Parks Canada Basic Impact Analysis

1. PROJECT TITLE & LOCATION

Alma Shoreline Protection, Fundy National Park.

The project site is located along the shoreline parallel to the Bay of Fundy and NB Highway 114 in Fundy National Park, Alma, New Brunswick. The project site coordinates are 45.597239°N, 64.948640°W (see Figures 1 and 2 for the project location).

2. PROPONENT INFORMATION

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3. PROPOSED PROJECT DATES

Planned commencement:
2017-11-21

Planned completion:
2018-05-31

4. INTERNAL PROJECT FILE

NBSouth-2017-EIA-18

5. PROJECT DESCRIPTION

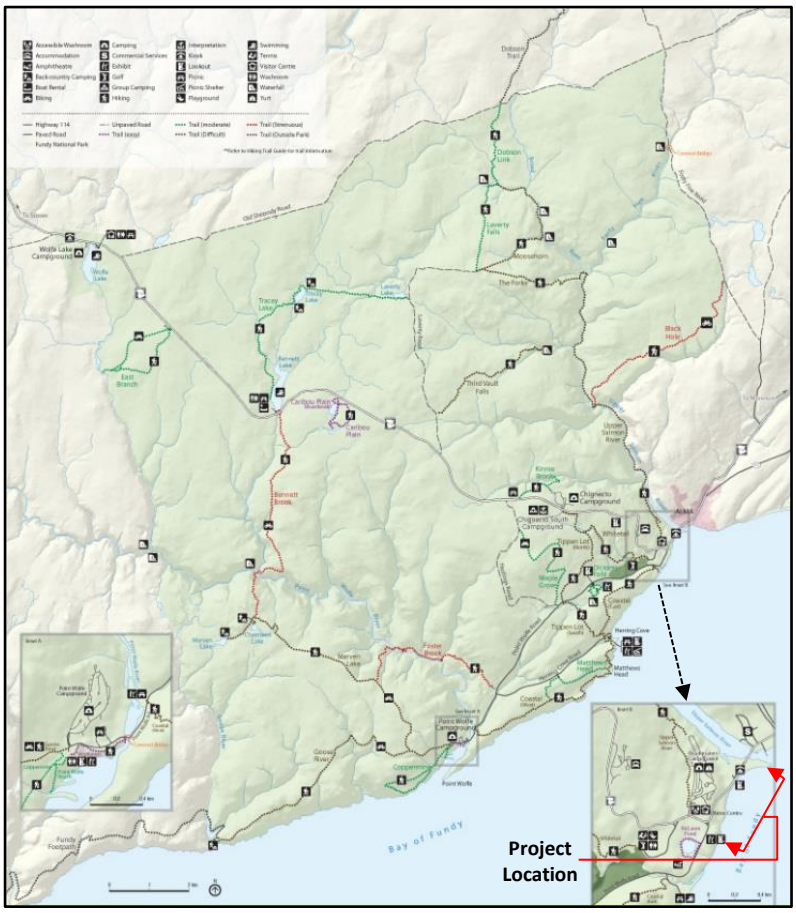


Figure 1: Project Location

Highway 114 is the main transportation route connecting Albert with Kent and Westmorland Counties in the southeast corner of New Brunswick. Approximately 20.6 km of this highway passes through the Fundy National Park and it is the main through-way that links the park to other roads in the provincial network. This section of highway is federally owned and operated by Fundy National Park (Parks Canada). It is managed and maintained in accordance with the adjacent provincial Highway 114 standards that is operated and managed by the New Brunswick Department of Transportation and Infrastructure.

The East Gate entrance is one of two entry points into the park and the only gateway connecting Fundy National Park to the village of Alma. Visitors entering this gateway arrive at the Headquarters area of the park where many of the front country services are located. Reconstructed in 2015, this section of Highway 114 is located on a sediment bar on the delta of the Upper Salmon River (Figure 2). Tides on the Bay of Fundy can reach up to 12 m in this area. At high tide, the shoreline is exposed to prevailing Bay of Fundy waves from the southwest. In addition, potential impact to the shoreline greatly increases when high tide coincides with heavy wave and wind activity.

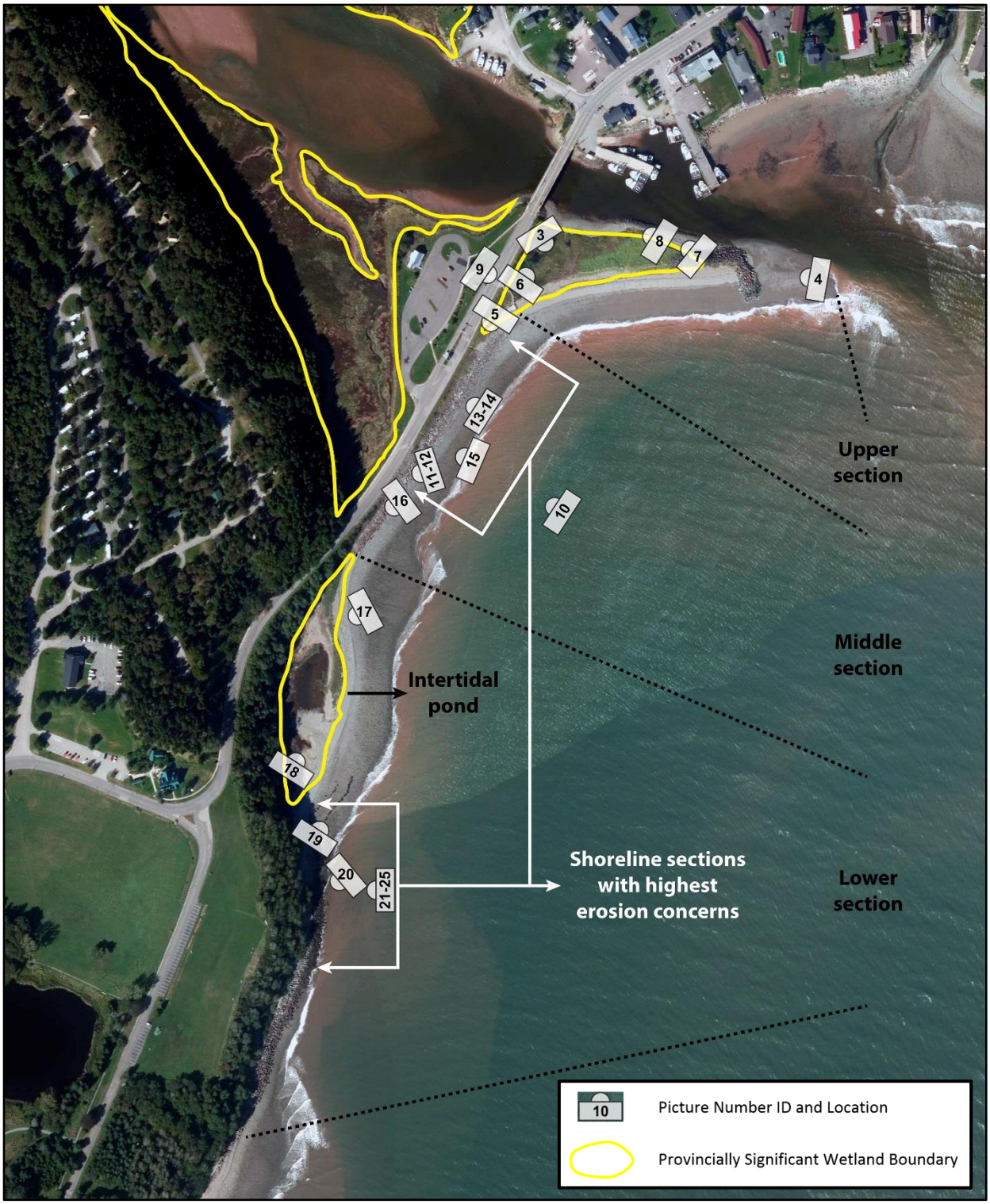


Figure 2: Vertical photography (2013) of the project location, wetlands are delimited in yellow (SNB).

Facilities/attractions in the area of the East Gate entrance/Headquarters of the Fundy National Park include the Headquarters Campground, the Visitor Reception Centre, an outdoor amphitheatre, viewpoints, interpretation panels, heated salt water swimming pool, playground and golf course.

The shoreline near the East Gate entrance presents extensive damage and erosion from previous storms and wave action along the Bay of Fundy coast which have weakened the armour stone and its ability to protect the land and the nearby NB Highway 114. Over the years, previously existing armour rock has been displaced and sediment washed into the Bay of Fundy, while structures such as the beach access boardwalk have been damaged, and debris and rocks left on the road from water overwash.

To minimize the threat of a complete or partial road failure and to ensure the safety of the public, emergency repairs have been conducted each time significant damages occur along a section of highway that is greatly impacted by wave activing causing shoreline erosion adjacent to the road embankment. Following two back to back storms (the first on December 30, 2016 and the second on January 11, 2017), emergency repairs were scheduled for early 2017 but were never implemented. The storms caused the largest of armour stone to shift leaving the embankment exposed to further erosion, presented visible undermining of the embankment in a number of places, and exposure of two drainage culverts.

Continued emergency repair measures are costly but necessary to stabilize the road embankment and protect the road from future damages. In the past, mitigation measures have included the placement of varying size armour stone adjacent to the shoreline to protect the expose embankment. Some armour stone have measured up to 1.5 m in diameter. The park continues to monitor and maintain this section of highway.

The proposed project entails a long-term solution to the erosion problem by minimizing cumulative storm damage mitigation costs, while maintaining the natural beauty of the site for continued visitor enjoyment at the Park entrance. A consulting team was commissioned by Parks Canada to investigate the causes of the problem and recommend solutions with conceptual coastal engineering design. The scope of this proposed project was designed to upgrade the entire extent shoreline protection in order to prevent further erosion of the embankment and ensure continuous safe access to the park via its east entrance.

The project area was visited on July 27, 2017. The impacted land extend approximately 1.2 km along a shoreline primarily made of beach rock mixed with mud and sand (Figures 2-3). The upper section consists of a recently extended breakwater which separate the beach from the mouth of the Upper Salmon River and the Alma DFO-SCH (Figure 4). The breakwater extends from a partially vegetated area registered as a provincially significant wetland (Figures 5-6). Semi-buried wood piles from an old cribwork are also visible on the northern side of the land from which the breakwater extends (Figures 7-8).

A walkway terminating with a viewing platform (Figure 9) delimits the southern end of the wetland with the beginning of the middle section of the shoreline (Figure 10). This section of the shoreline shows major signs of erosion, with altered vegetation and exposed soil along the coastal banks (Figures 11-14). The existing armour stone also shows alteration by erosive forces that have reshaped the shoreline's profile and exposed the under layers of the armour stone foundation, including fabric and corrugated drainage pipes (Figures 13-14).

The southern end of the middle section is less impacted by erosion and the existing armour stone still provides adequate protection for the shoreline (Figures 15-16).

The northern part of the lower section consists of a large intertidal pond, which covers an area of approximately 5,000 m^2 (Figures 17-18).

Figure 3: Panoramic view of the project location from the breakwater

Figure 4: Panoramic view of the breakwater at low tide with the Upper Salmon River and the harbour of Alma on the right side.

Figures 5-6: View of the vegetation covering the upper land of the breakwater

Figures 7-8: View of the old cribwork along the Upper Salmon River

Figure 9: View of the walkway and deck facing the Bay of Fundy

Figure 10: Panoramic view of the middle section of the shoreline that runs along the provincial highway 114 (Note the viewing platform in the right side of the picture)

Figures 11-12: View of the altered vegetation and exposed soil along the coastal banks

Figures 13-14: View of the exposed corrugated drainage pipes and fabric layers

Figures 15-16: View of the southern end of the middle section

Figures 17-18: View of the intertidal pond

Figures 19-20: View of the armour stone near the intertidal pond

From the mouth of the pond, the shoreline is covered by two lines of single armour stone which extend from a long armour stone wall and its associated steel sheet piling (Figures 19-20). This area is heavily impacted by erosion with collapsed sections and steep slopes where natural vegetation was torn away (Figures 21-23).

Most of the steel sheet piling retaining wall is highly corroded, unearthed, deformed and/or detached from the remaining wall still in place, exposing rods and sharp metal edges which present a potential health and safety concern to the public (Figures 24-25).

The remaining lower section was not visited during the site visit due to tide access restrictions.

Figure 21: Panoramic view of the armour stone and its steel sheet piling

Figures 22-23: View of the eroded cliff

Figures 24-25: View of the deteriorated steel sheet piling

The proposed scope of work involves the complete rebuild of the shoreline protection. The specific scope of work will consist of, but will not necessarily be limited to, the following:

- Construct a temporary access road and install snow fencing to delineate the area of work. Temporary crushed gravel will be installed from Highway 114 to Alma Beach to allow a tracked excavator to access the beach without damaging the concrete curb and beach area. Geo-fabric will be placed under the gravel driveway to prevent the gravel material from damaging the grass and beach habitat.
- Removal and disposal at a provincially-approved location of any existing fabric, steel sheet piles and tie rods that will be covered within the new armourstone limits.
- Extend four drainage pipes so they will terminate within the extents of the armourstone.
- Laying of a geogrid beneath the shoreline protection works to provided added stability and strength. Excavations along the shoreline will be undertaken where necessary to allow for the placement of erosion protection structures.
- Building of the erosion protection structures which will consist of two layers of 3-5 tonne armourstone measuring 2.3 m in thickness atop two layers of 300-500 kg filter stone measuring 1 m in thickness. Core stone will be placed where needed along some sections of the works prior to laying of the filter stone material. Some sections of the shoreline may only require the installation of one layer of the armourstone (minimum 1.1 m thick) atop existing armourstone.
- "Toeing" of the armourstone into the beach at a depth of 1 m with either screened beach or excess excavated cobble material or excavated cobble material placed atop the toe of the finished structure.
- Removing the existing observation platform and partial boardwalk and installation of a new wooden boardwalk which will include two observation platforms and galvanized wire fencing. Each of the observation decks and sections will be mounted on helical screw foundation.
- Removal of the temporary access road and associated material (including snow fencing) and restoration of any damaged areas during the construction process.

All work is to be completed at low tide. Please refer to Appendices II and III for an existing condition site plan and proposed site plans and cross-sections of the works.

It is important to note that the design of erosion protection works incorporates the allowance of water flow to the intertidal pond in order to maintain the function of this wetland system.

Project Timing

The project is expected to go to tender in autumn 2017. Following the tender period the successful contractor will provide a more detailed construction schedule. Mitigation measures are in place to reduce or eliminate adverse effects. The anticipated construction dates will be from late 2017 until May 2018.

Indigenous Setting

Fundy National Park falls within traditional Mi'gmag territory called Sikniktewag ("drain-age area"). The Mi'gmag, Wolastoqiyik (Maliseet) and Passamaquoddy Aboriginal peoples have a long history in the greater Fundy region and consider the area part of their traditional territory. There is currently no documented evidence of Aboriginal presence within the park, possibly due to European settlements being built on top of previously occupied Aboriginal settlements (Parks Canada, 2011).

The Project location, New Brunswick, is located in lands governed under the Peace and Friendship Treaties of 1725-1779. On July 15, 1976, the Mi'gmag and Maliseet Aboriginal people of New Brunswick petitioned Her Majesty Queen Elizabeth regarding their traditional Aboriginal rights and lands. At that time, Canada was already funding research for the New Brunswick Indians' asserted claim, but it was not accepted for negotiation until after the 1999 Marshall decision. On September 17, 1999, the Supreme Court of Canada found that the Treaties of 1760-61 affirmed the rights of the Mi'kmaq and Maliseet signatories to hunt, fish and gather to the extent of a "moderate livelihood". Canada subsequently resolved to begin a long-term process that considered both the Aboriginal and treaty rights of the First Nations in New Brunswick.

The closest First Nation Reserve (Fort Folly Indian Reserve NO.1) is located approximately 48 km northeast of the shoreline project area. The second closest First Nation Reserve (SOEGAO Indian Reserve NO.35) is located approximately 55 km northwest of the project area. The project is not anticipated to have any potential infringement on Aboriginal rights and interest due to its limited scope of work.

Other Departments Involved

The following other Federal Departments are also involved in this project:

- Department of Fisheries and Oceans-Fisheries Protection Program (DFO-FPP): The project was referred to DFO-FPP for review. The proponent will comply with all/any of the conditions of the FPP letter/approval.
- Transport Canada, Navigation Protection Program (NPP) and Environmental Affairs and Aboriginal Consultation Unit (TCEA): The scope of the work requires a Notice to the Minister subsequent to the Navigation Protection Act.
- New Brunswick Department of Environment and Local Government: A Watercourse and Wetland Alteration Permit is required for the installation of the boardwalk and observation platforms. The proponent will comply with all/any of the conditions of the letter/approval.

6. VALUED COMPONENTS LIKELY TO BE AFFECTED

The Effects Identification Matrix located in Appendix I identifies environmental components likely to be affected by this project. The components most likely to be impacted include air, soil/landforms, water, flora, fauna, cultural resources and visitor experience.

6.1 Air quality

Air quality is influenced by the concentrations of air contaminants in the atmosphere. Air contaminants are emitted by both natural and anthropogenic sources and are transported, dispersed, or concentrated by meteorological and topographical conditions. Air contaminants eventually settle or are washed out of the atmosphere by rain and are deposited on vegetation, livestock, soil, water surfaces, and other objects. In some cases, contaminants may be redistributed into the atmosphere by wind.

The nearest air quality monitoring station from the project site was located at Alma. This station monitored ground ozone level (O_3) and acid rain which is derived by measuring the annual sulphate (SO_4^{2-}) and nitrate (NO_{3-}) wet deposition. In 2014, last year before this monitoring station was decommissioned, the mean ozone concentration on a one-hour average was approximately 26.5 parts per billion (ppb), well below the one hour standard of 82 ppb. Between 2005 and 2010, the annual sulphate and nitrate wet deposition has significantly decreased from a maximum of 436.28 equivalents per hectare per year (eq/ha/yr) to a mean value of 229 eq/ha/yr which was maintained until the end of December 2014.

The monthly wind roses for the project area show that prevailing winds are from the Northwest, West, South and Southwest directions with seasonal variations. Summer winds are generally below 40 km/h and from the Southwest. Winter winds are generally much stronger (> 50 km/h) and predominantly from the Northwest (CBCL, 2017). Considering that the project activities will be conducted during the winter 2017-2018, the air quality for the project area may be affected by northern source of air pollution generated from anthropic activities. The nearest (60 km north) air quality monitoring station from the project site is located in Moncton. This station monitors ground level ozone (O_3), fine particulate matter (FPM), carbon monoxide (CO) and nitrogen dioxide (NO_2). Overall the air quality for the 2014 annual survey was in compliance with Canadian Ambient Air Quality Standards (NBDELG, 2016).

6.2 Soil/Landforms/Physical Environment

Fundy National Park is located within the Atlantic maritime ecozone and extends mostly inside the Southern New Brunswick Uplands ecoregion which forms a 40-km-wide band that runs parallel to the Bay of Fundy and along the United States border to the Saint John River valley (Ecological Stratification Working Group, 1995). Inside this ecoregion, the northern part of Fundy National Park is found inside the Caledonia ecodistrict which is characterized by a broad upland plateau situated along the upper Bay of Fundy. The southern part of Fundy National Park, where the shoreline is located, is part of the Fundy Coast ecoregion which covers a narrow coastal strip along the Bay of Fundy in New Brunswick and Nova Scotia (Ecological Stratification Working Group, 1995).

The landscape of the Fundy Coast ecoregion owes much of its scenic diversity to the varied types of bedrock, from seaside salt marshes and estuaries to towering cliffs overlooking the Bay of Fundy (Zelazny, 2007). Mean elevation is under 100 m, although some coastal cliffs can reach over 300 m. All rivers in the ecoregion flow into the Bay of Fundy or one of its subsidiary bays and basins. Some rivers meet the ocean directly as waterfalls or swift streams, whereas others enter more gently through coastal estuaries or marshes before mingling with the salt water (Zelazny, 2007). Its proximity with the Atlantic Ocean strongly influence its climate with high winds, high humidity, and fog. Summers are usually cool and wet while winters are mild and wet with most precipitation falling as rain (Ecological Stratification Working Group, 1995).

Canadian Climate Normals (1981-2010) for nearby Alma weather station (45°36’ N; 64°57’ W) indicate that the project area receives an average of 1,510.1 mm of precipitation annually and experiences measurable precipitation (>= 0.2 mm) 171.5 days per year. Extreme precipitation events of up to 179.1 mm have been recorded. The temperatures range from an extreme minimum of -31.0°C to an extreme maximum of 35.5°C with an annual daily mean temperature of 5.7°C (Environment Canada, 2017a).

Surficial geology maps identifies the surrounding land area of the shoreline as being made primarily by Late Wisconsinan morainal sediments which consist of lodgment till, ablation till, and associated sand and gravel deposited directly by Late Wisconsinan ice or with minor reworking by water (Rampton, 1984). Blanket soil is generally expected to be mainly stony till (more than 35 % of clasts pebble-sized and larger). Bedrock in the area consists of a mixed of Early (Mabou Group) and Late Carboniferous (Cumberland Group) stratified rocks (NBDTR, 2008).

According to the Resource Description and Analysis the soils in this area, the Outwash Terrace, tend to be the deepest in the park and well drained. Soil series are mainly split between Gagetown gravelly sandy loam and Parleeville gravelly loam. Soils beneath Highway 114 would have been manipulated during different phases of construction. Armour rock have been imported and placed along the shoreline to protect and stabilize the road embankment.

6.3 Water/Hydrology

Highway 114 at the East Gate entrance is bounded by the Bay of Fundy on one side and the Upper Salmon River and salt water marsh on the other. Waters from the Upper Salmon River empty into the Bay of Fundy. As previously noted, tides can reach 12.0 m in the Alma area of the Bay of Fundy. The mean tidal range of the nearby Chignecto Bay (Cape Chignecto to Martin Head) is approximately 9.6 m with a maximum value of approximately 13.0 m. The mean tidal volume reaches 9,752.71x106m3 with a mean tidal current of 0.56 m/s which peak at 0.88 m/s (Gregory et al., 1993). Both the bay and the river are influenced by the tidal cycle which rise and fall twice in a 24 hour period. Coastal access to the eroded section of embankment highway and work schedule will be restricted by the tide cycle.

No instream work is proposed for this project, some sections of the revetment will be constructed below the Ordinary High Water Mark (OHWM), but none will extend below the Ordinary Low Water Mark (OLWM) and work will always be conducted in the dry at low tide. Fisheries and Oceans Canada - Fisheries Protection Program (DFO-FPP) has reviewed the proposed project scope and indicated that the project is not likely to cause serious harm to fish with the implementation of mitigation measures (Appendix V). Mitigation measures identified in Section 8 of this document must be adhered to and every effort should be taken to minimize negative impact to aquatic species and habitat.

6.4 Flora

Fundy National Park is home to more than 800 species of vascular plants (fern, clubmosses, flowering plants), 270 bryophytes species (mosses and liverworts), and 400 species of lichens.

