construction activities related to causeway widening is dependent on the construction technique utilised, although some level of impact would be expected in all scenarios (assuming that some fish trap stakes actually remain within the potential impact area). The construction techniques that will be used to create the perimeter dyke and remainder of the causeway expansion within the intertidal zone are not yet established, but the risks of impacting sites using two general potential construction methods are outlined below.

6.3.1 Excavation followed by fill

If causeway construction activities involved any deep disturbance or excavation of the subsurface sediments in the intertidal zone, impacts to fish trap remains would result in destruction of the feature within the excavated area. Due to the large size of the features and their unknown distribution, parts of the same feature are likely to extend beyond the project footprint. These parts of the feature would remain un-impacted by causeway construction and afford an opportunity for future study, so this possible negative impact is moderate.

6.3.2 Capping with fill

If remains are avoided by excavation, they could be nevertheless indirectly impacted by causeway construction by compacting or drying underlying sediments. Compaction could crush or splinter wood stakes. Covering large areas with fill could cause underlying sediments to dry. With anaerobic conditions removed, any preserved fish trap stakes would quickly biodegrade.

Causeway widening involving construction of a perimeter dyke followed by infilling will likely involve direct import of sediment via barge from offshore. Sediments could be deposited on top of the existing surface, essentially capping the current and historic surfaces. The area between the causeway and perimeter dyke would then be filled and compacted as necessary.

While this approach would avoid any direct impact to sediments, the indirect impacts associated with compaction and saturation levels could apply. In addition, those parts of the features will be essentially inaccessible for future archaeological study or preservation. However, as mentioned in **Section 6.3.1** parts of the feature outside the Project footprint would remain un-impacted and available for future study, so this possible negative impact is moderate.

7.0 IMPLICATIONS FOR FURTHER WORK AND RECOMMENDATIONS

It is recommended a Chance Finds Procedure should be put in place for all construction work.

7.1 ONSHORE

No further archaeological work on the onshore parts of the facility are recommended, provided the footprint remains the same as present.

7.2 SUBTIDAL

Proposed construction activities in the subtidal zone that would impact any archaeological material, such as dredging, cannot be effectively inventoried or monitored for the presence of archaeological material. Due to this factor, and the very low archaeological potential in the subtidal zone, no further work is recommended for the subtidal areas including the marine terminal expansion, berth pocket, and temporary offshore sediment holding area.

7.3 INTERTIDAL

Typically, an Archaeological Impact Assessment would be recommended in areas with moderate archaeological potential. However, while portions of the intertidal zone within the project footprint retain moderate potential, a conventional AIA is not considered a necessary step ahead of Project initiation due to the following considerations.

7.3.1 AIA Considerations

Several of the outcomes that an AIA is designed to address are already known, including the type of archaeological remains expected, the likely level of impact, and an appropriate strategy for mitigating impacts if any archaeological materials do, indeed, exist.

The inventory stage of an AIA involves establishing the nature and distribution of archaeological material in the Project area. Based on background research and the PFR, the nature of any such material can be predicted with great confidence to be the organic remains of fish traps. The distribution of material is not known, but the wooden stakes are expected to form very long, very narrow lines. An assessment of impacts, while not specific to an inventoried site, is expected to be identical to the considerations of the preliminary impact assessment (**Section 6.0**), and different impacts would be expected based on the construction techniques eventually used. The primary unknown impact, from fill indirectly impacting due to drying and sediment compaction, would not be better understood with the results of an AIA.

One of the primary opportunities typically presented by an AIA is for project redesign. Redesign would likely require a major diversion of the causeway and, if a diverging line of stakes is present, may simply offset the impact. Discussions with PMV suggest that project redesign is unlikely to be a feasible option at this point.

The other opportunity afforded by an AIA is for mitigation ahead of project construction. In this instance, the methods and extent of work necessary to record and conserve archaeological material to an appropriate degree would be identical to the methods and extent of work required in the alternative recommendations provided below. However, depending on the construction technique eventually used, the methods may not be feasible.

7.3.2 Further Work in Intertidal Zone

While this study does not consider that an AIA is a necessary follow-up to this AOA, it is recommended that further work be considered if a feasible and cost-effective inventory/mitigation plan can be devised.

7.3.3 Capping

Creation of a perimeter dyke and subsequent infilling by dumping and compacting sediment directly on the existing surface would not allow for monitoring, since the recently deposited silts that cover any potential cultural materials would continue to cover them during construction, and there would be no opportunity to view deeper deposits. Instead, a combined inventory and mitigative approach could be considered. This approach would fulfill the inventory aspect of an AIA and supplement it with a direct to mitigation process, essentially combining the relevant aspects of both AIA and mitigative data recovery procedures. The feasibility of this work has not been determined, but the following scenarios are presented.

If a perimeter dyke was constructed and the area between the existing causeway and the dyke drained, a backhoe or bladed machine could excavate a series of trenches, or a single continuous trench, along the potential area (within the potential area surrounding the tidal channel as shown in (**Figure 8**). If fish trap remains were to be encountered, steps would be taken to concurrently inventory and mitigate. This would involve expanding the excavated area along the orientation of the feature, recording and collecting stakes as described above.