Through the Fundy Coast ecoregion, the shoreline project area is more precisely located inside the Fundy Coastal ecodistrict which comprises the southern coastline of New Brunswick along the Bay of Fundy from east Passamaquoddy Bay to Shepody Bay. It also encompasses the Western Isles, including Campobello, Deer, and Grand Manan islands. The cool and wet climate has created a forest composition with many boreal elements, except for the prominence of red spruce (*Picea rubens*). Forest stands on higher plateaus in the east consist almost solely of pure red spruce. Elsewhere, forests comprise a mixture of red spruce with white spruce (*Picea glauca*) and black spruce (*Picea mariana*), or balsam fir (*Abies balsamea*) with some red maple (*Acer rubrum*), white birch (*Betula papyrifera*), and yellow birch (*Betula alleghaniensis*). Typically, black spruce is associated with the margins of bogs and wet areas; white spruce is the predominant spruce species in a narrow band along the shoreline and on abandoned pastures and fields. Trembling aspen (*Populus tremuloides*), a native species to the Fundy National Park, can also be found near the project area (Zelazny, 2007).

Ground vegetation adjacent to Highway 114 at the East Gate consist of roadside grass mixtures which are most likely non-native species. Vegetation species in this area include but not limited to saltwater cordgrass (*Spartina alterniflora*), beach pea (*Lathyrus japonicus*), rose species (*Rosa* sp.), dune grass (*Leymus mollis*), beach grass (*Ammophila breviligulata*), hairy flat-top white aster (*Doellingeria umbellata*), evening primrose species (*Oenothera sp.),* trembling aspen (*Populus tremuloides*), speckled alders (*Alnus rugosa*), and searocket (*Cakile* sp.).

The project location is located near four provincially significant wetlands (Figure 2), with the closest one on the upper land where the breakwater is connected. Only a portion (~50 %) of this upper land is covered with coastal vegetation, the remaining being mostly made of a sandy area facing the bay and a rocky shoreline along the Upper Salmon River where semi-buried wood piles from an old cribwork are visible. The second wetland in the project area is identified as an intertidal pond in the northern part of the lower section of the shoreline. This wetland contains Roland's seablite (*Suaeda rolandii*) a globally rare aquatic plant which requires brackish water to thrive (Figures 26-27). This herbaceous species has a woody taproot.

It is normally erect or ascending and single-stemmed, up to 70 centimeters tall, and branching only from the upper stem. The leaves are fleshy and succulent, linear, and up to 3 centimeters long. The flower heads are distributed throughout the main stem and lateral branches. The sepals are hooded and keeled, somewhat unequal, and 2 to 4 millimeters wide (FNA, 2003). In order to provide the most optimal habitat for this species the design of the shoreline erosion protection works allows for water flow to the intertidal pond.

Figures 26-27: Example of habitat and stems of Roland's seablite (*Suaeda rolandii*) (FNA, 2003)

The remaining wetlands are located on the other side of the provincial Highway 114 along the Upper Salmon River. Although not directly within the project limits, the wetland near the parking lot on the right shore of the river, is considered a salt marsh and could be indirectly affected by the project activities.

Fundy National Park is currently monitoring the abundance, distribution and spread of several invasive plant species including woodland angelica (*Angelica sylvestris*). A small population of woodland angelica was located adjacent to the east gate parking lot in 2015. Efforts have been taken by the park to eradicate the population but it is likely that a seed source remain in the area. This species is considered highly invasive given the potential treat to spread and outcompete native vegetation.

6.5 Fauna

6.5.1 Mammals

Over 38 species of mammals reside in Fundy National Park. These mammal are diverse and are representative of the natural food chain, with species ranging from top carnivores to lower herbivores and scavengers. The mammals that are more likely to be encountered near the project area and which may have a potential interaction (direct or indirect) with the project are described in Table 1.

Table 1: List of fauna potentially encountered in the vicinity of the shoreline

Species		Habitat description	Home range (km²)
Common name	Scientific name		
Large fauna			
Moose	*Alces alces*	Mixed forests, particularly Balsam Fir and White and Yellow Birch forests, recently burned areas, clearcutting, swamps and ponds.	20 to 100

Black bear	*Ursus americanus*	Dense conifer-broadleaf forests, recently burned areas, shrubs, near wetlands, lakes and streams.	Male: 60 to 173
			Female: 5 to 50
White-tailed deer	*Odocoileus virginianus*	Abandoned fields, primary-secondary forests with mixed and hardwoods. In winter, coniferous stands.	Year round: 10 to 30
			Winter: 1 to 3
Small fauna - carnivorous			
Eastern coyote	*Canis latrans*	Rural and suburban areas, fields, bushes, woodlands and marshes	10 to 80
Raccoon	*Procyon lotor*	Mixed and deciduous forests, agricultural regions, fields bordered with hedges, bushes, or large forests, along watercourses and swamps.	Up to 80
Small fauna - rodents			
Eastern chipmunk	*Tamias striatus*	Well-drained broadleaved forests, fields, bushes and hedges.	0.1
Red squirrel	*Sciurus vulgaris*	Various habitats from coniferous forests to mixed sugar bush.	0.01 to 0.02
Small fauna - chiropter			
Little brown bat	*Myotis lucifugus*	Day roosts in buildings or trees, under rocks or wood piles and sometimes in caves. Nursery roosts in both natural hollows and in buildings. Night roosts in the similar structures as day roosts and where the bats pack together for warmth.	Up to 0.3

Scientific literature also confirmed that the park and to some extend the project area is potentially inhabited by many micromammals including the cinereus shrew (*Sorex cinereus*), the northern water shrew (*Sorex palustris*), the smoky shrew (*Sorex fumeus*), the arctic shrew (*Sorex arcticus*), the american pygmy shrew (*Sorex hoyi*), the northern short-tailed shrew (*Blarina brevicauda*), the star-nosed mole (*Condylura cristata*), the deer mouse (*Peromyscus maniculatus*), the southern bog lemming (*Synaptomys cooperi*), the Gapper's red-backed vole (*Myodes gapperi*), the meadow vole (*Microtus arvalis*), the norway rat (*Rattus norvegicus*), the house mouse (*Mus musculus*), the meadow jumping mouse (*Zapus hudsonius*) and the Woodland jumping mouse (*Napoeozapus insignis*) (Desrosiers *et al.*, 2002).

6.5.2 Avifauna

Fundy National Park is well positioned on the Atlantic migration route, and over 260 bird species have been identified in the park or on the adjacent bay. The Maritime Breeding Bird Atlas identifies a total of 96 species of birds in the geographical block which contains the shoreline (20LR45), 34 of which are listed as confirmed for breeding in the vicinity of the project area (IBA Canada, 2017).

The project site is located less than 10 km southwest of the Shepody Bay West Important Bird Area (IBA), which form a large tidal embayment at the western head of the Bay of Fundy and encompasses an area of 290.63 km^2 (Birds Studies Canada, 2017). This site has importance due to its mudflats and tidal marshes at the head of the Bay of Fundy which are considered one of the most important stopover sites for shorebirds in eastern North America, especially the semipalmated sandpipers (*Calidris pusilla*) and the endangered piping plover (*melodus* subspecies – *Charadrius melodus melodus*).

6.5.3 Fish

In the immediately adjacent waters of the Bay of Fundy, there are Lobster (*Homarus americanus*), Scallop (*Placopectin magellanicus*), and Rock Crab (*Cancer irroratus*) fishing grounds. Clam beds are noted as existing adjacent to the project site, while Periwinkles (*Littorina* sp.) are harvested along the coast, approximately 500 m east of the harbour.

The upper section is located at the mouth of the Upper Salmon River which contains populations of several anadromus, catadromous and freshwater fish including: Atlantic salmon (*Salmo salar*), Brook Trout (*Salvelinus fontinalis*), American Eel (*Anguilla rostrata*), Rainbow Trout (*Oncorhynchus mykiss*), White Perch (*Morone americana*), and Rainbow Smelt (*Osmerus mordax*).

6.5.4 Herpetofauna

Eighteen species of reptiles and amphibians have been identified in the park. Five of these species are considered rare; these include the Leopard frog *(Lithobates pipiens*), the Ring-neck snake (*Diadophis punctatus*), the Four-toed salamander (*Notophthalmus viridescens*), northern Dusky salamander (*Desmognathus fuscus*), and the blue-spotted salamander (*Ambystoma laterale*). The project location is not expected to have any impacts on those species.

6.5.5 Species at Risk

A search of the Atlantic Canada Conservation Data Centre database was conducted (ACCDC, 2017). The ACCDC provided a list of nationally and/or provincially rare/unique species (i.e. plants and animals) within a 5 km buffer zone (standard ACCDC procedures) of the site of the proposed work. All species were cross-referenced with Schedule 1 of the *Species at Risk Act* (SARA). Species at risk or of concern are listed in Table 2.

Table 2: Species at risk or of concern around the shoreline in Fundy National Park.

Scientific Name	Common Name	ACCDC Species Rank	General Description	Latest observation recorded	Status
Animals					
Riparia riparia	Bank Swallow	S2S3B	Bank swallows can be found in coastal areas, rivers, streams, and reservoirs. They nest in burrows in vertical banks where they form colonies. They are insectivorous, feeding in the air.	2014	COSEWIC: Threatened
Hirundo rustica	Barn Swallow	S3B	Before European settlement, the Barn Swallow's nesting habitat was mainly characterized by natural features such as caves, holes, crevices, and ledges associated with rocky cliff faces. Although Barn Swallows continue to nest in traditional natural situations, they are now most closely associated with human situations in rural areas. Such nesting sites include a variety of artificial structures that provide either a horizontal nesting surface (e.g., a ledge) or a vertical face, often with some sort of overhang that provides shelter.	2014	COSEWIC: Threatened

Scientific Name	Common Name	ACCDC Species Rank	General Description	Latest observation recorded	Status
Catharus bicknelli	Bicknell's Thrush	S2B	The thrush breeds mainly in high elevation, dense and stunted fir/spruce forests. Most populations are confined to altitudes of 914 m to the tree line on rocky peaks, but some scattered pairs breed down to 762 m. The subalpine forests favoured by this species are characterized by a wet, cool, windy climate that increases in severity with elevation. Average canopy height ranges from 3-7 m in New Brunswick. The species is an above-ground nester, building bulky, well-constructed nests in small or medium-sized spruce and fir (and sometimes, in alder, birch or striped maple). Most nests are built relatively close to the ground (1-4.5 m above ground level). Nest construction occurs in early June, shortly after the birds arrive on the breeding grounds. Clutches of 3-4 greenish-blue eggs, lightly spotted with brown, are laid around mid-June and are incubated solely by the females.	2007	COSEWIC: Threatened SARA: Schedule 1, Threatened
Dolichonyx oryzivorus	Bobolink	S3B	Bobolink nest primarily in field of forage crops (e.g., hayfields and pastures) dominated by a variety of species, such as clover, timothy, tall grasses, and broadleaved plants. Hayfields and associated pastures are its preferred habitat due to the plant cover present at the start of the nesting season. The bobolink is also known to use sites that have been restored to grassland habitat.	1977	COSEWIC: Threatened
Wilsonia canadensis	Canada Warbler	S3S4B	The Canada Warbler is found in a variety of forest types, but it is most abundant in wet, mixed deciduous-coniferous forest with a well-developed shrub layer. It is also found in riparian shrub forests on slopes and in ravines and in old-growth forests with canopy openings and a high density of shrubs, as well as in stands regenerating after natural disturbances, such as forest fires, or anthropogenic disturbances, such as logging. The Canada Warbler builds its nest on or very close to the ground, often in dense ferns or fallen logs.	1975	COSEWIC: Threatened SARA: Schedule 1 Threatened
Chaetura pelagica	Chimney Swift	S2S3B	The Maritimes Canadian Chimney Swift population is estimated at 900. The Chimney Swift spends the major part of the day in flight feeding on insects. Flocks can often be seen near bodies of water due to the abundance of insects. Prior to the arrival of European settlers in North America, Chimney Swifts nested mainly in the trunks of large, hollow trees, and occasionally on cave walls or in rocky crevices. However, due to the land clearing associated with colonization, hollow trees became increasingly rare, which led Chimney Swifts to move into house chimneys. However, it is likely that a small portion of the population continues to use hollow trees.	2011	COSEWIC: Threatened SARA: Schedule 1 Threatened

Scientific Name	Common Name	ACCDC Species Rank	General Description	Latest observation recorded	Status
Chordeiles minor	Common Nighthawk	S3B	The Common Nighthawk nests in a wide range of open, vegetation-free habitats, including dunes, beaches, recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and river banks. This species also inhabits mixed and coniferous forests. The Common Nighthawk arrives in Canada from early May to mid-June, where it produces one clutch per year. The species migrates to South America between mid-August and mid-September.	1977	COSEWIC: Threatened SARA: Schedule 1, Threatened
Contopus virens	Eastern Wood-Pewee	S4B	In the Maritimes, an analysis of breeding bird atlas point count data suggests that pewees are strongly associated with mature poplar and hardwood forest, with weaker associations with older pine, hemlock and other forest. At the landscape scale in the Maritimes, pewees are associated with the presence of marshes, lakes, ponds and rivers, and negatively associated with harvested forest, human-occupied areas and roads. In Canada, adults arrive on the breeding grounds mostly from mid-May to the end of May. Pair formation and nest building start soon after arrival. Nests are usually located on top of a horizontal limb in a living tree at heights between 2 and 21 m. Clutch size averages 3 eggs. Incubation lasts about 12 to 13 days, and nestlings fledge after about 16 to 18 days. Up to two broods can be produced per year. Generation time is estimated to be 2-3 years.	2009	COSEWIC: Special Concern
Myotis lucifugus	Little Brown Bat	S1	Little brown bat is the most widely distributed Canadian bat species. They roost in buildings, tree cavities, or any other dark, warm area they can find. They forage at night on flying insects and roost during the day. The population of little brown myotis in Canada has been reduced by over 75% in the last number of years as a result of White Nose Syndrome, caused by a fungus likely from Europe. Bats hibernate between October and May.	1983	COSEWIC: Endangered SARA: Schedule 1, Endangered
Myotis septentrionalis	Northern Long-eared Bat	S1	They are found primarily in forested habitats, especially boreal forests, since they typically roost in hardwood trees during the summer. During the spring and summer, northern long-eared bats spend the day roosting in trees or artificial structures, switching to a new roost every other day on average. In the fall, northern long-eared bats migrate to caves to hibernate. Depending on the latitude, this may occur at any time between September and November, and the bats emerge between March and May.	1983	COSEWIC: Endangered SARA: Schedule 1, Endangered
Contopus cooperi	Olive-sided Flycatcher	S3S4B	The Olive-sided Flycatcher is most often associated with open areas containing tall live trees or snags for perching. These vantage points are required for foraging. In the boreal forest, suitable habitat is more likely to be in or near wetland areas. Olive-sided Flycatchers arrive in Canada to breed between April and June, predominantly in mid- to late May.	1997	COSEWIC: Threatened SARA: Schedule 1 Threatened

Scientific Name	Common Name	ACCDC Species Rank	General Description	Latest observation recorded	Status
			Females choose the nest site, construct the nest (usually in a conifer) from twigs and rootlets, and lay one egg per day for an average clutch size of three (range of two to five). A single brood is raised each year. The fall migration begins in late July, with most birds travelling to the wintering grounds between mid-August and early September.		
Falco peregrinus anatum/tundrius	Peregrine Falcon - anatum/tundrius	S1B	The Peregrine Falcon is found in various types of habitats, from Arctic tundra to coastal areas and from prairies to urban centres. It usually nests alone on cliff ledges or crevices, preferably 50 to 200 m in height, but sometimes on the ledges of tall buildings or bridges, always near good foraging areas. Suitable nesting sites are usually dispersed, but can be common locally in some areas. In addition, structures built by humans in both rural and urban areas provide the Peregrine Falcon with other potential nesting sites. In the fall, most Peregrine Falcons migrate to the southern United States, Mexico, Central America and South America. However, some couples in coastal and northern areas may remain at the nesting site all winter if there is an abundant supply of food. This is particularly true for anatum Peregrine Falcons that nest in urban areas in Eastern Canada.	2014	COSEWIC: Special Concern SARA: Schedule 1, Special Concern
Calidris canutus rufa	Red Knot rufa ssp	S2M	Red Knots use different habitats during the breeding, wintering, and migration seasons. Nesting sites are usually located in dry, south-facing locations, near wetlands or lakes, where the young are led after hatching. Red Knots generally feed in damp or barren areas that can be as far as 10 km from the nest. Migratory stopovers and wintering grounds are vast coastal zones swept by tides twice a day, usually sandflats but sometimes mudflats. In these areas, the birds feed on molluscs, crustaceans, and other invertebrates. The species also frequents peat-rich banks, salt marshes, brackish lagoons, mangrove areas, and mussel beds.	1971	COSEWIC: Endangered SARA: Schedule 1, Endangered
Phalaropus lobatus	Red-necked Phalarope	S3M	Red-necked Phalaropes spend up to nine months at a time at sea. They nest in the low Arctic, on tundra ponds with marshy shores and bogs. During migration, large numbers gather at hyper-saline lakes before heading south. Many migrate over the open ocean, often within sight of land. Some migrate over land and can be seen on reservoirs, lakes, and coastal marshes. At sea, they gather at upwellings and convergence zones where food is brought to the surface. They are sometimes blown onshore by storms and during these times can be found anywhere, especially at sewage ponds.	1971	COSEWIC: Special Concern
Euphagus carolinus	Rusty Blackbird	S3B	The Rusty Blackbird nests in the boreal forest and favours the shores of wetlands such as slow-moving streams, peat bogs, marshes, swamps, beaver ponds and pasture edges. In wooded areas, the Rusty Blackbird only rarely	1998	COSEWIC: Special Concern SARA: Schedule

Scientific Name	Common Name	ACCDC Species Rank	General Description	Latest observation recorded	Status
			enters the forest interior. During the winter, the Rusty Blackbird mainly frequents damp forests and, to a lesser extent, cultivated fields. Migration begins in late August and lasts until early October.		1, Special Concern
Hylocichla mustelina	Wood Thrush	S1	In Canada, the Wood Thrush nests mainly in second-growth and mature deciduous and mixed forests, with saplings and well-developed understory layers. This species prefers large forest mosaics, but may also nest in small forest fragments. Wintering habitat is characterized primarily by undisturbed to moderately disturbed wet primary lowland forests. In Canada, most breeding adults arrive on the breeding grounds from mid-late May. Fledglings remain on their natal home range for 24-33 days before departing to the wintering range between mid-August and mid-September.	2003	COSEWIC: Threatened
Invertebrates					
Danaus plexippus	Monarch	S3B	Monarchs in Canada exist primarily wherever milkweed (Asclepius) and wildflowers (such as Goldenrod, asters, and Purple Loosestrife) exist. This includes abandoned farmland, along roadsides, and other open spaces where these plants grow. The eastern and western populations of the Monarch annually migrate south, beginning in August and continuing until mid-October.	2015	COSEWIC: Endangered SARA: Schedule 1, Special Concern

Although not listed in the ACCDC search, the following species are highly mobile and may occur near the project site:

- Populations of Atlantic salmon (*Salmo salar*) inhabit rivers as well as smaller brooks in New Brunswick. Individuals would be found seasonally in the lower river sections and coastal zone both as smolts migrating to feed in the sea, and as adults returning to rivers to spawn. The salmon of this area are part of the Inner Bay of Fundy (IBoF) population which is listed on Schedule 1 of SARA and COSEWIC as Endangered (DFO, 2010). The iBoF salmon are at very low levels and extirpations have occurred in several rivers. Juvenile salmon are present in rivers with Live Gene Bank (LGB) support, but densities are extremely low in rivers without support. Annual mortality of immature salmon at sea has increased alongside with annual mortality of post-spawning adults. Under present conditions, the population is highly unstable and without human intervention it is accepted that iBoF Atlantic salmon population will go extinct on the time scale of 10-15 years (DFO, 2004). Nowadays, with LGB support, the Upper Salmon River shows signs of increased juvenile salmon abundance which confirm that such program has slowed or halted the decline of Atlantic salmon in this river (DFO, 2010). Over the last 15 years, Fundy National Park has played an integral role in the Inner Bay of Fundy Atlantic Salmon Recovery program. Through this program the park has released fry, par, smolt and adult salmon into the Upper Salmon and Point Wolfe rivers and into the Bay of Fundy (adults only) with the objective of restoring viable populations to the Upper Salmon and Point Wolfe rivers. Therefore it is necessary that any construction activities in the vicinity of the Upper Salmon River should not coincide with the presence of salmon in the area, such as during their migration activities which occurs from early

spring to the end of October. Smolts and kelts generally migrate from the Upper Salmon River to the ocean during the months of April and May, while the adult Salmon migrate back to the river from mid-August to the end of October where they winter in the upper reaches of the Upper Salmon River. Taking into consideration the nature of the work and, the spatial and temporal extent of project activities which will occur when this species has already migrated to its wintering ground, interaction of the project with this species or its preferred habitat is not anticipated.

- The American eel (*Anguilla rostrata*) is classed as a catadromous fish, which means that on attaining sexual maturity, adult eels migrate downstream to the sea where ultimately they spawn. Spawning migration occurs between August and December, with downstream movement is most active at night, during the first several hours after sunset. Peak migration activity usually occurs during September and October. Yellow eels (sexually immature adult stage) may also be found migrating seaward in the autumn but they are believed to be moving to overwintering sites within the river or estuary. Yellow eels are generally active at night, retiring to burrows in muddy bottoms or to other cover during daylight. Temperature influences the degree of seasonal activity and eels become noticeably less active when the water temperature drops below 11°C in autumn. During winter, eels hibernate in the bottom mud. Eels are voracious carnivores and consume a variety of fishes and invertebrates such as insects, crayfish, snails and worms (DFO, 2014). With regard to the project, and taking into consideration the spatial and temporal extent of project activities and nature of the work, interaction by the species with the project is not anticipated.

6.6 Cultural/Aboriginal Resources

Although Fundy National Park falls within the traditional territory of both the Mi'kmaq and Wolastoqiyik (Maliseet) people, no physical evidence related to their use or occupation of the park has been found. The Mi'kmaq, Wolastoqiyik (Maliseet), and Passamaquoddy Aboriginal peoples have a long history in Fundy National Park and its greater ecosystem (Fundy Biosphere) region and consider the area as part of their traditional territory, a landscape woven by a labyrinth of water, over which they travelled extensively on its rivers, lakes and coastlines. These people co-occupied the region in permanent villages and semi-permanent, seasonal encampments, for purposes such as salmon fishing. To date, little archaeological evidence of past aboriginal use has been found in the park perhaps largely due to the fact that the sites preferred for traditional encampments in this rugged landscape were also the same sites appropriated for construction of logging mills and modern communities whose activities have obliterated the archaeological record. In addition, other nearby locations, known to have been used until well within living memory, such as Indian Island near Mary's Point, are slowly being lost to coastal erosion and sea-level rise (Cook and McKay, 2010).

An Archaeology Overview Assessment (AOA) was conducted by PCA in 2017 for the proposed work area (Appendix IV). The AOA mentioned that there is moderate to high potential that excavation activities may yield Aboriginal and/or historical artifacts. With a potential for the discovery of unknown archaeological resources, the proposed work activity will require an Archaeological Impact Assessment (AIA) to assess the potential for archaeological resources along the shoreline and the wharf area. Mitigation measures, including archaeological survey (pedestrian), cribwork recording and test pitting, are required to minimize these impacts. Findings from this survey will inform additional mitigation measures, if required. If found, these areas must be tested and depending on the result, may require additional excavation or mitigation work. Archaeological Resources could be disturbed as a consequence of this project, resulting in a loss of data about past activities at the site. The AIA will be designed to assess potential remains of pre-contact and historic periods or buried resources.

6.7 Visitor experience

Fundy National Park receives approximately 250 000 visitors each year. Many of whom enter the park via the East Gate entrance. This entrance is vital to the function of Fundy National Park and it is the only gateway connecting the village of Alma with the park and the only access for through travel connecting this section of southern New Brunswick with other provincial highway routes. Visitors entering the park must stop at the East Gate kiosk, located adjacent to the eroded shoreline, to purchase park entry passes and receive information on park orientation and services. The East Gate parking lot can accommodate small vehicles, recreational motorhomes (RV) and large touring buses. Often this parking lot is used as a rest stop for bus and RV motorcades where participants can disembark and tour the beach or the village of Alma. A walking path from the parking lot connects to the beach access boardwalk located along the shoreline just north of the existing damaged area. In addition, the Molly Cool Centre, owned and operated by a local non-profit organization, is located in the East Gate parking lot. Here park staff perform traditional maritime kitchen parties through song, stories and dancing. This building is also used by other organization to host events. Construction activities could potentially impact visitors by creating noise disturbance and interruption to the flow of traffic. Furthermore, the height of the armour stone along the road could potentially reduce the view of the sand flats, hence reducing the vista for visitors driving on the road.

7. EFFECTS ANALYSIS

Described below is a list of effects that could potentially impact the valued components:

Air

- Exhaust emissions from vehicles, equipment and small gas operated equipment could potentially have an effect on air quality.
- Potential increase in dust particle pollution generated from vehicles and equipment at the work site.

Soil / Landforms

- Potential runoff, erosion, sedimentation and soil compaction from movement of machinery.
- Potential impact to landscape and visual aesthetic.
- Introduction of building materials potentially harmful to the environment if the stone is not cleaned before its placement.
- Potential contamination of soil from the use of and potential leaks from machinery.

Water / Hydrology

- Potential for dust particles, debris and toxic substances to enter and affect the marine environment and impact water quality.
- Potential for suspended solid/sediments to enter adjacent marine environment during the placement of stone and decommissioning the existing erosion control measures.
- Potential contamination of water from the use of machinery and if the stone is not cleaned before its placement.
- Potential disturbance or destruction to aquatic habitat.

Flora

- Potential loss or damage of native flora from stockpiling, vehicle and machinery travel, further erosion if site not stabilized.
- Potential decrease in flora diversity.
- Possible disturbance, destruction or fragmentation to habitat.
- Introduction or spread of non-native or invasive species though the importation of non-native soil.
- Introduction of building materials that could be potentially deleterious to flora habitat.

Fauna

- Possible damage or loss of native fauna during construction.
- Potential decrease in fauna diversity.
- Possible disturbance, destruction or fragmentation to aquatic and terrestrial habitat.
- Possible loss of food supply.
- Noise disturbance.
- Wildlife corridor disruption.
- Introduction of building materials that could be potentially deleterious to fauna habitat.

Cultural / Aboriginal Resources

- Unidentified cultural/aboriginal resources could be directly impacted by construction activities.

Visitor Experience

- Potential access disruption to Fundy National Park if embankment isn't stabilized.
- Potential access disruption to the East Gate parking lot or beach access boardwalk during construction.
- Inadequate signage, alerting visitors of construction activities, can affect visitor experience and create safety concerns. Without barriers, visitors may wander into an active construction site without knowing the dangers and safety concerns.
- Increased construction traffic within the East Gate area could potentially affect visitor experience.

8. MITIGATION MEASURES

The following mitigation measures are to be followed in order to reduce or eliminate potential negative impacts resulting from the work:

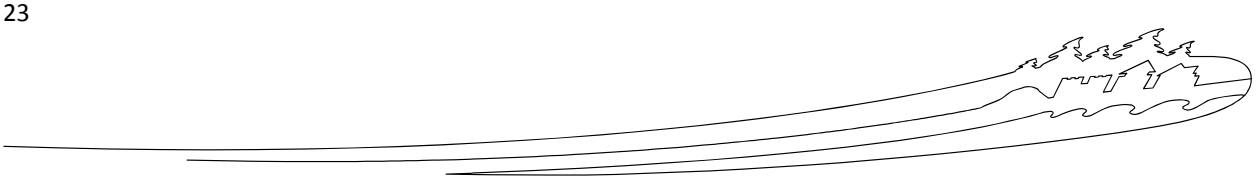
<u>Valued Components</u>

Air

- All mechanical construction equipment should be properly maintained, in good operating order, and fitted with standard air emission control devices. Detection of leaks or exhaust issues shall be fixed immediately or work is suspended until repairs can be made.
- Daylight operation of all mechanized equipment will be respected.
- Care and appropriate measures must be taken to ensure dust and other air borne particulates do not reach a level that would compromise air quality or impact vegetation/wildlife.

Soil / Landforms

- Develop and implement an Erosion and Sediment Control Plan, as part of the Environmental Protection Plan for the site. Erosion and sediment control measures should be maintained until all disturbed ground has been permanently stabilized. The plan should, where applicable, include:
  - Installation of effective erosion and sediment control measures before starting work to prevent sediment from entering any water body.
  - Measures for managing water flowing onto the site, as well as water being pumped/diverted from the site such that sediment is filtered out prior to the water entering a waterbody. For example, pumping/diversion of water to a vegetated area, construction of a settling basin or other filtration system.
  - Regular inspection and maintenance of erosion and sediment control measures and structures during the course of construction.
  - Repairs to erosion and sediment control measures and structures if damage occurs.
  - Removal of non-biodegradable erosion and sediment control materials once site is stabilized.
- The contractor will maintain a stockpile of appropriate erosion and environmental protection materials (e.g. silt fences, straw bales, wood chips, clean rock fill and aggregate base course) on site at all times.
- Remove all construction materials from site upon project completion.
- Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds.
- Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.
- Equipment operators shall take extreme caution to avoid striking vegetation, including trees and tree bark that is outside of the construction corridor. Efforts will also be taken to minimize damage to tree roots. Equipment shall be stored within the project limits.
- The contactor must set project limits prior to the start of construction. No trees and vegetation will be cut or removed outside these limits. Tree removal will be limited to individuals within the construction site that have been identified by the park representative.
- Measures shall be taken to protect vegetation remaining on the site and not intended for removal. The park representative must be informed if there is a requirement to remove unmarked vegetation. Removal shall only commence with the approval of the park representative. Root systems shall be left intact whenever possible.
- Disturbance of soil and vegetation must be kept to an absolute minimum. This will minimize disturbance and disruption to plants and wildlife communities and habitat.
- All exposed soils must be stabilized as soon as possible in order to control sediment runoff during and after construction.
- Clearing of riparian vegetation should be kept to a minimum: use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction. When practicable, prune or top the vegetation instead of grubbing/uprooting.
- Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter. Prune limbs close to the tree trunk. For a clean cut, make a shallow undercut first, then follow with the top cut. This prevents the limb from peeling bark off the tree as it falls. Do not use an ax for pruning. Cut limbs and branches to be trimmed close to bole of tree or main branches.
- If over half of a tree needs pruning, it is recommended to cut it down. Trees should be cut at ground level and do not leave pointed stumps.



- Any required re-planting for landscaping purposes must utilize native species approved by park representative.
- Minimize equipment travel outside of construction corridor.
- Slash generated from vegetation removal shall be disposed of in an appropriate manner. All work will be done with the goal of having a low aesthetic impact on the landscape.
- All salvageable wood is the property of the Contractor and must be removed from the park. The remaining non-salvageable woody material (e.g. stumps, etc.) will be removed by the contractor from the National Park and disposed of at a provincially approved site.
- Cover de-vegetated areas if heavy rains are expected in erosion prone locations.
- Keep excavation to a minimum and reduce disturbance to ground surface and vegetation.
- Organic materials removed during project construction activities must be removed from the project site.
- If soil becomes saturated during extreme wet weather, operations shall be suspended until soil conditions are more favourable.
- To minimize the introduction of invasive species, all construction material must be clean and free of any contaminates and non-native species (refer to invasive plant section below).
- Excavated soil that is suspected of or known to be contaminated (i.e. fuel, oil) is to be placed in covered bins or stockpiled and covered with plastic until the material can be transported to a provincially approved waste management facility.
- All soils brought on site from an outside source must be pre-approved by Parks Canada through inspection at the source location to ensure there are no invasive plants.
- All topsoil material removed during the project and that is not reused in the project will be disposed of outside the National Park at a provincially approved site.
- The use of chemical vegetation control is not permitted.
- Fires and burning of rubbish on site is not permitted.

Hydrology / Water Quality

- Do not use watercourse beds for borrow material.
- Do not skid logs or construction materials across waterways.
- Do not operate construction equipment in waterways.
- No rock, silt, cement, grout, asphalt, petroleum product, lumber, domestic waste, or any deleterious substance shall be placed or allowed to disperse into any stream, river, pond, wetland, lake or other water course.
- Mitigation measures must be in place to reduce the introduction of sediment into any drainage channels (see Erosion and Sedimentation Control plan in the EPP).

Flora

- Refer to the mitigation measures presented under **Soil / Landforms**.
- Construction equipment may facilitate the movement and spread of invasive plants by moving invasive plant seeds from infested areas. Contractors/construction operators are responsible to pressure wash equipment before entering the park or moving from an infested area within the park.
- Hand tools and footwear should be cleaned between work sites to prevent cross contamination and reduce the risk of invasive species introduction.
- Materials to be used on construction projects should be stored in areas free of invasive plant species.

- Freshly disturbed ground created by construction equipment during construction activities provide suitable habitat for invasive plants. Ensure that exposed soil is planted with native vegetation species as soon as feasible to reduce the risk of invasive species invasion.
- Reduce the spread of invasive plants by prohibiting the movement of soil, vegetation and materials from infested areas

Fauna

- Feeding wildlife is not permitted. All work sites must be kept free of edible and other garbage that could attract or harm wildlife.
- To avoid the risk of nest destruction, the proponent shall avoid vegetation clearing during the most critical period of the migratory bird breeding season, which is May 1st through August 31st.
- In the event that vegetation clearing is to take place inside the May 1st to August 31st window, a qualified biologist must inspect the area prior to potential disturbance or loss of habitat activities to ensure there will be no adverse impacts to birds and wildlife.
- Before cutting of trees, rap their trunks repeatedly with a stick (or similar object) to awaken hibernating mammals.
- All construction activities shall be designed to have minimum effect on fish and fish habitat.

Cultural / Aboriginal Resources

- The 100% design concept plans for the project must be submitted to Parks Canada's Terrestrial Branch for further review.
- If there are any changes to the proposed plans, all additional information and construction drawings must be submitted to Parks Canada's Terrestrial Branch for further review.
- Additional an Archaeological Impact Assessment (AIA) is required to evaluate the potential for archaeological resources to occur within the project study area.
- Vehicular access routes and staging areas will be restricted to present-day roadways, parking lots, and significantly disturbed areas. If this is not possible, the use of protective covering such as geotextile protective mats with a wood chip lift or granular "A" gravel is required. All protective measures employed must be removed following construction and the area restored to a pre-construction state. Excavation is not permitted during installation or removal of protective covering.
- If significant features (i.e., structural remains and/or high artifact concentrations) are encountered during construction activities, excavation should cease in the immediate area, and the Parks Canada project manager will be informed. The project manager will contact Parks Canada's Terrestrial Archaeology section for advice and assessment of significance, which will in turn determine the requirements to mitigate the find.

Visitor Experience

- The overall visitor experience is expected to be improved by the completion of the project.
- During construction, the contractor must provide and maintain signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from the Project.

Other

General

- The Project Manager is responsible to ensure all parties (i.e. Park Staff, Contractor, etc.) receive a copy of this Basic Impact Analysis (BIA) prior to project start up.
- The conditions presented in this BIA will be considered part of the project. Failure to comply may result in work being suspended pending rectification of problem(s).
- All activities must conform to relevant Occupational Health and Safety Guidelines and to all relevant Municipal, Provincial and Federal regulations.
- All activities pursuant to the project shall be governed by and carried out in accordance with the *Canada National Parks Act* and *Regulations* and with all other laws of Canada and the Province of New Brunswick such as the *Navigation Protection Act* approval, WAWA permit, etc.
- Before commencing construction activities or delivery of materials to site, the contractor must submit an Environmental Protection Plan (EPP) for review and approval by PSPC and Parks Canada. The EPP must include a comprehensive overview of known or potential environmental issues to be addressed during construction.
- The Contractor is required to provide for approval ten (10) working days before start-up to PSPC and Parks Canada an erosion and sediment control plan, as part of the Environmental Protection Plan. The plan shall incorporate all necessary silt fences, silt traps, plastic lined trenches and ditches as approved by PSPC and Parks Canada.
- The Contractor/Project Lead is required to notify the Project Manager of the proposed work schedule at least one week in advance of potential start up.
- A pre-construction meeting will be held on-site and attended by the Contractor/Project Lead, Project Manager, and the Parks Canada Environmental Assessment Officer. The meeting is to ensure construction personnel are aware of the environmental concerns, laws, rules and regulations associated with this project.
- Emergency contact list with phone numbers to be compiled and posted in a conspicuous location at the construction/project site.
- A designated Parks Canada Environmental Assessment Officer shall be kept informed of project scheduling and will be notified of changes at all times.
- The Contractor must be aware that they are working in a National Park where emphasis is on ecological/cultural integrity and resource protection.

Machinery / Storage and Handling of Fuels and Dangerous Fluids

- For all contractors, a Spill Response Kit (absorbent materials, etc.) must be on site at all times and the employees trained in its use. In the event of any spill, the offending party (Parks Canada or Contractor) is responsible for containing and cleaning up the spill. The offending party is required by law to report all toxic spills and petroleum spills >20 litres to Environmental Emergency 1-800-565-1633. In addition, for any spill, the Project Manager (506-407-7812) and/or the Environmental Assessment Officer (506-227-7428) must be notified immediately. If unavailable contact Jasper Dispatch (1-877-852-3100).
- Gas or diesel operated equipment shall be shut down if not needed for a period greater than 5 minutes to reduce noise and emissions.
- Cleanup, repair and rehabilitation resulting from any spill shall be to the satisfaction of the Parks Canada Environmental Assessment Officer.

- The refuelling or parking of equipment, if required, shall be at a location pre-approved by the Project Manager/Parks Canada and will not take place within 30 m of a waterway or critical habitat.
- Refueling shall not take place in locations where runoff could carry contaminants into drainage pathways. An absorbent pad should be placed beneath the machine to capture small spills.
- Minimize quantity of hazardous materials on site to that absolutely necessary to perform the work.
- Disposal of debris or waste into any drain, and/or waterway, is strictly prohibited.
- Any hazardous material/waste is to be stored, handled, transported and disposed of in compliance with *Transportation of Dangerous Goods Act* and WHMIS labeling. Disposal shall be at an approved provincial waste management site and proof of disposal provided to the Project Manager.
- Dispose of all waste materials at an appropriate provincial waste/recycle facility.

Erosion Control

- If there is a requirement to excavate, install sediment and erosion control structures to reduce the introduction of sediment into the waterway or adjacent vegetation.
- Regularly inspect sediment and erosion control structures and repair as required. Remove accumulated sediment at regular intervals and dispose of the sediment at an approved location.
- Minimize the amount of dust created by construction activities on adjacent vegetation and reduce the impact to air quality.
- Ensure an Environmental Protection Plan that highlights procedures is in place before the project begins and have materials readily available for use in the event of a silt release.
- Remove non-biodegradable erosion and sediment control materials once site is stabilized.

Access

- Access for emergency response, fire suppression and site maintenance should be reflected in safety plan for the site.
- Whenever possible, only existing roadways or disturbed areas shall be used for site access.

Facilities

- Leave No Trace wilderness ethic principles shall be communicated to/observed by all of the construction crew.
- During the construction phase, store food, garbage and other smelling products in sealed containers. Pack all garbage out form the site daily, unless permanent garbage facilities exist at the site. Garbage structures shall minimize the opportunity for wildlife to feed from the garbage.
- Daily maintenance of the site shall be done to ensure that it is free from accumulations of waste, debris and garbage.
- Remove all construction materials from site upon project completion.
- A complete site cleanup including restoration of exposed and damaged areas, shall be required to the satisfaction of the park representative, before the site is vacated after project completion.
- Fires are only permitted in approved structures at designated sites within the park.

Safety

- On-site work crews must comply with all applicable health/safety regulations, including use of appropriate protective equipment.
- Site access must be restricted to authorized workers only.
- Workers in contact with hazardous materials must be provided with and use appropriate personal protective equipment.
- Proper safety procedures must be followed throughout the duration of the project as per applicable municipal, provincial, and federal regulations.
- Employees must be trained in health and safety protocols (e.g., safe work practices, emergency response).
- A project safety plan must be in place before project commences.
- The Project Manager is responsible to take all necessary precautions to ensure there is no safety concerns related to visitors of the Park.
- The contractor shall determine the exact location of all existing buried utilities before commencing work.
- Blasting is not permitted.

Navigation

- Environmental effects of the project on navigation are taken into consideration as part of the Basic Impact Analysis (BIA) only when the effects are indirect, i.e. resulting from a change in the environment affecting navigation. Direct effects on navigation are not considered in the BIA, but any measures necessary to mitigate direct effects will be included as terms and conditions associated work approved or permitted pursuant to the Navigation Protection Act.

9. PUBLIC/STAKEHOLDER ENGAGEMENT & ABORIGINAL CONSULTATION

- Indicate whether public/stakeholder engagement was undertaken in relation to potential adverse effects of the proposed project:

  ☒ No

  ☐ Yes (describe the process to involve relevant parties and indicate how comments were taken into consideration)

- Indicate whether Aboriginal consultation was undertaken in relation to potential adverse effects of the proposed project:

  ☒ No

  ☐ Yes (describe the process to involve relevant parties and how the results were taken into consideration)

10. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

All effects are likely not significant or are able to be mitigated. If appropriate mitigating measures described in this report are followed and carried out, the environmental effects should be reduced to minor or insignificant levels. Thus, the level of disturbance is considered to be localized and of low magnitude. The project is not likely to cause significant adverse environmental effects in the short or long term. Impact to visitor experience can be expected during the construction period. These impacts are expected to be short term and all efforts will be taken to mitigate the issues.

11. SURVEILLANCE

☐ Surveillance is not required

☒ Surveillance is required (An Environmental Surveillance Officer will conduct daily site inspections to determine if construction activities comply with the mitigation measures, set out in this report, to reduce negative impacts to the site. Items to be monitored during the inspection include transportation of materials, fuel management, erosion and sediment control, work adjacent to a waterway, waste management and general condition of the site)

12. FOLLOW-UP MONITORING

Follow-up monitoring is:

☐ Not required

☐ Required by legislation or policy (indicate basis of requirement – e.g. required by the *Species at Risk Act*; *Fisheries Act*, or the *Parks Canada Cultural Resource Management Policy*)

☒ Required to evaluate effectiveness of mitigation measures and/or assess restoration success

13. SARA NOTIFICATION

Notification is:

☒ Not required

☐ Required under the *Species at Risk Act* (outline the nature of and response to any notification)

14. EXPERTS CONSULTED

Department/Agency/Institution: Parks Canada Agency	Date of Request: Various times throughout July and August 2017
Expert's Name & Contact Information: Shirley Butland (SB)	Title: A/ Environmental Assessment Officer
Department/Agency/Institution: Parks Canada	Date of Request: Various times throughout July and August 2017
Expert's Name & Contact Information: Debra Hickey	Title: Project Manager
Expertise Requested: 1) Historical Information, 2) Environmental Information, 3) Construction Details	
Response: 1) Historical Information by SB, 2) Environmental Information by SB 3) Building Detail by DH	

15. ATTACHMENTS

The following is a list of attachments to this BIA:

Appendix I: Environmental Impact Analysis Tool: Effects Identification Matrix

Appendix II: Existing condition site plan

Appendix III: Proposed site plans and cross-sections

Appendix IV: Archaeology Overview Assessment (AOA)

Appendix V: DFO-FPP Request for Review and Letter of Advice

16. AUTHORS

Prepared by:	
Nicolas Rolland, Ph.D. Water Sciences Environmental Specialist, PSPC nicolas.rolland@pwgsc-tpsgc.gc.ca / 506-961-2344 and Chyann Kirby, B.Sc., Environmental Management Senior Environmental Specialist, PSPC chyann.kirby@pwgsc-tpsgc.gc.ca / 506-639-5297	Date: September 25, 2017 Date: November 6, 2017

17. NATIONAL IMPACT ASSESSMENT TRACKING SYSTEM (Parks Canada Responsibility)

The project must be registered in the Parks Canada National Impact Assessment Tracking System within the fiscal year the project took place. If the project is on hold, was cancelled, or was determined to be likely to cause significant adverse effects and did not proceed, please indicate this information in the tracking system (see selections in the *Assessment Status/Decision* field).

☐ Project registered in tracking system

☒ Not yet registered *(CEAA 2012 requires PCA submit a report to Parliament annually. EIAs must be entered in the tracking system **by the end of April** to enable reporting)*

18. DECISION

Taking into account implementation of mitigation measures outlined in the analysis, the project is:

☒ Not likely to cause significant adverse environmental effects

☐ Likely to cause significant adverse environmental effects

NOTE: If the project is identified as likely to cause significant adverse effects, CEAA 2012 prohibits approval of the project unless the Governor in Council (Cabinet) determines that the effects are justified in the circumstances. A finding of significant effects therefore means the project CANNOT go ahead as proposed.

FOR SARA REQUIREMENTS:

☒ There are no residual adverse effects to species at risk and therefore the SARA-Compliant Authorization Decision Tool was not required

OR, the SARA-Compliant Authorization Decision Tool was used and determined:

☐ There is no contravention of SARA prohibitions

☐ Project activities contravene a SARA prohibition and CAN be authorized under SARA

☐ Project activities contravene a SARA prohibition and CANNOT be authorized

19. RECOMMENDATION AND APPROVAL (Parks Canada Responsibility)

Reviewed by: Shirley Butland, A/Environmental Assessment Officer (EAO) – Parks Canada Agency	Date: November 7, 2017
EIA Specialist Comments: The A/EAO assisted with the preparation, review and edit of this document. In addition, Fundy National Park Resource Conservation staff participated in the design process ensuing that ecological processes of the coastal region of the park were incorporated into the design. This BIA identifies potential impacts to the environment and the necessary mitigation measures to reduce or eliminate these negative impacts. This project is not likely to cause significant adverse environmental effects in the short or long term. Impact to visitor experience can be expected during the construction period. These impacts are expected to be short term and efforts will be taken to mitigate the issues.	
Recommended by: Debra Hickey, Project Manager – Parks Canada Agency	Date: June 23, 2017
Approved by: Sharon Hayes, A/NB South Field Unit Superintendent – Parks Canada Agency	Date: November 7, 2017
Signature: 	

20. RECOMMENDATION AND APPROVAL (Transport Canada)

Project Title:	Parks Canada – FNP Shoreline Protection Project-Fundy National Park		
TC File No.:	NEATS#45923		
NPP File No.:	8200-2017-200156		
EED Decision:	☒ Taking into account the implementation of any mitigation measures that Transport Canada considers appropriate, the project **is not likely** to cause significant adverse environmental effects and, as such, Transport Canada may exercise any power or perform any duty or function that would permit the project to be carried out in whole or in part. ☐ Taking into account the implementation of any mitigation measures that Transport Canada considers appropriate, the project **is likely** to cause significant adverse environmental effects that cannot be justified. As such, Transport Canada shall not exercise any power or perform any duty or function conferred on it by or under any Act of Parliament that would permit the project to be carried out in whole or in part, at this point in time. The project shall be referred to the Governor in Council to decide if those adverse environmental effects are justified under the circumstances pursuant to subsection 69(3) CEAA, 2012.		
Recommended by:	Jason Flanagan		
Title:	Senior Environmental Assessment Officer Environmental Affairs and Aboriginal consultation Unit		
Signature:		**Date:**	
Mailing Address:	95 Foundry Street, Heritage Court PO Box 42 Moncton, New Brunswick E1C 8K6		
Tel:	(506) 227-8257	**Fax:**	(506) 851-7542
Email:	jason.flanagan@tc.gc.ca		
Approved by:	Kevin LeBlanc		
Title:	Regional Manager Environmental Affairs and Aboriginal Consultation Unit		
Signature:		**Date:**	

21. REFERENCES

ACCDC (Atlantic Canada Conservation Data Centre) (2017) ACCDC data response for project site, New Brunswick. Accessed through PSPC Atlantic Region GIS Tool on July 2017.