If construction techniques do not allow for a machine excavation after creation of the perimeter dyke, similar work could be completed prior to construction of the dyke near the tidal channel. This work would be more expensive compared to working behind a perimeter dyke and might require Department of Fisheries or other environmental permitting as sediment release during excavation would be expected. The work would likely involve an excavator on pontoons.

Mitigation would consist of mapping the location and collecting stakes as they became visible, radiocarbon dating a sample of the stakes, and applying conservation methods to preserve the stakes. Mapping and collecting stakes would be minimally disruptive to construction.

7.3.4 Excavation

Causeway construction activities involving any deep disturbance or excavation of the subsurface sediments in the intertidal zone are not currently expected. However, should such activities take place in the vicinity of the historic drainage channel they should be monitored (the potential area shown in (**Figure 8**). If any material was identified, it is recommended that mitigation would take place as described in **Section 7.3.3**.

8.0 LIMITATIONS

The current study is concerned with the management of archaeological sites which may be affected by the proposed development. Unidentified cultural deposits may be present within the Project area. In keeping with best practices, if unanticipated archaeological remains are encountered during construction or land-altering activities, the proponents is advised to halt work in the immediate area and contact a professional archaeologist and the appropriate regulatory agency.

9.0 PROFESSIONAL STATEMENT

The information contained in this report has been compiled specifically for the project as defined by the proponent, Port Metro Vancouver, and discussed herein. Any subsequent changes to the proposed Project may not be addressed by the current archaeological study and additional studies may be appropriate.

The information compiled in this report has been prepared in accordance with the standards of the BC Association of Professional Archaeologists and Federal guidelines for heritage management. This report has been prepared by Millennia Research Limited staff and reviewed by a senior archaeologist (see signatories below).

Millennia Research Limited

Signature:

Roger Eldridge, BA
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Senior Archaeologist

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APPENDIX 28-B

Rationale for Exclusion of Other Certain and Reasonably Foreseeable Projects and Activities in the Cumulative Effects Assessment of Archaeological and Heritage Resources

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Appendix 28-B Rationale for Exclusion of Other Certain and Reasonably Foreseeable Projects and Activities in the Cumulative Effects Assessment of Archaeological and Heritage Resources

The assessment included consideration of the potential for an interaction between a potential Project-related residual effect on archaeological and heritage resources and the effects of other certain and reasonably foreseeable projects and activities on that VC. **Table 28-B1** presents the rationale for exclusion from the cumulative effects assessment of each certain and reasonably foreseeable project and activity identified in **Table 8-8 Project and Activity Inclusion List** of **Section 8.0 Effects Assessment Methods**.

Table 28-B1 Rationale for Exclusion of Other Certain and Reasonably Foreseeable Projects in the Cumulative Effects Assessment of Archaeological and Heritage Resources

Other Certain and Reasonably Foreseeable Project /Activity	Rationale for Exclusion
Project	
BURNCO Aggregate Project, Gibsons, B.C.	No likely interaction due to distance from Project area
Centerm Terminal Expansion, Vancouver, B.C.	No likely interaction due to distance from Project area
Fraser Surrey Docks Direct Coal Transfer Facility, Surrey, B.C.	No likely interaction due to distance from Project area
Gateway Pacific Terminal at Cherry Point and associated Burlington Northern Santa Fe Railway Company Rail Facilities Project, Blaine, Washington	No likely interaction due to distance from Project area
Gateway Program - North Fraser Perimeter Road Project, Coquitlam, B.C.	No likely interaction due to distance from Project area
George Massey Tunnel Replacement Project, Richmond and Delta, B.C.	No likely interaction due to distance from Project area
Kinder Morgan Pipeline Expansion Project, Strathcona County, Alberta to Burnaby, B.C.	No likely interaction due to distance from Project area
Lehigh Hanson Aggregate Facility, Richmond, B.C.	No likely interaction due to distance from Project area
Lions Gate Wastewater Treatment Plant Project, District of North Vancouver, B.C.	No likely interaction due to distance from Project area
North Shore Trade Area Project – Western Lower Level Route Extension, West Vancouver, B.C.	No likely interaction due to distance from Project area
Pattullo Bridge Replacement Project, New Westminster and Surrey, B.C.	No likely interaction due to distance from Project area

Other Certain and Reasonably Foreseeable Project /Activity	Rationale for Exclusion
Southlands Development, Delta, B.C.	No likely interaction due to distance from Project area
Vancouver Airport Fuel Delivery Project, Richmond, B.C.	No likely interaction due to distance from Project area
Woodfibre LNG Project, Squamish, B.C.	No likely interaction due to distance from Project area
Activity	
Incremental Road Traffic Associated with RBT2	No likely interaction given nature of activity, e.g., no effects to sub-surface deposits
Incremental Train Traffic Associated with RBT2	No likely interaction given nature of activity, e.g., no effects to sub-surface deposits
Incremental Marine Vessel Traffic Associated with RBT2	No likely interaction given nature of activity, e.g., no effects to sub-surface deposits