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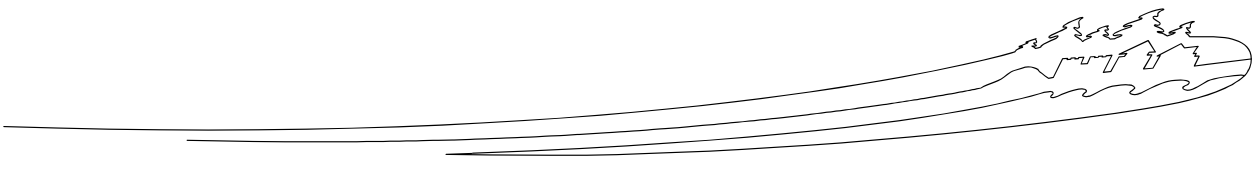
APPENDIX I

Effects Identification Matrix



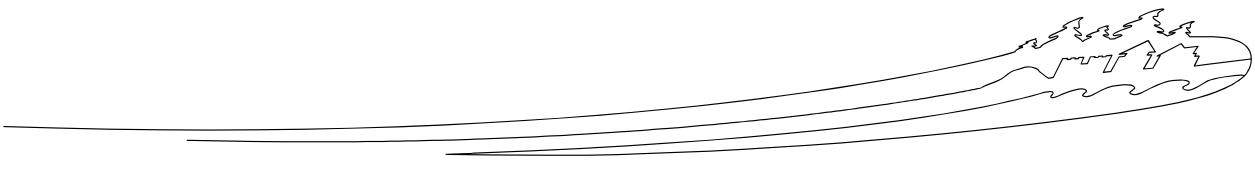
Direct Effects												
			Valued components potentially directly affected by the proposed project									
			Natural Resources					Cultural Resources	Visitor Experience			
Phases		Examples of Associated Activities	Air	Soil & landforms	Water (surface, ground, crossings, etc.)	Flora (trees and shrubs)	Fauna (mammals, Birds and fish)	Cultural Resources of Local Value	Recreational opportunities	Viewscapes and soundscapes	Visitor Safety
Project Components	Preparation / Construction / Operation / Decommissioning	Supply and storage of materials	☐	☒	☒	☒	☐	☐	☐	☒	☒
		Burning	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Clearing	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Demolition	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Disposal of waste	☐	☒	☒	☒	☒	☐	☐	☐	☐
		Blasting/ Drilling	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Dredging	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Drainage	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Excavation	☒	☒	☒	☒	☒	☒	☐	☒	☒
		Grading	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Backfilling	☒	☒	☒	☐	☐	☐	☐	☒	☒
		Use of machinery	☒	☒	☒	☒	☒	☒	☒	☒	☒
		Transport of materials/ equipment	☒	☒	☒	☒	☒	☐	☒	☒	☒
		Building of fire breaks	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Use of Chemicals	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Set up of temporary facilities	☐	☐	☐	☒	☒	☐	☐	☒	☒
		Other…	☐	☐	☐	☐	☐	☐	☐	☐	☐

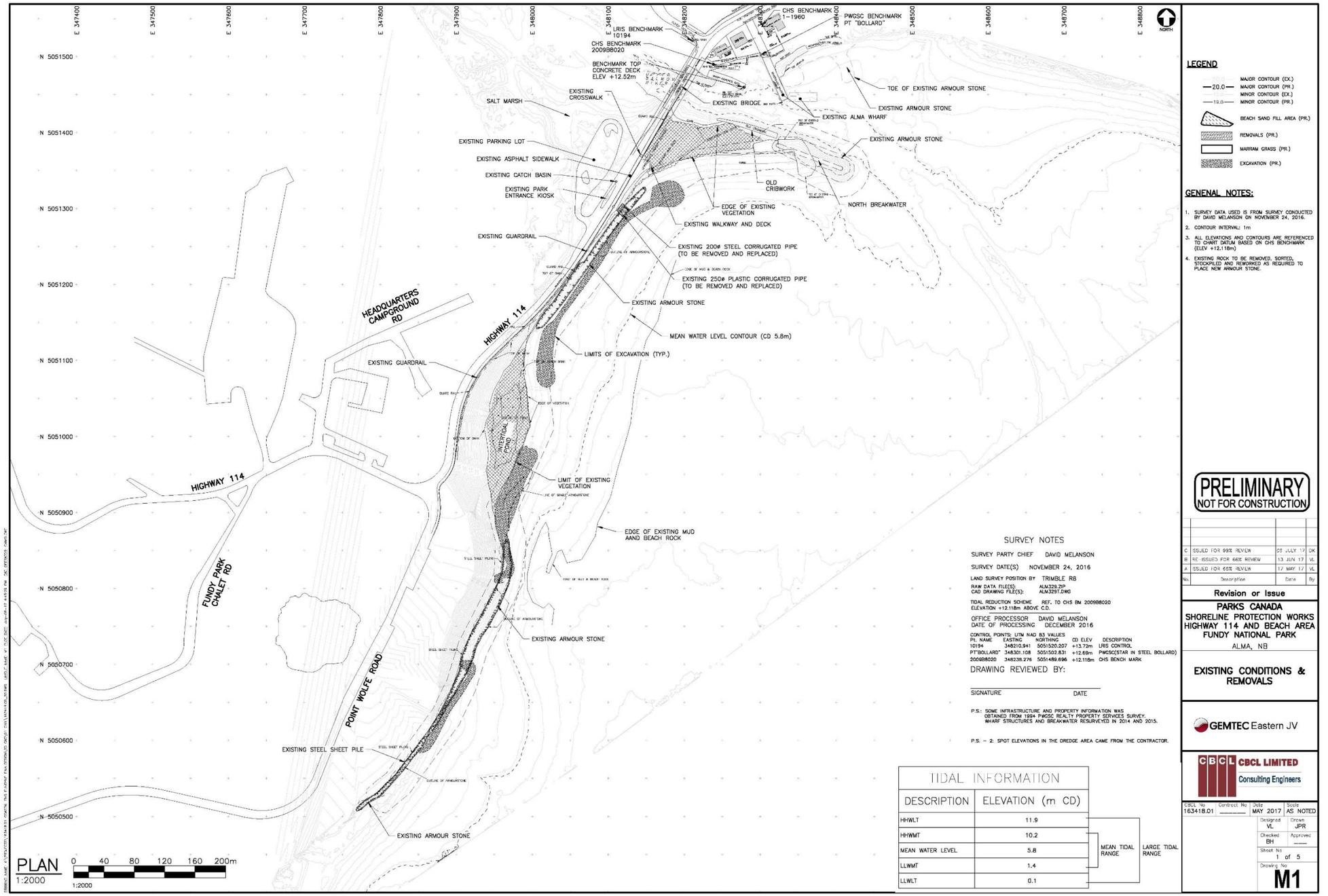
Direct Effects (continued)												
			Valued components potentially affected by the proposed project									
			Natural Resources					Cultural Resources	Visitor Experience			
Phases		Examples of Associated Activities	Air	Soil & landforms	Water (surface, ground, crossings, etc.)	Flora (trees and shrubs)	Fauna (mammals, Birds and fish)	Cultural Resources of Local Value	Recreational opportunities	Viewscapes and soundscapes	Visitor Safety
Project Components	Preparation / Construction / Operation / Decommissioning	Waste disposal	☒	☒	☒	☒	☒	☐	☒	☒	☒
		Wastewater disposal	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Maintenance	☐	☒	☒	☒	☒	☐	☐	☐	☐
		Use	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Use/Removal of temporary facilities	☒	☒	☒	☒	☒	☐	☐	☐	☐
		Use of Chemicals	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Active fire stage	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Prescribed burn cleanup	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Planting	☐	☒	☒	☒	☒	☐	☐	☒	☐
		Culling	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Vehicle Traffic	☒	☒	☐	☒	☒	☐	☐	☒	☒
		Other…	☐	☐	☐	☐	☐	☐	☐	☐	☐

Indirect Effects (all phases)							
		Impacts as a result of changes to the environment					
		With respect to non-Aboriginal peoples:	With respect to Aboriginal peoples:		With respect to visitor experience		
Phases	**Natural resource components affected by the project**	Health and socio-economic conditions	Health & socio-economic conditions	Current use of lands and resources for traditional purposes	Access & services	Recreation & accommodation opportunities	Safety
Preparation / Construction / Operation / Decommissioning	Could impacts to air lead to adverse effects on…	☐	☐	☐	☐	☐	☐
	Could impacts to soils and landforms lead to adverse effects on…	☐	☐	☐	☐	☐	☐
	Could impacts to water (e.g. surface, ground water and water crossings) lead to adverse effects on…	☐	☐	☐	☐	☐	☐
	Could impacts to flora (including SAR) lead to adverse effects on…	☐	☐	☐	☐	☐	☐
	Could impacts to fauna (including SAR) lead to adverse effects on…	☐	☐	☐	☐	☐	☐
	Other…	☐	☐	☐	☐	☐	☐

APPENDIX II

Existing Site Conditions





LEGEND

- 20.0 — MAJOR CONTOUR (EX.)
- 20.0 — MAJOR CONTOUR (PR.)
- 19.0 — MINOR CONTOUR (EX.)
- 19.0 — MINOR CONTOUR (PR.)
- BEACH SAND FILL AREA (PR.)
- REMOVALS (PR.)
- MARRAM GRASS (PR.)
- EXCAVATION (PR.)

GENENAL NOTES:

1. SURVEY DATA USED IS FROM SURVEY CONDUCTED BY DAVID MELANSON ON NOVEMBER 24, 2016.
2. CONTOUR INTERVAL: 1m
3. ALL ELEVATIONS AND CONTOURS ARE REFERENCED TO CHART DATUM BASED ON CHS BENCHMARK (ELEV +12.118m)
4. EXISTING ROCK TO BE REMOVED, SORTED, STOCKPILED AND REWORKED AS REQUIRED TO PLACE NEW ARMOUR STONE.

SURVEY NOTES

SURVEY PARTY CHIEF DAVID MELANSON

SURVEY DATE(S) NOVEMBER 24, 2016

LAND SURVEY POSITION BY TRIMBLE R8

RAW DATA FILE(S): ALM329.ZIP
CAD DRAWING FILE(S): ALM329T.DWG

TIDAL REDUCTION SCHEME REF. TO CHS BM 2009B8020
ELEVATION +12.118m ABOVE C.D.

OFFICE PROCESSOR DAVID MELANSON
DATE OF PROCESSING DECEMBER 2016

CONTROL POINTS: UTM NAD 83 VALUES

PT. NAME	EASTING	NORTHING	CD ELEV	DESCRIPTION
10194	348210.941	5051520.207	+13.72m	LRIS CONTROL
PT"BOLLARD"	348301.108	5051502.831	+12.69m	PWGSC(STAR IN STEEL BOLLARD)
2009B8020	348238.276	5051489.696	+12.118m	CHS BENCH MARK

DRAWING REVIEWED BY:

SIGNATURE DATE

P.S.: SOME INFRASTRUCTURE AND PROPERTY INFORMATION WAS OBTAINED FROM 1994 PWGSC REALTY PROPERTY SERVICES SURVEY. WHARF STRUCTURES AND BREAKWATER RESURVEYED IN 2014 AND 2015.

P.S. – 2: SPOT ELEVATIONS IN THE DREDGE AREA CAME FROM THE CONTRACTOR.

TIDAL INFORMATION

DESCRIPTION	ELEVATION (m CD)	
HHWLT	11.9	LARGE TIDAL RANGE
HHWMT	10.2	
MEAN WATER LEVEL	5.8	MEAN TIDAL RANGE
LLWMT	1.4	
LLWLT	0.1	

PRELIMINARY
NOT FOR CONSTRUCTION

No.	Description	Date	By
C	ISSUED FOR 99% REVIEW	05 JULY 17	DK
B	RE-ISSUED FOR 66% REVIEW	13 JUN 17	VL
A	ISSUED FOR 66% REVIEW	17 MAY 17	VL

Revision or Issue

PARKS CANADA
SHORELINE PROTECTION WORKS HIGHWAY 114 AND BEACH AREA FUNDY NATIONAL PARK
ALMA, NB

EXISTING CONDITIONS & REMOVALS

GEMTEC Eastern JV

CBCL LIMITED
Consulting Engineers

CBCL No	Contract No	Date	Scale
163418.01	_____	MAY 2017	AS NOTED

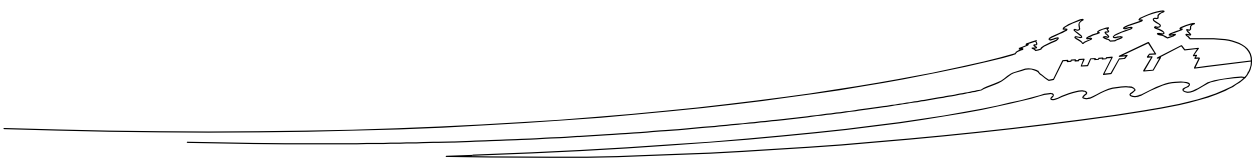
Designed	Drawn
VL	JPR
Checked	Approved
BH	____

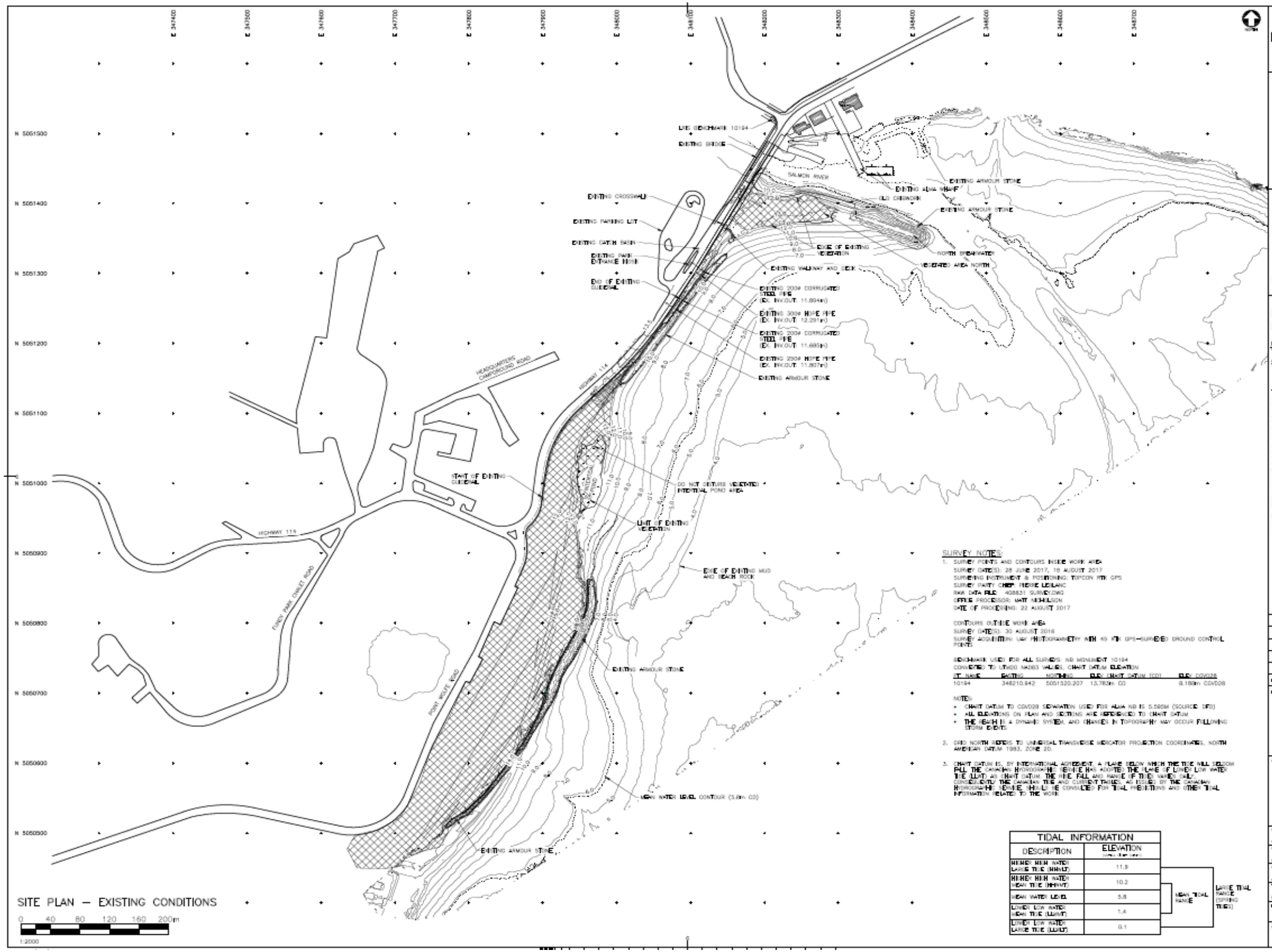
Sheet No 1 of 5

Drawing No **M1**

APPENDIX III

Proposed Site Plans and Cross-Sections





SURVEY NOTES:

1. SURVEY POINTS AND CONTOURS INSIDE WORK AREA
   SURVEY DATE(S): 28 JUNE 2017, 16 AUGUST 2017
   SURVEYING INSTRUMENT & POSITIONING: TOPCON HTK GPS
   SURVEY PARTY CHIEF: PIERRE LEBLANC
   RAW DATA FILE: 408831 SURVEY.DWG
   OFFICE PROCESSOR: MATT MICHELSON
   DATE OF PROCESSING: 22 AUGUST 2017

   CONTOURS OUTSIDE WORK AREA
   SURVEY DATE(S): 30 AUGUST 2016
   SURVEY ACQUISITION: UAV PHOTOGRAMMETRY WITH 45 KTK GPS-SURVEYED GROUND CONTROL POINTS

   BENCHMARK USED FOR ALL SURVEYS: NB MONUMENT 10194
   CONVERTED TO UTM20 NAD83 (MAIN), CHART DATUM ELEVATION

PT. NAME	EASTING	NORTHING	ELEV. (CHART DATUM CD0)	ELEV. CGVD28
10194	348210.842	5051520.207	13.782m CD	8.188m CGVD28

   NOTES:
   - CHART DATUM TO CGVD28 SEPARATION USED FOR ALMA NB IS 5.594M (SOURCE: CHS)
   - ALL ELEVATIONS ON PLAN AND SECTIONS ARE REFERENCED TO CHART DATUM
   - THE BEACH IS A DYNAMIC SYSTEM, AND CHANGES IN TOPOGRAPHY MAY OCCUR FOLLOWING STORM EVENTS

2. GRID NORTH REFERS TO UNIVERSAL TRANSVERSE MERCATOR PROJECTION COORDINATES, NORTH AMERICAN DATUM 1983, ZONE 20.

3. CHART DATUM IS, BY INTERNATIONAL AGREEMENT, A PLANE BELOW WHICH THE TIDE WILL SELDOM FALL. THE CANADIAN HYDROGRAPHIC SERVICE HAS ADOPTED THE PLANE OF LOWER LOW WATER TIDE LEVEL AS CHART DATUM. THE RISE, FALL AND RANGE OF TIDE VARIES DAILY, CONSEQUENTLY THE CANADIAN TIDE AND CURRENT TABLES, AS ISSUED BY THE CANADIAN HYDROGRAPHIC SERVICE, SHALL BE CONSULTED FOR TIDAL PREDICTIONS AND OTHER TIDAL INFORMATION RELATED TO THE WORK.

TIDAL INFORMATION	
DESCRIPTION	ELEVATION (metres above chart datum)
HIGHER HIGH WATER LARGE TIDE (HHWLT)	11.9
HIGHER HIGH WATER MEAN TIDE (HHWMT)	10.2
MEAN WATER LEVEL	5.8
LOWER LOW WATER MEAN TIDE (LLWMT)	1.4
LOWER LOW WATER LARGE TIDE (LLWLT)	0.1

MEAN TIDAL RANGE → LARGE TIDAL RANGE (SPRING TIDE)

Parks Canada / Parcs Canada

KEY PLAN

CBCL LIMITED
Consulting Engineers

GEMTEC EASTERN JV

LEGEND
EXISTING VEGETATION
EXISTING ARMOUR STONE

GENERAL NOTES:
1. CONTOUR INTERVAL 0.50m
2. ALL ELEVATIONS ARE REFERENCED TO CHART DATUM

GENERAL SITE DESCRIPTION:

THE SITE IS LOCATED IN FUNDY NATIONAL PARK ALONG NEW BRUNSWICK HIGHWAY 114 BETWEEN THE PARK VISITORS CENTRE AND THE SALMON RIVER CROSSING INTO THE TOWN OF ALMA. THE SITE IS CHARACTERIZED BY AN TIDAL SAND AND GRAVEL BEACH, A HIGHWAY EMBANKMENT WITH PARTIAL ARMOURSTONE PROTECTION, A TIDAL LAGOON CONTAINED WITHIN A SAND AND GRAVEL BERM, AND A STEEP BLUFF WITH MATURE TREES AND PARTIAL ARMOURSTONE PROTECTION. ONGOING EROSION ALONG THE SITE'S SHORELINE REQUIRES REMEDIATION THROUGH THE PARTIAL RETROFIT AND ADDITION OF NEW SHORELINE PROTECTION FEATURES. SECTIONS ALONG THE HIGHWAY EMBANKMENT AND BLUFF'S FEATURE EXISTING ARMOURSTONE OF VARIOUS SIZES, TO BE GENERALLY LEFT IN PLACE AND INTEGRATED INTO THE PROPOSED SHORE PROTECTION WORKS AS INDICATED ON THE DRAWINGS.

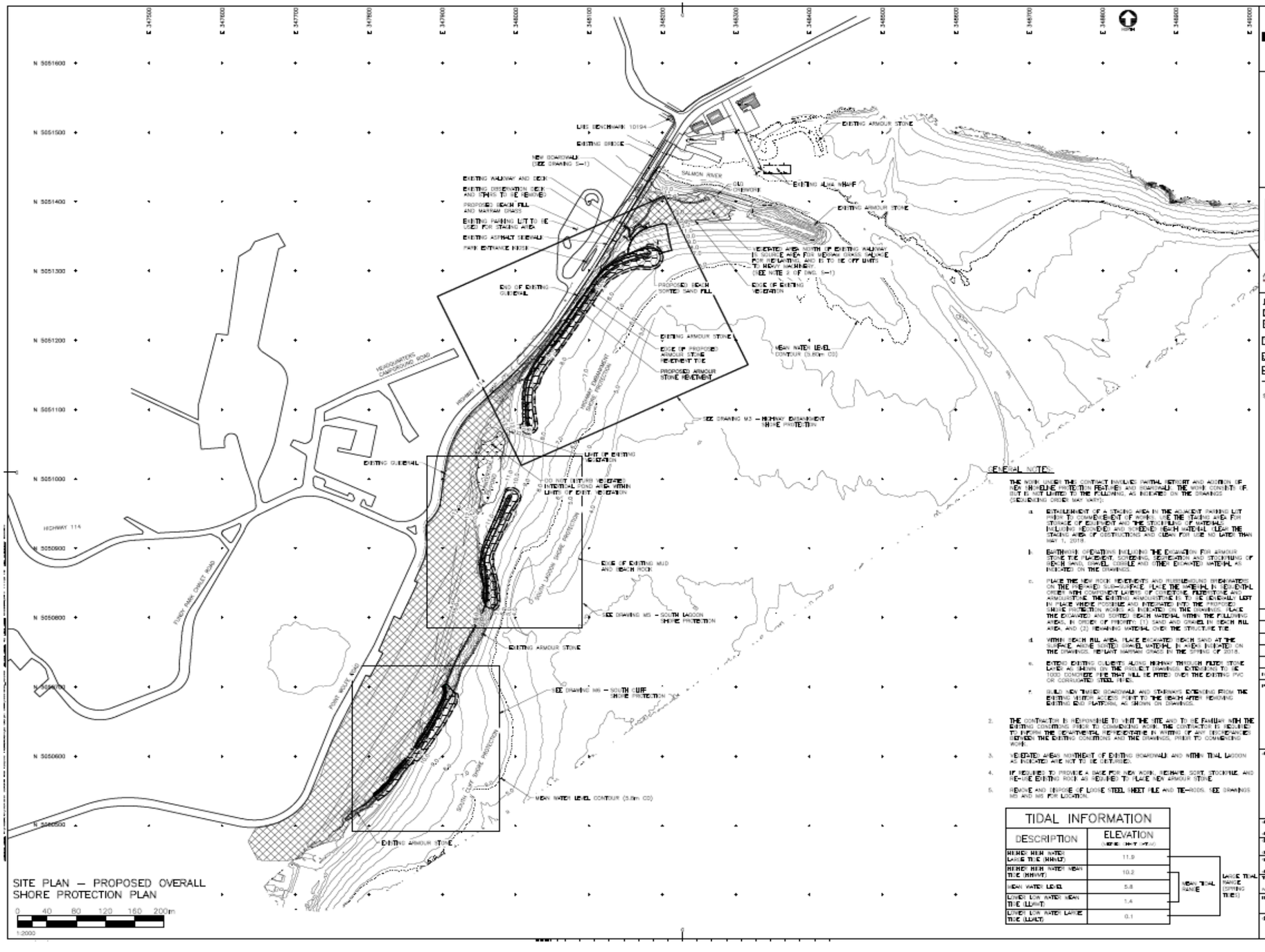
LICENSED PROFESSIONAL ENGINEER
PROVINCE of NEW BRUNSWICK
L18031 2017
Vincent M.R. Leve
15 Jul 2017

D	ISSUED FOR TENDER	25 OCT 2017
D	ISSUED FOR 100% REVIEW	30 AUG 2017
C	ISSUED FOR 99% REVIEW	08 JUL 2017
B	RE-ISSUED FOR 66% REVIEW	15 JUN 2017
A	ISSUED FOR 66% REVIEW	1 MAY 2017
Issued		Iss.

project: SHORELINE PROTECTION WORKS
FUNDY NATIONAL PARK
ALMA, NB

drawing: EXISTING CONDITIONS

designed: V. LEVE
date: OCT. 2017
drawn: J.R./C.M./M.E.C.
date: OCT. 2017
reviewed:
date: OCT. 2017
Parks Canada Representative: OCT. 2017
project number: 1346
drawing no.: M1



GENERAL NOTES:

THE WORK UNDER THIS CONTRACT INCLUDES PARTIAL DEMOLITION AND ADDITION OF NEW SHORELINE PROTECTION FEATURES AND BOARDWALK. THE WORK CONSISTS OF, BUT IS NOT LIMITED TO THE FOLLOWING, AS INDICATED ON THE DRAWINGS (SEQUENCING ORDER MAY VARY):

a. ESTABLISHMENT OF A STAGING AREA IN THE ADJACENT PARKING LOT PRIOR TO COMMENCEMENT OF WORKS. USE THE STAGING AREA FOR STORAGE OF EQUIPMENT AND THE STOCKPILING OF MATERIALS, INCLUDING REMOVED AND SCREENED BEACH MATERIAL. CLEAR THE STAGING AREA OF OBSTRUCTIONS AND CLEAN FOR USE NO LATER THAN MAY 1, 2018.

b. EARTHWORK OPERATIONS INCLUDING THE EXCAVATION FOR ARMOUR STONE TIE PLACEMENT, SCREENING, SEPARATION AND STOCKPILING OF BEACH SAND, GRAVEL, COBBLE AND OTHER EXCAVATED MATERIAL AS INDICATED ON THE DRAWINGS.

c. PLACE THE NEW ROCK REVETMENTS AND REBUILDING ENCROACHED ON THE PREPARED SUBGRADE. PLACE THE MATERIAL IN SEQUENTIAL ORDER WITH COMPONENT LAYERS OF GEOTEXTILE, FILTERSTONE AND ARMOURSTONE. THE EXISTING ARMOURSTONE IS TO BE GENERALLY LEFT IN PLACE UNLESS PROBABLE AND INTEGRATE INTO THE PROPOSED SHORE PROTECTION WORKS AS INDICATED ON THE DRAWINGS. PLACE THE EXCAVATED AND SORTED BEACH MATERIAL WITHIN THE FOLLOWING AREAS, IN ORDER OF PRIORITY: (1) SAND AND GRAVEL IN BEACH FILL AREA, AND (2) REMAINING MATERIAL OVER THE STRUCTURE TIE.

d. WITHIN BEACH FILL AREA PLACE EXCAVATED BEACH SAND AT THE SOURCE AND SORTED GRAVEL MATERIAL IN AREAS INDICATED ON THE DRAWINGS. REPLANT MARRAM GRASS IN THE SPRING OF 2018.

e. EXTEND EXISTING CULVERTS ALONG HIGHWAY THROUGH RIPRAP STONE LAYER AS SHOWN ON THE PROJECT DRAWINGS. EXTENSIONS TO BE 1000 CONCRETE PIPE THAT WILL BE FITTED OVER THE EXISTING PVC OR CORRUGATED STEEL PIPE.

f. BUILD NEW TIMBER BOARDWALK AND STAIRWAYS EXTENDING FROM THE EXISTING VISITOR ACCESS POINT TO THE BEACH AFTER REMOVING EXISTING END PLATFORM, AS SHOWN ON DRAWINGS.

2. THE CONTRACTOR IS RESPONSIBLE TO VISIT THE SITE AND TO BE FAMILIAR WITH THE EXISTING CONDITIONS PRIOR TO COMMENCING WORK. THE CONTRACTOR IS REQUIRED TO INFORM THE CONSTRUCTION REPRESENTATIVE IN WRITING OF ANY DISCREPANCIES BETWEEN THE EXISTING CONDITIONS AND THE DRAWINGS, PRIOR TO COMMENCING WORK.

3. EXCAVATED AREAS NORTHEAST OF EXISTING BOARDWALK AND WITHIN TIDAL LAGOON AS INDICATED ARE NOT TO BE DISTURBED.

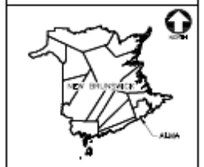
4. IF REQUIRED TO PROVIDE A BASE FOR NEW ROCK, REGRADE SOFT STOCKPILE AND RE-USE EXISTING ROCK AS REQUIRED TO PLACE NEW ARMOUR STONE.

5. REMOVE AND DISPOSE OF LOOSE STEEL SHEET PILE AND TIE-RODS. SEE DRAWINGS M5 AND M6 FOR LOCATION.

TIDAL INFORMATION

DESCRIPTION	ELEVATION (METRES ABOVE CD)	
HIGHEST HIGH WATER LARGE TIDE (HHWLT)	11.9	
HIGHEST HIGH WATER MEAN TIDE (HHWMT)	10.2	LARGE TIDAL RANGE (SPRING TIDES)
MEAN WATER LEVEL	5.8	MEAN TIDAL RANGE
LOWER LOW WATER MEAN TIDE (LLWMT)	1.4	
LOWER LOW WATER LARGE TIDE (LLWLT)	0.1	

Parks Canada — Parcs Canada



CDCL LIMITED
Consulting Engineers

GEMTEC EASTERN JV

LEGEND
- EXISTING REVETMENT
- EXISTING ARMOUR STONE
- BEACH SORTED SAND FILL AREA (TYP.)
- BEACH FILL AND REPLANTED MARRAM GRASS (TYP.)
- NEW ARMOUR STONE (TYP.)
- EDGE OF REVETMENT TOE

SEE DRAWING M1 FOR SURVEY NOTES.

Vincent M.R. Leys — 2017 — 26 Oct 2017

D	ISSUED FOR TENDER	26 OCT 2017
D	ISSUED FOR 100% REVIEW	30 AUG 2017
C	ISSUED FOR 99% REVIEW	28 JUL 2017
B	RE-ISSUED FOR 60% REVIEW	13 JUN 2017
A	ISSUED FOR 60% REVIEW	7 MAY 2017
issued/émis		date

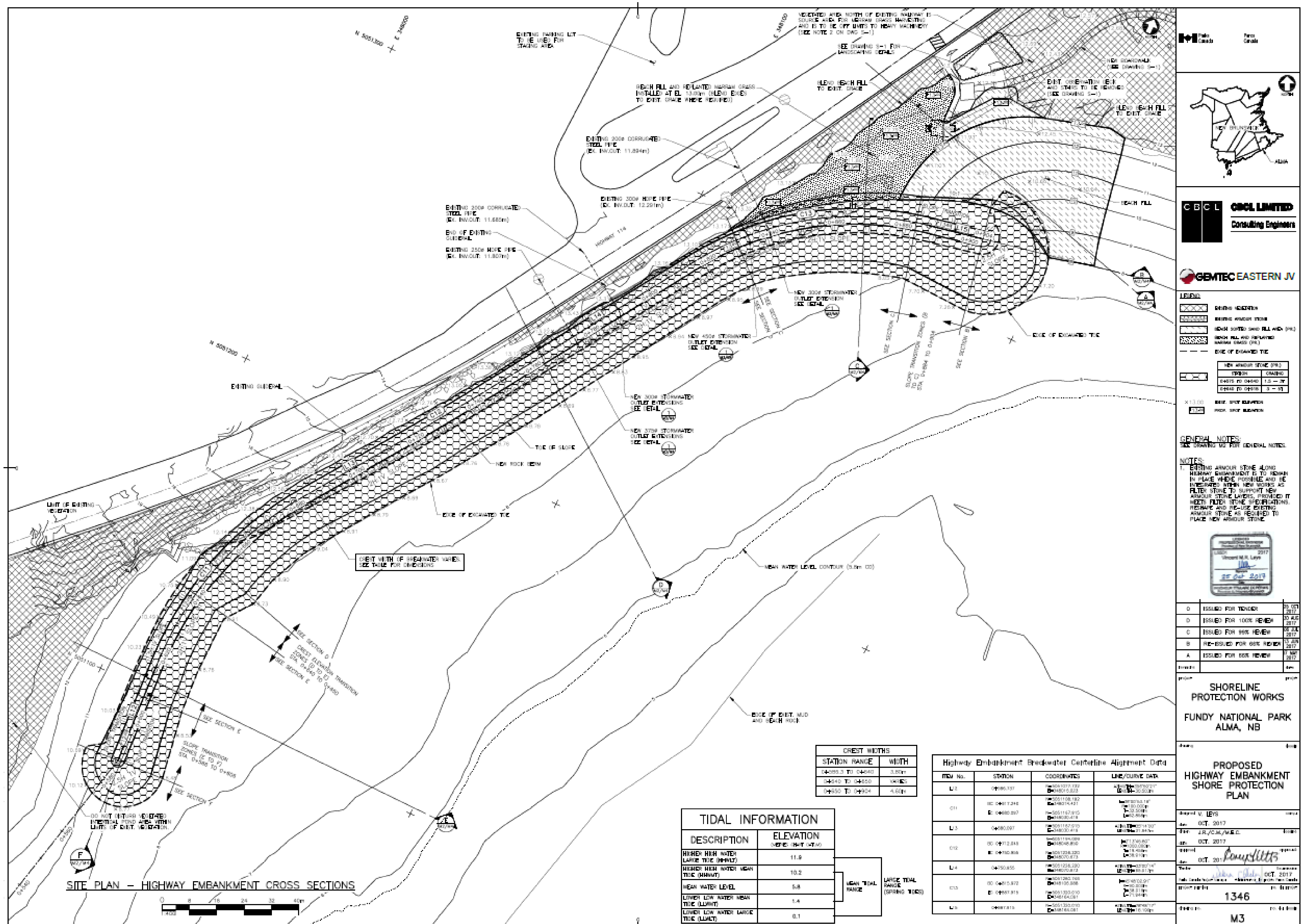
SHORELINE PROTECTION WORKS

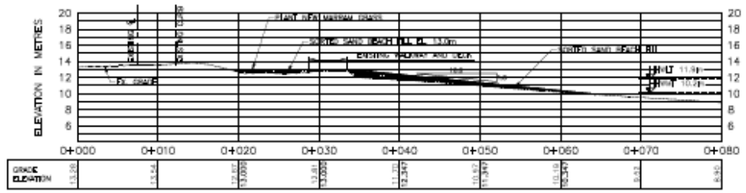
FUNDY NATIONAL PARK ALMA, NB

PROPOSED OVERALL SHORE PROTECTION PLAN

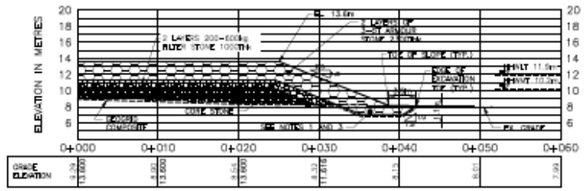
designed V. LEYS — date OCT. 2017
drawn J.R./C.M./M.E.D. — date OCT. 2017
examined — date OCT. 2017
approved — date OCT. 2017
Parks Canada Agency / Agence Parcs Canada — OCT. 2017

project number / numéro du projet: 1346
drawing no. / no du dessin: M2

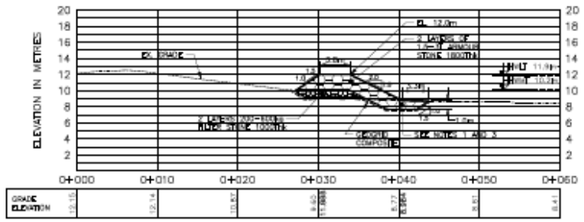

SITE PLAN – HIGHWAY EMBANKMENT CROSS SECTIONS
TIDAL INFORMATION
DESCRIPTION
ELEVATION
HIGHER HIGH WATER LARGE TIDE (HHWLT) 11.9
HIGHER HIGH WATER MEAN TIDE (HHWMT) 10.2
MEAN WATER LEVEL 5.8
LOWER LOW WATER MEAN TIDE (LLWMT) 1.4
LOWER LOW WATER LARGE TIDE (LLWLT) 0.1
MEAN TIDAL RANGE
LARGE TIDAL RANGE (SPRING TIDES)
CREST WIDTHS
STATION RANGE
WIDTH
VARIES
Highway Embankment Breakwater Centerline Alignment Data
ITEM No.
STATION
COORDINATES
LINE/CURVE DATA
EDGE OF EXIST. MUD AND BEACH ROCK
CBCL LIMITED
Consulting Engineers
GEMTEC EASTERN JV
LEGEND
GENERAL NOTES
NOTES
ISSUED FOR TENDER
ISSUED FOR 100% REVIEW
RE-ISSUED FOR 66% REVIEW
SHORELINE PROTECTION WORKS
FUNDY NATIONAL PARK
ALMA, NB
PROPOSED HIGHWAY EMBANKMENT SHORE PROTECTION PLAN
V. LEYS
OCT. 2017
1346
M3



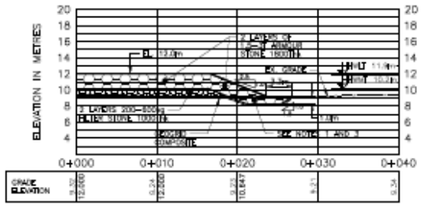
A SECTION
M2/M4 1:250 [H] 1:250 [V]



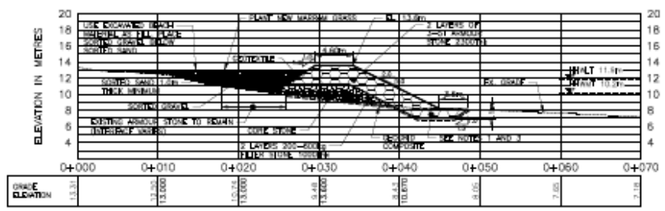
B SECTION
M2/M4 1:250 [H] 1:250 [V]



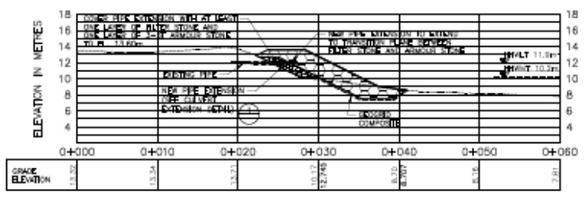
E SECTION
M2/M4 1:250 [H] 1:250 [V]



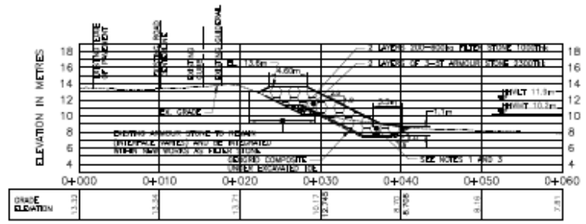
F SECTION
M2/M4 1:250 [H] 1:250 [V]



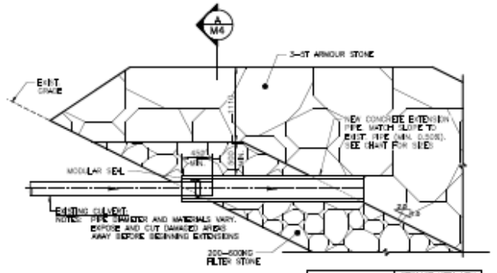
C SECTION
M2/M4 1:250 [H] 1:250 [V]



TYPICAL SECTION – STORMWATER OUTLET EXTENSION
1:250 [H] 1:250 [V]

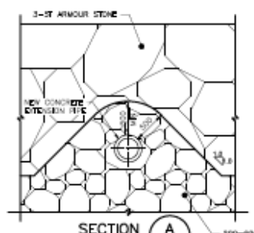


D SECTION
M2/M4 1:250 [H] 1:250 [V]



CULVERT EXTENSION DETAIL 1 M3/M4
SCALE 1:30

EXISTING CULVERT	REPLACE WITH NEW 1050 CULVERT TO CSA A257
250mm CSP	350ø
250mm HDPE	375ø
300mm HDPE	450ø



SECTION A M4

Parks Canada / Parcs Canada

CBCL LIMITED
Consulting Engineers

GEMTEC EASTERN JV

LEGEND
- SORTED SAND (BEACH FILL (PA))
- SORTED GRAVEL FILL (PA))
- CORE STONE (PR))
- 200–600KG FILTER STONE (PR))
- NEW ARMOUR STONE (PR))
- DESIGN COMPOSITE
- EXIST. GRADE

GENERAL NOTES:
SEE DRAWING M2 FOR GENERAL NOTES.

NOTES:
1. PLACE THE EXCAVATED AND SORTED BEACH MATERIAL WITHIN THE FOLLOWING AREAS, IN ORDER OF PRIORITY:
   1.1. SAND AND GRAVEL IN BEACH FILL AREA, AND
   1.2. REMAINING MATERIAL OVER THE STRUCTURE TOE AFTER COMPLETION.
2. EXISTING ARMOUR STONE ALONG HIGHWAY EMBANKMENT IS TO REMAIN IN PLACE WHERE POSSIBLE AND BE INTEGRATED WITHIN NEW WORKS AS FILTER STONE TO SUPPORT NEW ARMOUR STONE LAYERS, PROVIDED IT MEETS FILTER STONE SPECIFICATIONS. RESHAPE AND RE-USE EXISTING ARMOUR STONE AS REQUIRED TO PLACE NEW ARMOUR STONE.
3. DO NOT PLACE DESIGNED COMPOSITE OVER EXISTING ARMOUR STONE OR OVER NEW FILTER STONE AND START DESIGNED COMPOSITE PLACEMENT SEAWARD OF EXISTING ARMOUR STONE.
4. PLACE GEOTEXTILE ONLY AT FOLLOWING LOCATIONS: BACKFACE OF EXCAVATED LINDEN NEW BEACH FILL AND NEW CULVERT EXTENSIONS AS SHOWN.

D	ISSUED FOR TENDER	29 OCT 2017
D	ISSUED FOR 100% REVIEW	20 AUG 2017
C	ISSUED FOR 99% REVIEW	04 JUL 2017
B	RE-ISSUED FOR 66% REVIEW	13 JUN 2017
A	ISSUED FOR 66% REVIEW	2 MAY 2017
issue/révision		date

project / projet
SHORELINE PROTECTION WORKS

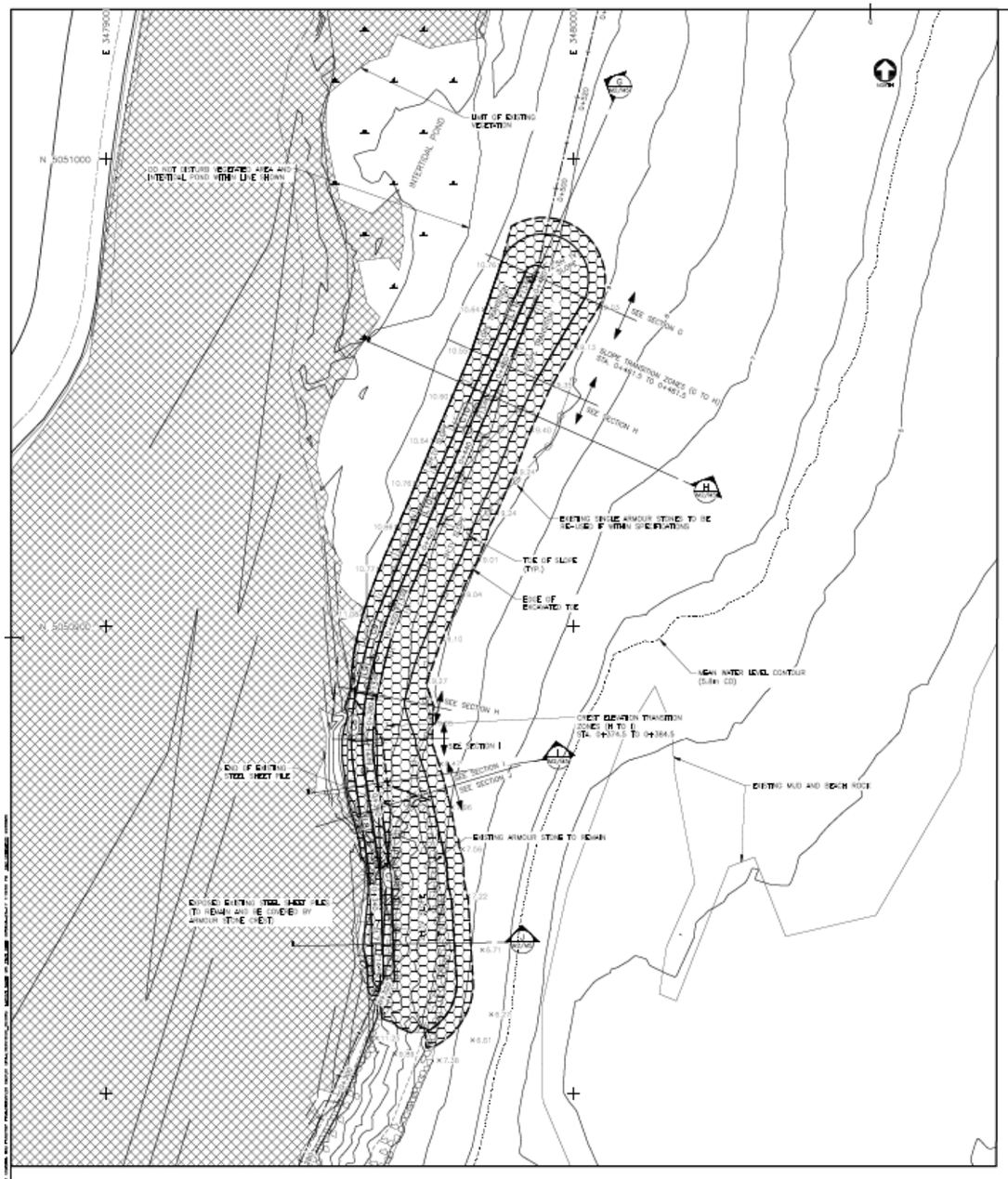
FUNDY NATIONAL PARK
ALMA, NB

drawing / dessin
PROPOSED HIGHWAY EMBANKMENT CROSS SECTIONS

designed V. LEYS
date OCT. 2017
drawn J.R./C.M./M.E.C.
date OCT. 2017
reviewed
date OCT. 2017
Verified
Date OCT. 2017

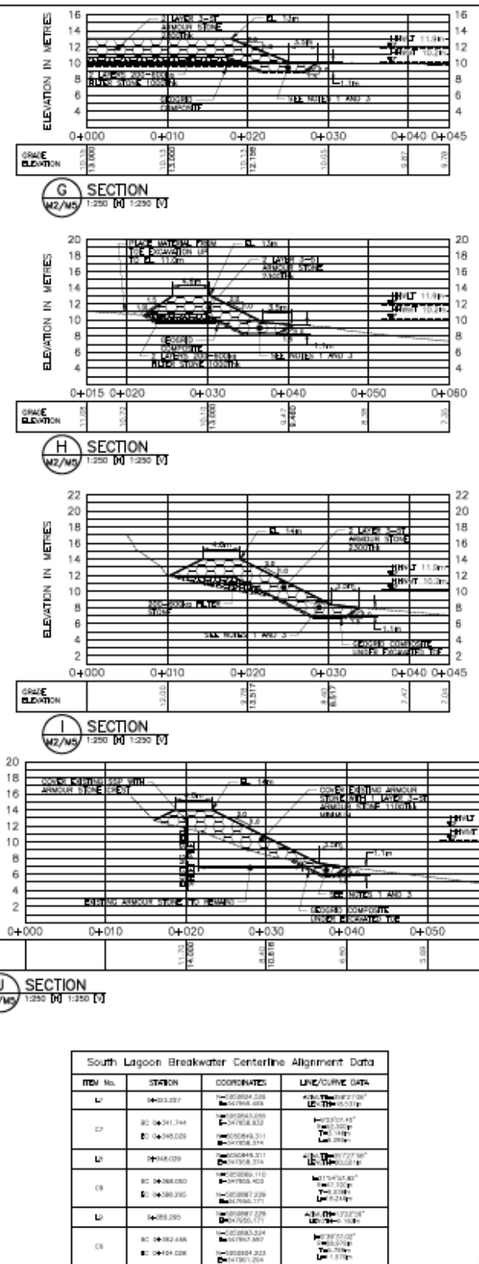
project number / numéro de projet
1346

drawing no. / no. de dessin
M4



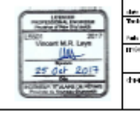
SITE PLAN – SOUTH LAGOON SHORE PROTECTION

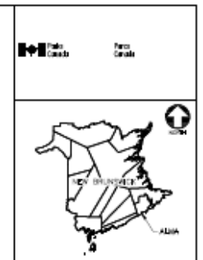
0 8 16 24 32 40m
1:800



South Lagoon Breakwater Centerline Alignment Data

ITEM No.	STATION	COORDINATES	LINE/CURVE DATA
L7	0+323.287	N=5050924.226 E=347868.669	+Tan Th=358°27'06" LC=Th= 65.531m
C7	BC 0+341.744 EC 0+395.029	N=5050943.065 E=347838.832 N=5050949.311 E=347808.374	R=370.00' Chord=53m Th= 1.19m Lm= 1.99m
L8	0+468.029	N=5050849.311 E=347808.374	+Tan Th=357°27'56" LC=Th=65.531m
C8	BC 0+388.050 EC 0+390.295	N=5050862.110 E=347855.402 N=5050867.229 E=347861.171	R=274.00' Chord=35m Th= 0.01m Lm= 0.01m
L9	0+455.295	N=5050867.229 E=347930.021	+Tan Th=172°27'06" LC=Th=65.531m
C9	BC 0+382.486 EC 0+434.029	N=5050853.024 E=347867.997 N=5050824.203 E=347901.204	R=387.00' Chord=57m Th= 1.59m Lm= 1.77m
L10	0+434.029	N=5050824.203 E=347901.204	+Tan Th=137°41'18" LC=Th=61.116m
C10	BC 0+445.165 EC 0+460.664	N=5050810.208 E=347877.428 N=5050807.089 E=347875.928	R=237.00' Chord=27m Th= 1.73m Lm= 1.80m
L11	0+460.664	N=5050807.089 E=347875.928	+Tan Th=137°41'18" LC=Th=53.581m





CBCL LIMITED
Consulting Engineers

GEMTEC EASTERN JV

LEGEND (Plan)
EXISTING VEGETATION
EXISTING ARMOUR STONE
NEW 3-HT ARMOUR STONE (TYP.)
EDGE OF EXCAVATED TOE

LEGEND (Sections)
200–600kg RUBBLE STONE (TYP.)
NEW 3-HT ARMOUR STONE (TYP.)
DESIGN COMPOSITE
EXIST. GRADE
EXIST. SPOT ELEVATION
PROP. SPOT ELEVATION

GENERAL NOTES:
SEE DRAWING M2 FOR GENERAL NOTES.

NOTES:
1. PLACE THE EXCAVATED AND SORTED BEACH MATERIAL WITHIN THE FOLLOWING AREAS, IN ORDER OF PRIORITY:
   1.1. SAND AND GRAVEL IN BEACH FILL AREA, AND
   1.2. REMAINING MATERIAL OVER THE STRUCTURE TOE AFTER COMPLETION.
2. EXISTING ARMOUR STONE IS TO REMAIN WHERE POSSIBLE AND BE INTEGRATED WITHIN NEW WORKS.
3. DO NOT PLACE DESIGNED COMPOSITE OVER EXISTING ARMOUR STONE AND MINIMIZE DESIGNED COMPOSITE PLACEMENT SEAWARD OF EXISTING ARMOURSTONE.

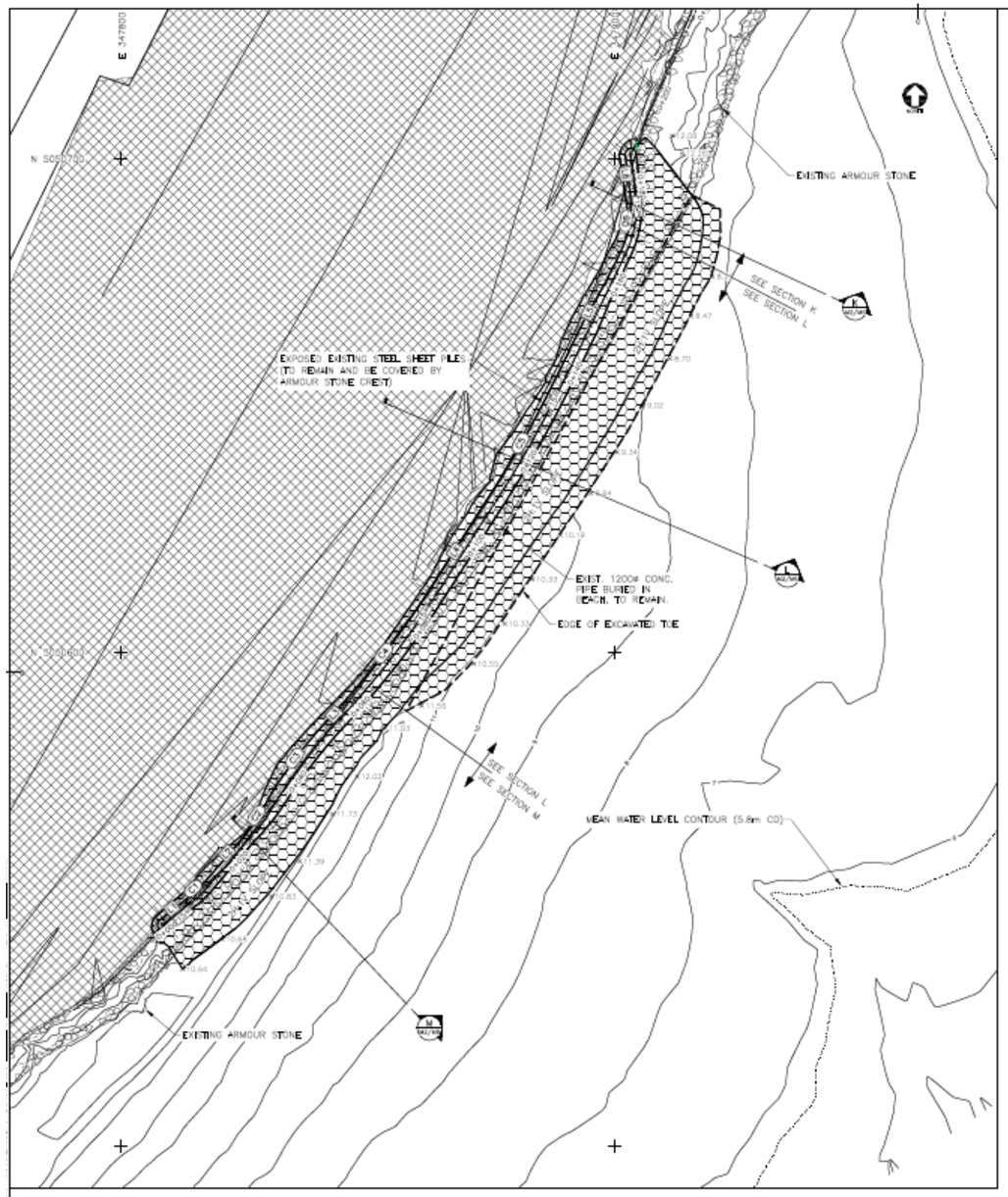
D	ISSUED FOR TENDER	25 OCT 2017
D	ISSUED FOR 100% REVIEW	30 AUG 2017
C	ISSUED FOR 99% REVIEW	08 JUL 2017
B	RE-ISSUED FOR 66% REVIEW	13 JAN 2017
A	ISSUED FOR 66% REVIEW	21 SEP 2017
Issue/Is		Date

SHORELINE PROTECTION WORKS

FUNDY NATIONAL PARK
ALMA, NB

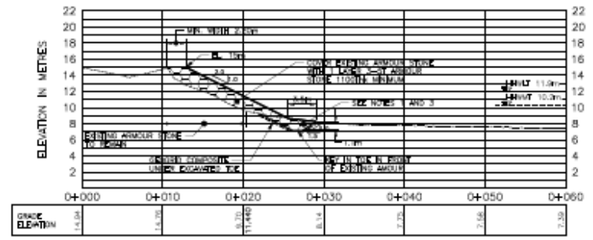
PROPOSED SOUTH LAGOON SHORE PROTECTION PLAN AND SECTIONS

Designed V. LEYS — OCT. 2017
Drawn J.R./C.M./M.E.C. — OCT. 2017
Approved — OCT. 2017
Review — OCT. 2017
Project number: 1346
Drawing no.: M5

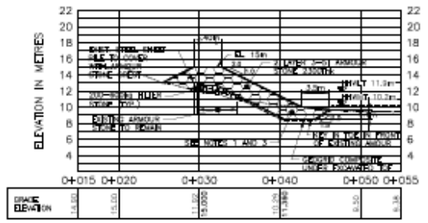


SITE PLAN – SOUTH CLIFF SHORE PROTECTION

0 8 16 24 32 40m
1:400



K SECTION
M2/M6 1:250 [H] 1:250 [V]

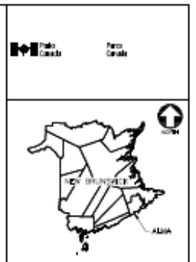


L SECTION
M2/M6 1:250 [H] 1:250 [V]

M SECTION
M2/M6 1:250 [H] 1:250 [V]

South Cliff Breakwater Centerline Alignment Data

ITEM No.	STATION	COORDINATES	LINE/CURVE DATA
L1	0+000.000	N 5031844.376 E 347808.354	AZIM=N 8°46'12" E LENGTH=100.00m
C1	BC 0+087.033 EC 0+092.679	N 5031940.070 E 347813.818 N 5031952.545 E 347817.582	Δ=20°20'29" R=35.00m T=6.38m L=12.39m
L2	0+112.079	N 5031952.545 E 347817.582	AZIM=N 28°07'41" E LENGTH=0.23m
C2	BC 0+321.316 EC 0+331.847	N 5032084.096 E 347827.922 N 5032097.655 E 347832.048	Δ=56°31'29" R=30.00m T=17.00m L=29.59m
C3	BC 0+331.847 EC 0+365.211	N 5032087.820 E 347838.348 N 5032085.405 E 347844.178	Δ=-63°24'53" R=10.00m T=6.82m L=11.07m
L3	0+366.211	N 5032085.405 E 347844.178	AZIM=N 33°57'44" E LENGTH=0.00m
C4	BC 0+365.316 EC 0+387.370	N 5032085.413 E 347844.182 N 5032111.781 E 347863.865	Δ=-91°31'33" R=25.00m T=25.10m L=39.93m
L4	0+387.370	N 5032111.781 E 347863.865	AZIM=N 57°37'10" E LENGTH=0.00m
C5	BC 0+199.004 EC 0+136.690	N 5032037.207 E 347872.892 N 5032053.882 E 347896.358	Δ=32°35'14" R=45.37m T=14.25m L=25.88m
L5	0+136.690	N 5032053.882 E 347896.358	AZIM=N 25°02'48" E LENGTH=27.480m
C6	BC 0+164.142 EC 0+176.153	N 5032080.330 E 347902.373 N 5032093.211 E 347904.136	Δ=-27°09'48" R=30.00m T=8.69m L=14.01m
L6	0+176.153	N 5032093.211 E 347904.136	AZIM=N 25°15'50" E LENGTH=7.771m



CBCL LIMITED
Consulting Engineers

GEMTEC EASTERN JV

LEGEND (PLAN)
EXISTING VEGETATION
EXISTING ARMOUR STONE
NEW 3–5T ARMOUR STONE (PR.)
EDGE OF EXCAVATED TOE

LEGEND (SECTION)
200–400kg RUBBLE STONE (PR.)
NEW 3–5T ARMOUR STONE (PR.)
GEOGRID COMPOSITE
EXIST. GRADE
EXIST. SPOT ELEVATION
PROP. SPOT ELEVATION

GENERAL NOTES:
SEE DRAWING M2 FOR GENERAL NOTES.

NOTES:
1. PLACE THE EXCAVATED AND SORTED BEACH MATERIAL WITHIN THE FOLLOWING AREAS IN ORDER OF PRIORITY:
   1.1. SAND AND GRAVEL IN BEACH FILL AREA, AND
   1.2. REMAINING MATERIAL OVER THE STRUCTURE THE AFTER COMPLETION.
2. EXISTING ARMOUR STONE IS TO REMAIN WHERE POSSIBLE AND BE INTEGRATED WITHIN NEW WORKS.
3. DO NOT PLACE GEOGRID COMPOSITE OVER EXISTING ARMOUR STONE AND SEWN GEOGRID COMPOSITE PLACEMENT SEAWARD OF EXISTING ARMOURSTONE.

D	ISSUED FOR TENDER	20 OCT 2017
D	ISSUED FOR 100% REVIEW	10 AUG 2017
C	ISSUED FOR 99% REVIEW	08 JUL 2017
B	RE-ISSUED FOR 66% REVIEW	13 JUN 2017
A	ISSUED FOR 66% REVIEW	17 MAY 2017
issue		date

project
SHORELINE PROTECTION WORKS

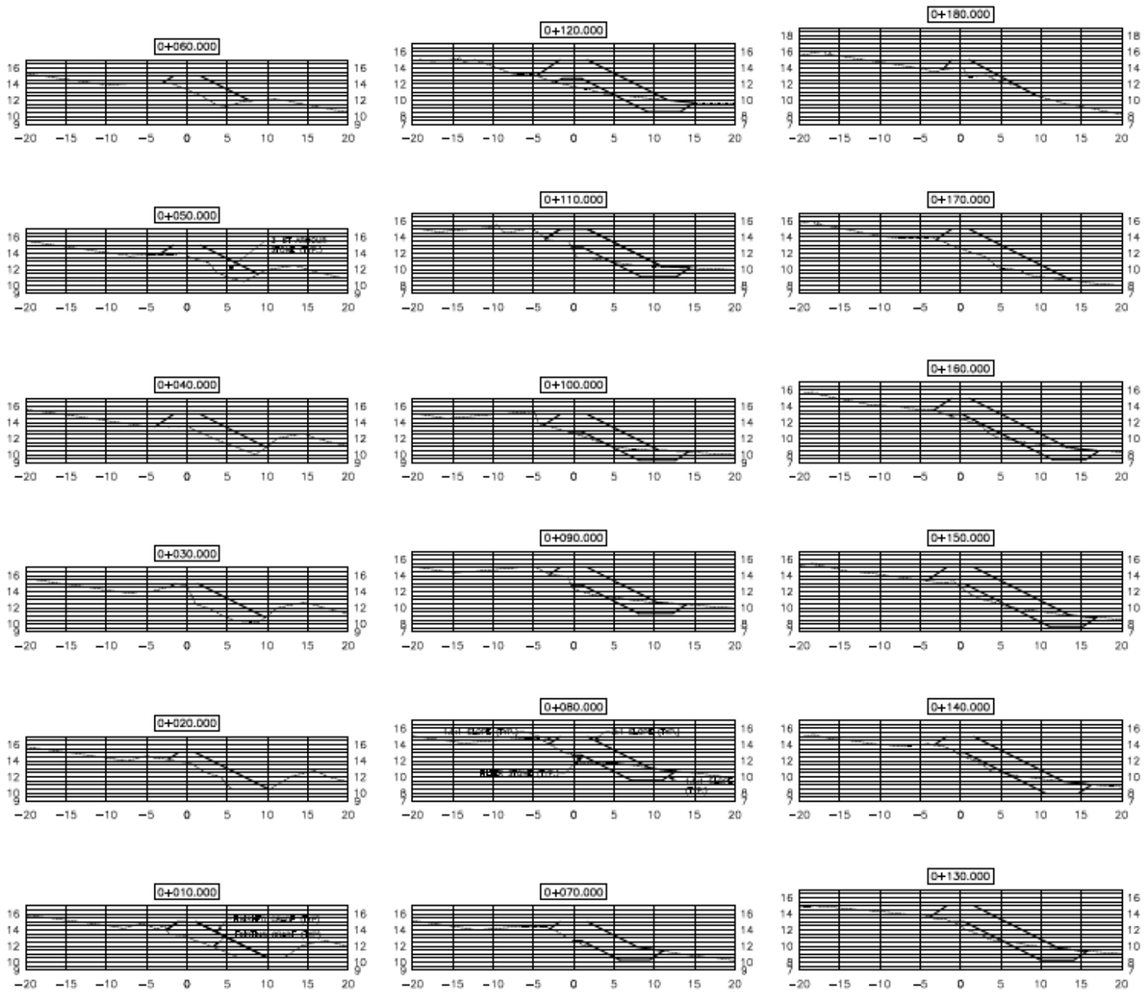
FUNDY NATIONAL PARK
ALMA, NB

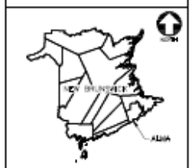
drawing title
PROPOSED SOUTH CLIFF SHORE PROTECTION PLAN AND SECTIONS

designed V. LEYS
date OCT. 2017
drawn J.R./C.M./M.E.C.
date OCT. 2017
approved
date OCT. 20
Parks Canada Agency – Agence Parcs Canada
Parks Canada
date OCT. 2017

project number
1346

drawing no.
M6





GENERAL NOTES:
1. SEE DRAWING M2 FOR GENERAL NOTES.

SECTIONS	SEE TYPICAL REFERENCE SECTION FOR DETAILS AND DIMENSIONS
0+000 TO 0+060	Drawing M5 = Section H
0+070 TO 0+170	Drawing M6 = Section L
0+180	Drawing M6 = Section B

D	ISSUED FOR TENDER	25 OCT 2017
D	ISSUED FOR 100% REVIEW	30 AUG 2017
C	ISSUED FOR 99% REVIEW	06 JUL 2017
B	RE-ISSUED FOR 66% REVIEW	13 JUN 2017
A	ISSUED FOR 66% REVIEW	31 MAY 2017

SHORELINE PROTECTION WORKS

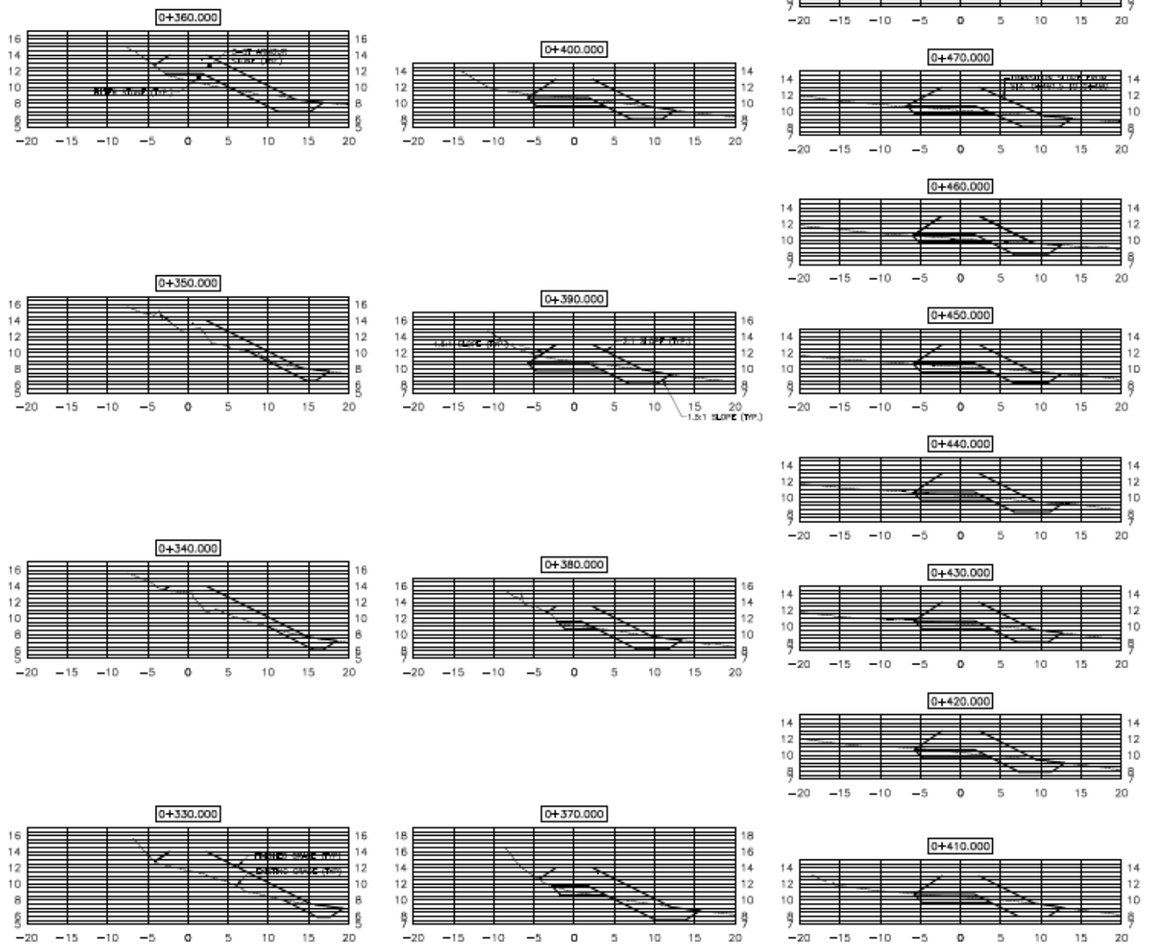
FUNDY NATIONAL PARK
ALMA, NB

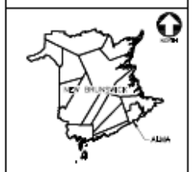
SOUTH CLIFF
SECTIONS
0+010 TO 0+180

designed V. LEYS
date OCT. 2017
drawn J.R./C.M./M.E.C.
date OCT. 2017
approved
date OCT. 2017
Technical Review
Technical Review OCT. 2017

1346

M7





CBCL LIMITED
Consulting Engineers

GEMTEC EASTERN JV

GENERAL NOTES:
1. SEE DRAWING NO1 FOR GENERAL NOTES.

SECTIONS	SEE TYPICAL REFERENCE SECTION FOR DETAILS AND DIMENSIONS
0+330 TO 0+340	Drawing M8 reference A
0+350 TO 0+360	Drawing M8 reference B
0+370 TO 0+480	Drawing M8 reference H, G

D	ISSUED FOR TENDER	25 OCT 2017
C	ISSUED FOR 100% REVIEW	20 AUG 2017
B	ISSUED FOR 95% REVIEW	04 JUL 2017
A	RE-ISSUED FOR 65% REVIEW	12 JAN 2017
A	ISSUED FOR 65% REVIEW	07 MAR 2017
Issued for		date

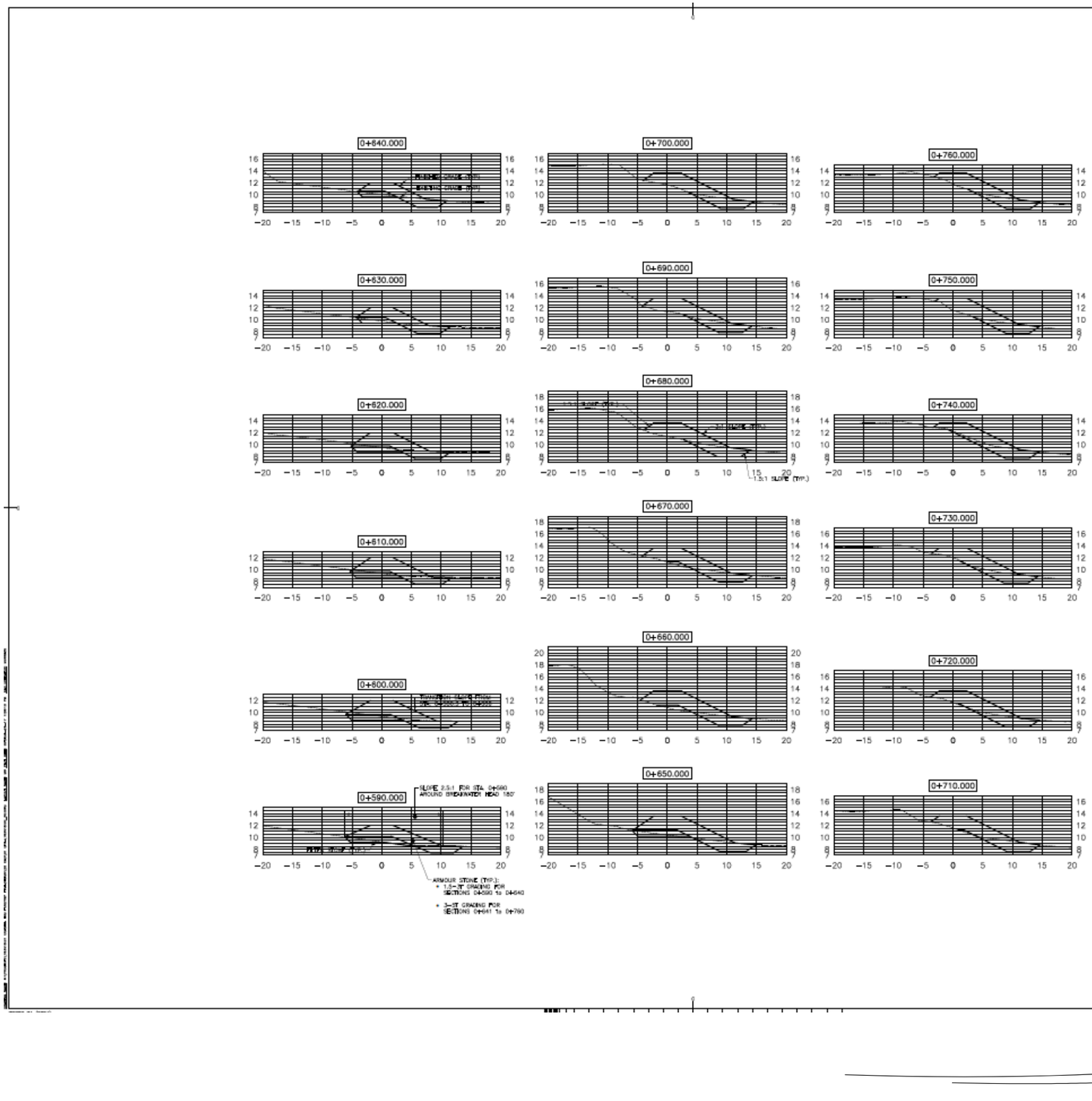
SHORELINE PROTECTION WORKS

FUNDY NATIONAL PARK
ALMA, NB

SOUTH LAGOON SECTIONS
0+330 TO 0+480

drawn: V. LEVIS
date: OCT. 2017
check: J.R./C.M./M.E.C.
date: OCT. 2017
approved
date: OCT. 2017
Parks Canada Agency: OCT. 2017

project number: 1346
drawing no.: M8



Parks Canada

CBCL LIMITED
Consulting Engineers

GEMTEC EASTERN JV

GENERAL NOTES:
1. SEE DRAWING M0 FOR GENERAL NOTES.

SECTIONS	SEE TYPICAL REFERENCE SECTION FOR DETAILS AND DIMENSIONS
0+590 TO 0+640	TYPICAL SECTION FOR 1.5–3T ARMOUR STONE
0+641 TO 0+760	TYPICAL SECTION 1

D	ISSUED FOR TENDER	20 OCT 2017
C	ISSUED FOR 100% REVIEW	30 AUG 2017
B	ISSUED FOR 99% REVIEW	08 JUN 2017
A	RE-ISSUED FOR 66% REVIEW	15 JUN 2017
A	ISSUED FOR 66% REVIEW	17 MAY 2017

SHORELINE PROTECTION WORKS

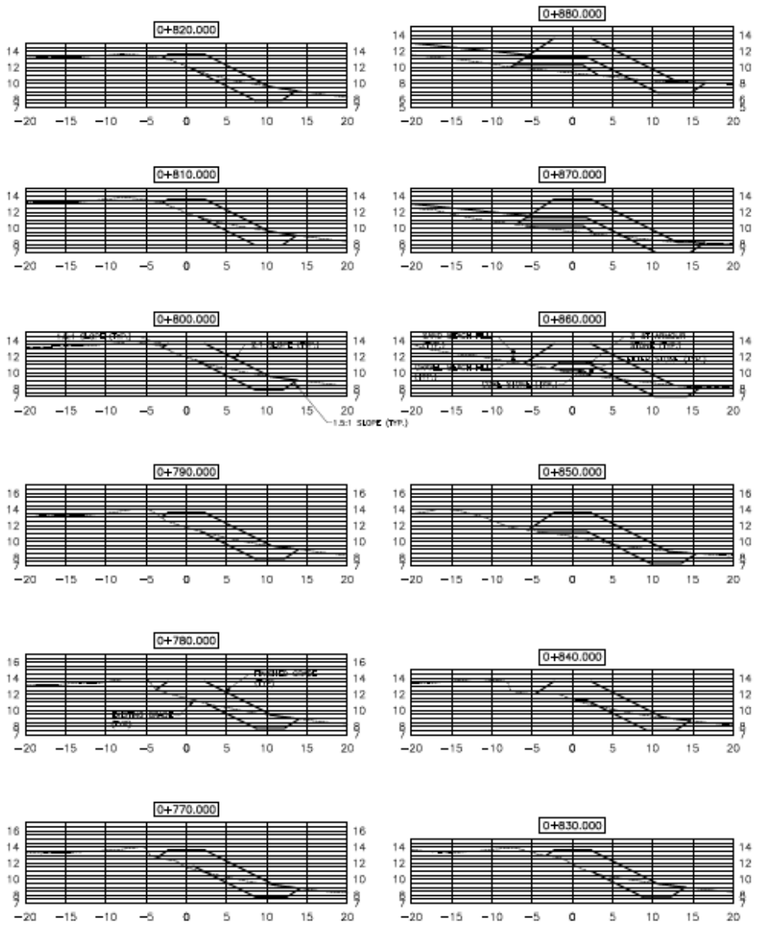
FUNDY NATIONAL PARK
ALMA, NB

HIGHWAY EMBANKMENT SECTIONS
0+590 TO 0+760

Drawn: V. LEYS — date: OCT. 2017
Design: J.R./C.M./M.E.C. — date: OCT. 2017
Checked — date: OCT. 2017
Approved — date: OCT. 2017

1346

M9



SECTIONS	SEE TYPICAL REFERENCE SECTION FOR DETAILS AND DIMENSIONS
0+770 TO 0+800	Drawing M1 - Section B
0+810 TO 0+880	Drawing M1 - Section C
0+890	Transition Plan M1 No. 5
0+900	Drawing M1 - Section B

GENERAL NOTES:
1. SEE DRAWING M2 FOR GENERAL NOTES.

D	ISSUED FOR TENDER	25 OCT 2017
D	ISSUED FOR 100% REVIEW	30 AUG 2017
C	ISSUED FOR 99% REVIEW	08 JUL 2017
B	RE-ISSUED FOR 66% REVIEW	13 JUN 2017
A	ISSUED FOR 66% REVIEW	17 MAY 2017

CBCL LIMITED
Consulting Engineers

GEMTEC EASTERN JV

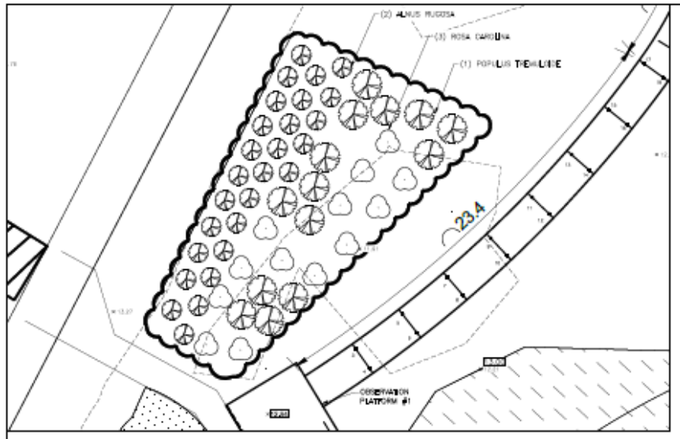
SHORELINE PROTECTION WORKS

FUNDY NATIONAL PARK
ALMA, NB

HIGHWAY EMBANKMENT SECTIONS
0+770 TO 0+900

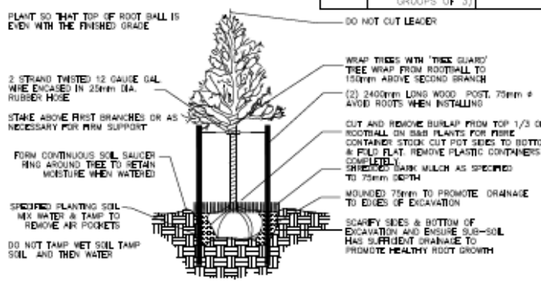
drawn: V. LEYS
date: OCT. 2017
check: J.R./C.M./M.E.C.
date: OCT. 2017
approved
date: OCT. 2017
Parks Canada Representative
date: OCT. 2017

project number: 1346
drawing no.: M10

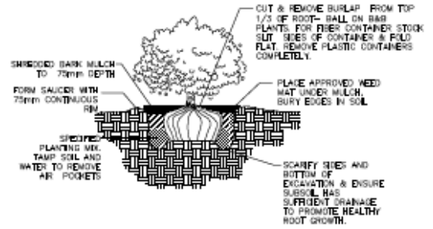


PLANTING PLAN
SCALE: NTS

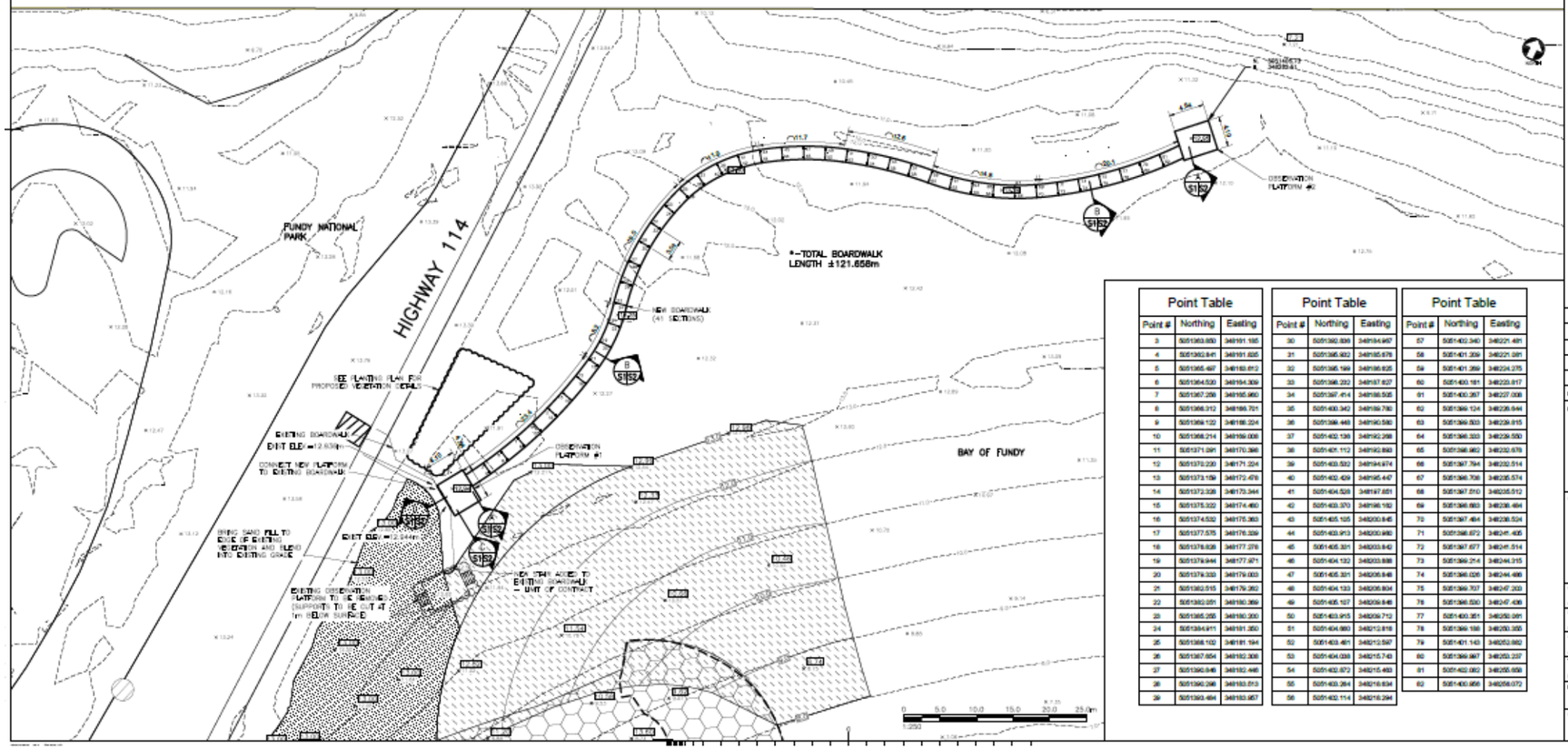
VEGETATION SCHEDULE						
CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	SPACING	PLANTING DETAIL
1	14	POPULUS TREMULOIDE	TREMBLING ASPEN	200 CM HT	1.5m	1
2	27	ALNUS RUGOSA	SPECKLED ALDER	200 CM HT	1.0m	1
3	39 (SHOWN IN GROUPS OF 3)	ROSA CAROLINA	PASTURE ROSE	200 MM HT	3 WITHIN A 1.5m RADIUS	2



1 / S1 DECIDUOUS TREES
SCALE: NTS



2 / S1 SHRUB PLANTING
SCALE: NTS



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4	5051362.841	348191.695
5	5051365.487	348193.612
6	5051364.530	348194.309
7	5051367.256	348195.960
8	5051366.312	348196.701
9	5051369.122	348198.334
10	5051368.214	348199.008
11	5051371.091	348170.398
12	5051370.230	348171.224
13	5051373.159	348172.478
14	5051372.328	348173.344
15	5051375.322	348174.460
16	5051374.532	348175.363
17	5051377.575	348176.329
18	5051376.828	348177.278
19	5051379.944	348177.971
20	5051379.333	348179.003
21	5051382.515	348179.262
22	5051382.051	348180.389
23	5051385.258	348180.300
24	5051384.911	348181.350
25	5051388.102	348181.194
26	5051387.854	348182.308
27	5051390.946	348182.446
28	5051390.298	348183.513
29	5051393.484	348183.957

Point Table		
Point #	Northing	Easting
30	5051390.836	348184.967
31	5051395.922	348185.679
32	5051395.199	348186.825
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34	5051397.414	348188.505
35	5051400.342	348189.786
36	5051399.448	348190.586
37	5051402.136	348192.298
38	5051401.112	348192.892
39	5051403.532	348194.674
40	5051402.429	348195.447
41	5051404.528	348197.051
42	5051403.370	348196.192
43	5051405.105	348200.845
44	5051403.913	348200.980
45	5051405.301	348203.842
46	5051404.132	348203.888
47	5051405.331	348206.848
48	5051404.133	348206.804
49	5051405.107	348209.846
50	5051403.915	348209.712
51	5051404.980	348212.816
52	5051403.481	348212.597
53	5051404.038	348215.749
54	5051402.672	348215.493
55	5051403.264	348216.834
56	5051402.114	348216.294

Point Table		
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62	5051399.124	348226.844
63	5051399.303	348229.915
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66	5051397.764	348232.514
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68	5051397.010	348235.612
69	5051396.663	348238.464
70	5051397.464	348238.534
71	5051396.872	348241.406
72	5051397.677	348241.514
73	5051396.214	348244.315
74	5051396.026	348244.486
75	5051396.707	348247.203
76	5051396.530	348247.436
77	5051400.351	348250.085
78	5051399.186	348250.358
79	5051401.143	348252.882
80	5051399.997	348253.237
81	5051402.092	348255.659
82	5051400.956	348256.073

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LEGEND
- BEACH SORTED SAND FILL AREA (TYP.)
- BEACH FILL AND REPLANTED MARSH GRASS (TYP.)
- EDGE OF ENHANCED TIE
- PROPOSED VEGETATION AREA
- NEW 3-D T ARMOUR STONE
- 11.25 PROPOSED GRADE / EXISTING GRADE
- PROPOSED POSTHOLE LOCATION

GENERAL NOTES:
1. SEE DRAWING M1 FOR GENERAL NOTES.
2. THERE WILL BE ABSOLUTELY NO EQUIPMENT PERMITTED ON THE BEACH OR GRADED AREA CONSTRUCTION OF BOARDWALK WILL BE COMPLETED BY STAGING OFF THE COMPLETED SECTIONS. THE CONTRACTOR SHALL PROVIDE EQUIPMENT OF SUITABLE SIZE AND CAPACITY TO ALLOW STAGING OFF COMPLETED SECTION OF BOARDWALK FOR ALL ELEMENTS OF THE BOARDWALK CONSTRUCTION. INSTALLATION EQUIPMENT WEIGHT TO BE LIMITED TO 2000 KG. BOARDWALK SURFACE DECKING TO BE PROTECTED FROM DAMAGE DURING CONSTRUCTION.

S. S. Brinham 4111 Province of New Brunswick

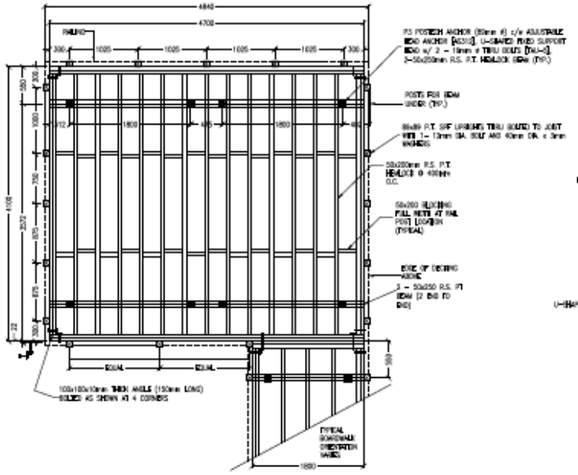
D	ISSUED FOR TENDER	25 OCT 2017
C	ISSUED FOR 100% REVIEW	30 AUG 2017
B	ISSUED FOR 99% REVIEW	09 JUN 2017
A	RE-ISSUED FOR 66% REVIEW	31 MAY 2017
	ISSUED FOR 66% REVIEW	17 MAY 2017
Issued/e		dm

SHORELINE PROTECTION WORKS

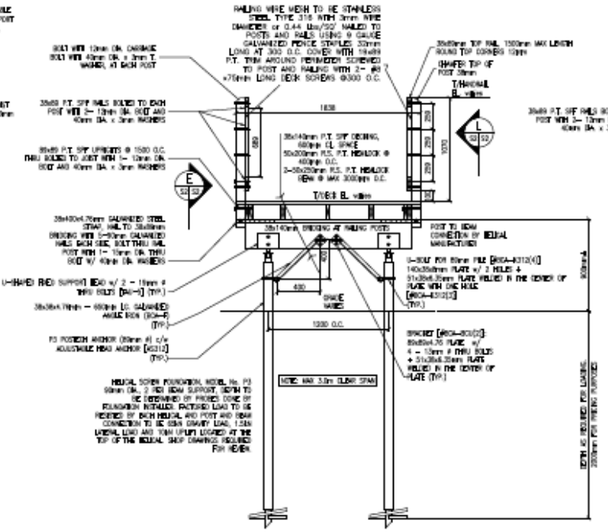
FUNDY NATIONAL PARK
ALMA, NB

PROPOSED BOARDWALK LOCATION PLAN

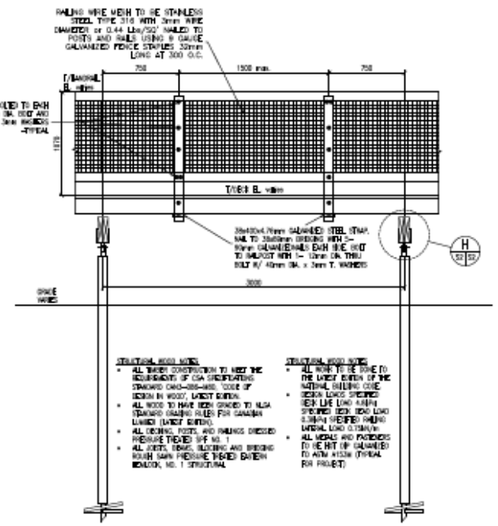
designed S. BRINHAM
date OCTOBER 2017
drawn M. RIMTHAULT
date OCTOBER 2017
approved
date OCT. 2017
Tender OCT. 2017
PROJECT NUMBER
1346
DRAWING NO.
S-1



A S1/S2 TERRESTRIAL OBSERVATION AREA PLAN
SCALE 1:50

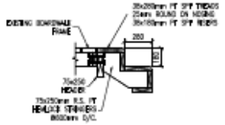


B S1/S2 TERRESTRIAL BOARDWALK SECTION
SCALE 1:20

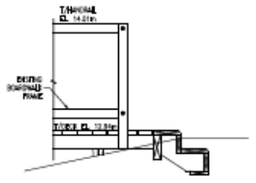


E S1/S2 TERRESTRIAL BOARDWALK ELEVATION
SCALE 1:20

C S1/S2 STAIR PLAN
SCALE 1:20



F S1/S2 STAIR SECTION
SCALE 1:20



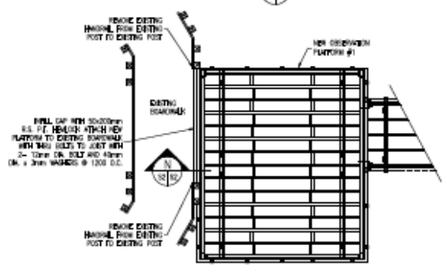
G S1/S2 STAIR SECTION
SCALE 1:20

NOTES:
ALL STAIR LUMBER SHALL BE P.T. EASTERN HEMLOCK NO. 1 STRUCTURAL GRADE or P.T. SPF NO. 1.

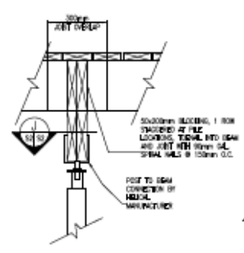
ALL METAL WORK AND FASTENERS TO BE HOT DIPPED GALVANIZED TO ASTM A153M.

ALL WELDS TO BE GROUND SMOOTH. STAIR LENGTH TO BE DETERMINED WITH SPECIFIC ON-SITE MEASUREMENTS. STAIR DRAWINGS REQUIRED FOR APPROVAL OF METAL WORK.

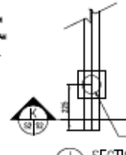
STAIR STRINGERS FASTENED TO STRINGERS WITH 3– 10mm GALVANIZED DECK SCREWS, 2 EACH STRINGER.



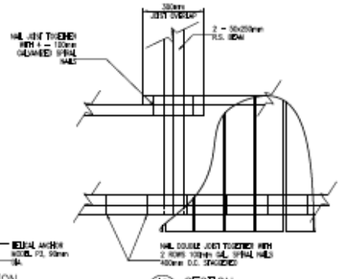
D S1/S2 EXISTING BOARDWALK CONNECTION TO NEW OBSERVATION AREA PLAN
SCALE 1:50



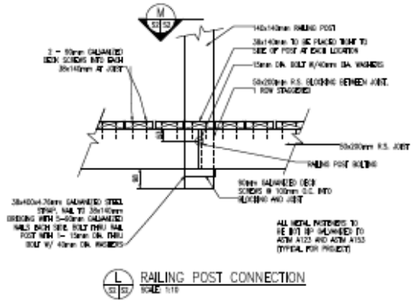
H S1/S2 FRAMING AT HELICAL
SCALE 1:10



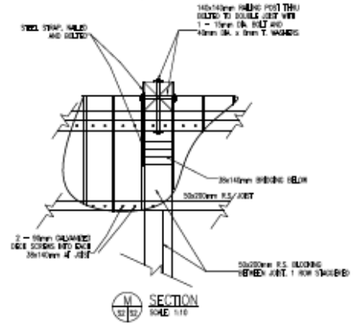
J S1/S2 SECTION
SCALE 1:10



K S1/S2 SECTION
SCALE 1:10



L S1/S2 RAILING POST CONNECTION
SCALE 1:10



M S1/S2 SECTION
SCALE 1:10

Parks Canada / Parcs Canada

CBCL LIMITED
Consulting Engineers

GEMTEC EASTERN JV

D	ISSUED FOR TENDER	26 OCT 2017
D	ISSUED FOR 100% REVIEW	09 AUG 2017
C	ISSUED FOR 99% REVIEW	26 JUL 2017
B	RE-ISSUED FOR 66% REVIEW	17 JUN 2017
A	ISSUED FOR 66% REVIEW	2 MAY 2017
number		date

FNP SHORELINE PROTECTION WORKS

FUNDY NATIONAL PARK
ALMA, NB

SECTIONS AND DETAILS

drawn: S. SHINEHAM — date: OCTOBER 2017
design: M. FLINTHALT — date: OCTOBER 2017
reviewed: OCT. 2017
date:
Parks Canada Representative
PARKS Project Manager

project number: 1346

drawing no.: S–2

APPENDIX IV

Archaeology Overview Assessment

PARKS CANADA AGENCY
ARCHAEOLOGY AND HISTORY BRANCH
INDIGENOUS AFFAIRS AND CULTURAL HERITAGE DIRECTORATE

ARCHAEOLOGICAL OVERVIEW ASSESSMENT (AOA)
FUNDY NATIONAL PARK – ALMA BREAKWATER PROJECT
INVESTMENT IN ASSETS- 2368

André MILLER
FII Project Archaeologist, IAHCD
National Office, Gatineau

ABSTRACT
Parks Canada Agency (PCA) and PWGSC has proposed an extension of the SCH breakwater onto the piece of land next to the existing wharf in Alma at Fundy National Park (Figure 1). The current project involves also the construction of a Curved armour stone revetment and breakwater as a long-term solution to the erosion problem and is required in order to minimize storm damage while maintaining the natural beauty of the site for continued visitor enjoyment at the Park entrance. This Archaeological Overview Assessment (AOA) will evaluate the archaeological potential of the project area and the potential impacts of the proposed work on known or potential archaeological resources. This AOA will determine if an Archaeological Impact Assessment and/or mitigation measures are required.

PROJECT INTRODUCTION

The original breakwater design was to cover the existing wharf. After construction of the extension at the Alma Wharf, fishermen noticed a change in wave action. It started bouncing off the extension. Also, at high tides in December it was very hard on the fishermen, and they advised PWGCS that the water coming from the bay was topping off, on Parks land. PWGSC and SCH decided to investigate and hired CBCL, Vincent Leys to do a coastal study. Looking at the findings and talking with the fishermen, SCH and PWGSC decided to proceed with plans and specs to extend the breakwater on the West and East sides to give better protection for the fishermen (Parks Canada 2017).

Parks Canada chose the option that will protects the road embankment with an armour stone revetment ended with curved breakwaters to hold the existing sediment around the lagoon, and new sand fill at the base of the north beach. The level of protection from wave overtopping at the road could be high (Option 2) which would partially block motorists' view of the sand flats, to moderate (Option 2B) which would keep the view open from the road. The present beach access platform could remain, from which the view would be partially blocked by the new breakwater. Option 2b will require major construction works (Figure 2) in two large areas:

North Beach

- Requires beach fill behind new breakwater
- Visually intrusive breakwater required to keep public access at present location
- Boardwalk extent should still be limited to shadow of new breakwater

Lagoon

- Visually intrusive breakwaters to dissipate wave energy and contain the local sediment to mitigate against erosion.

ARCHAEOLOGICAL ASSESSMENT METHODOLOGY

This archaeological assessment is based on a review of documentation provided by the Fundy NP Field Unit, online resources and existing documentation at the PCA Terrestrial Archaeology Branch, National Office, Gatineau, Quebec. The documentation includes Archaeological Resource Evaluation mapping, reports, and digital files.

HISTORICAL BACKGROUND

The Bay of Fundy which separates the provinces of New-Brunswick and Nova Scotia, has unusual physical and historical attractions. The Bay is remarkable for its tremendous tides, believed to be the highest in the world. Known to Europeans since the 16th century, the Bay of Fundy was shown on the Cabot map of 1544. It was called La Baie Française by Sieur de Monts, who spent a winter on Dochet Island in the St. Croix River in 1604-05 and who later in 1605 established the settlement of Port Royal on Annapolis Basin. By the end of the 16th century, the bay was known as the Bay of Fundy. An area overlooking the Bay of Fundy was selected in 1947 for the establishment of the first national park in New Brunswick. It incorporates an area of nearly 80 square miles of rolling forested land, rising in steps from the bay. High swift tides, aided by wind and wave action, have carved and sculptured the rugged shoreline into sheltered coves and bold promontories. The rugged grandeur of the park's coastline provides a strong contrast to the sylvan solitude of its well-wooded uplands, which reach a height of about 1,200 feet above sea level (Parks Canada 1976, p.101).

The settlement, known as Salmon River Settlement, now Alma village, began in earnest as the lumbering trade took root with the exchange of land-grant title, and construction of a sawmill on the Upper Salmon River by its new owners. The Village municipality incorporated in 1966 following sweeping changes that disbanded county councils. It was 18 years prior that the federal government expropriated land in the village and parish west of the Upper Salmon River for the creation of Fundy National Park. Many homes were relocated east of the river as lumber barons gave way to the new land managers, Parks Canada Agency. Finally, highway 114 and bridge were realigned much closer to the shoreline between 1962 and 1976.

PREVIOUS ARCHAEOLOGICAL WORK AT FUNDY NATIONAL PARK

Although physical evidence of Indigenous use or occupation within Fundy NP has not been located to date, the area is within traditional territory of the Mi'kmaq, Wolastokiyik (Maliseet), and Passamaquoddy peoples. Archaeological and historical research has identified many cultural resources related to European settlement and use of the park area. These resources include:

- Features and contexts associated with human settlement such as abandoned farms and homesteads that include foundations, remnant fields and roads, stone fences and culverts, cemeteries, and archaeological artifacts;
- Features associated with resource harvesting within FNP that include remnants of saw mill sites and dams, the "Harry McManus" submerged canal, logging roads and lumber camps, and an abandoned copper mine;
- Features associated with Public works including the original Howe-truss covered bridge, circa 1914; a reconstructed replica Howe-truss covered bridge (1992) recognized by FHBRO for its form and function, and the associated dam and abutments of the original bridge; and lighthouse foundations. (PCA 2005).

There is limited knowledge of the condition of the park's cultural resources in this area (further evaluations and inventories are required) and that cultural resource research and information has not been consolidated yet. The park has a fair understanding of the inventory of the cultural resources; however, a cultural

resource management strategy and monitoring program for cultural resources in Fundy NP has not been developed to date (PCA 2011).

Parks Canada must ensure that these cultural resources and newly discovered are recognized, managed and presented so that the public will learn about and better appreciate the park's cultural heritage in ways that do not interfere with ecological processes and ecosystem management programs.

ARCHAEOLOGICAL POTENTIAL

Previously there was no archaeological investigations in the immediate area of this project on the coastline of Fundy National Park. However, there is moderate to high potential that excavation activities may yield Aboriginal and/or historical artifacts, particularly in areas illustrated below, including where Armour stone revetments would be required behind the lagoon once shoreline erosion has progressed close to the road embankment (Figure 5).

ASSESSMENT OF PROPOSED PROJECT IMPACT ON POTENTIAL ARCHAEOLOGICAL RESOURCES

The present AOA is based on a review of drawings and designs provided. There is archaeological concern with the design concept for Shoreline Protection and related works (Figure 4). Therefore, an Archaeological Impact Assessment (AIA) is recommended for this project. This AIA will included pedestrian survey, documenting the Old Cribwork and test pitting in specific areas. The proposed construction project of new Armours Stone and Breakwater will certainly result in unearthing and digging.

Archaeological Mitigation Measures

This area of the Fundy NP has not been subjected to archaeological tests or survey. Impacts on archaeological resources from construction activities of this project as outlined in recent documents, have the potential to be deemed significant. With a potential for the discovery of unknown archaeological resources, the proposed work activity will require an Archaeological Impact Assessment (AIA) to assess the potential for archaeological resources along the shoreline and the wharf area. Mitigation measures, including archaeological survey (pedestrian), cribwork recording and test pitting, are required to minimize these impacts. This must be undertaken by a PCA-licenced archaeologist who will survey the proposed locations defined by PCTAR[1] to determine if undisturbed areas of archaeological potential exist (Figure 5). Findings from this survey will inform additional mitigation measures, if required. If found, these areas must be tested and depending on the result, may require additional excavation or mitigation work. Archaeological Resources could be disturbed as a consequence of this project, resulting in a loss a data about past activities at the site. The AIA will be designed to assess potential remains of pre-contact and historic periods or buried resources.

[1] PCTAR: Parks Canada Terrestrial Archaeologist Research

Additional Mitigation Measures

Therefore the following mitigation measures have been also identified to ensure the construction activities, as outlined in drawings, will not have an impact on archaeological resources:

1. If there are any changes to the plans, all additional information and construction drawings must be submitted to Parks Canada's Terrestrial Branch for further review.

2. The 100% design concept plans for the project must be submitted to Parks Canada's Terrestrial Branch for further review.

3. Additional Archaeological Impact Assessment (AIA) are required for the access roadways for construction. Forward additional details, including length sections of roadways, depth and width of excavation if necessary, to Parks Canada's Archaeology Section for further review;

4. Vehicular access routes and staging areas will be restricted to present-day roadways, parking lots, exposed bedrock areas and significantly disturbed areas. If this is not possible, the use of protective covering such as geotextile protective mats with a wood chip lift or granular "A" gravel is required. All protective measures employed must be removed following construction and the area restored to a pre-construction state. Excavation is not permitted during installation or removal of protective covering.

5. If significant features (i.e., structural remains and/or high artifact concentrations) are encountered during construction activities, excavation should cease in the immediate area, and the Parks Canada project manager will be informed. The project manager should then contact Parks Canada's Terrestrial Archaeology section for advice and assessment of significance, which will in turn determine the requirements to mitigate the find.

OTHER CONSIDERATIONS:

Fundy National Park functions in many ways for the benefit of Canadians. It preserves as a public heritage a unique example of the national landscape, including the upland plateau of the Caledonian Highlands, and the marine environment of the Fundy coastline. The park supports a varied wild life, and provides exceptional opportunities for many forms of outdoor recreation. Proposals for future use and development of the park should help expand its value to the nation.

REFERENCES

Parks Canada Agency (PCA)

2017 Shoreline Protection Works Highway 114 and Beach Area Fundy National Park, CBCL Ltd., Gemtec Eastern JV.

2011 Fundy National Park of Canada, Management Plan. On file at Parks Canada, Gatineau, Quebec.

2005 Fundy National Park of Canada, Management Plan. On file at Parks Canada, Gatineau, Quebec.

1976 History of the National Parks of Canada, Vol. 1, p. 104-110

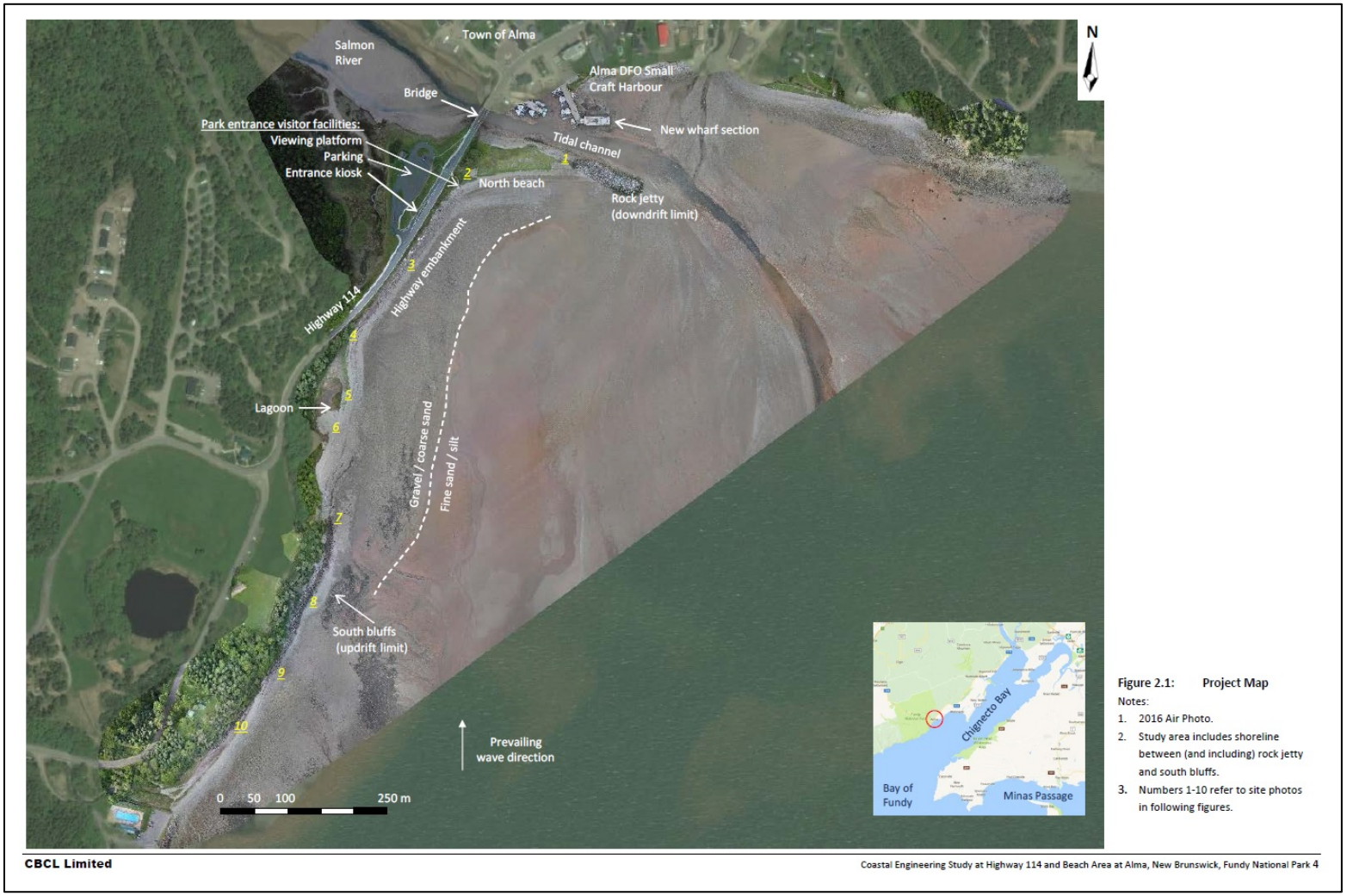


Figure 1. Location of Fundy National Park Alma Breakwater Project (CBCL Ltd. 2017 - PCA Digital Files).

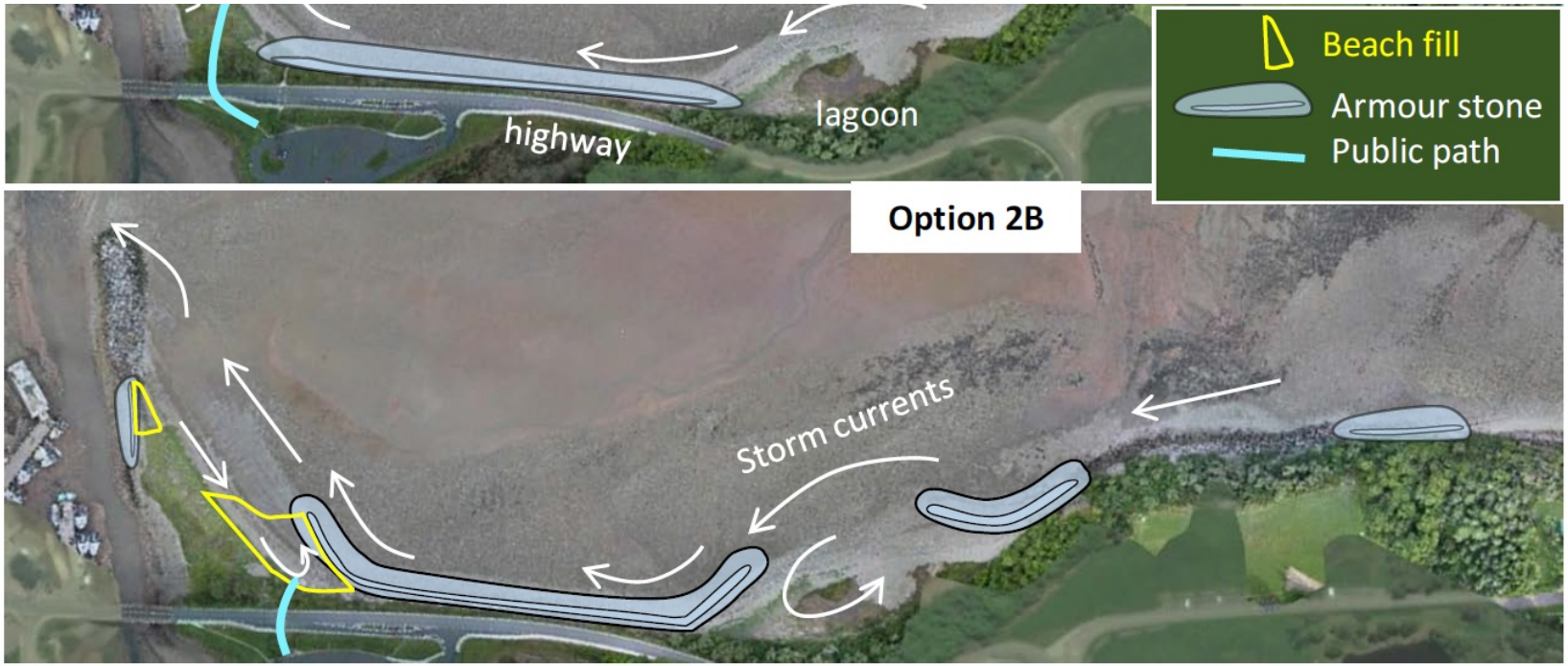


Figure 2. Option 2B – Boardwalk, Beach Fill, Curved Armour Stone Revetment and Breakwaters (CBCL Ltd 2017 - PCA Digital Files).

Figure 3. A three masted boat (schooner barque or clipper?) at the Wharf in October 1933 and the south side of Salmon River. *Note buildings and cribwork on that side of the River* (PCA Digital Files).

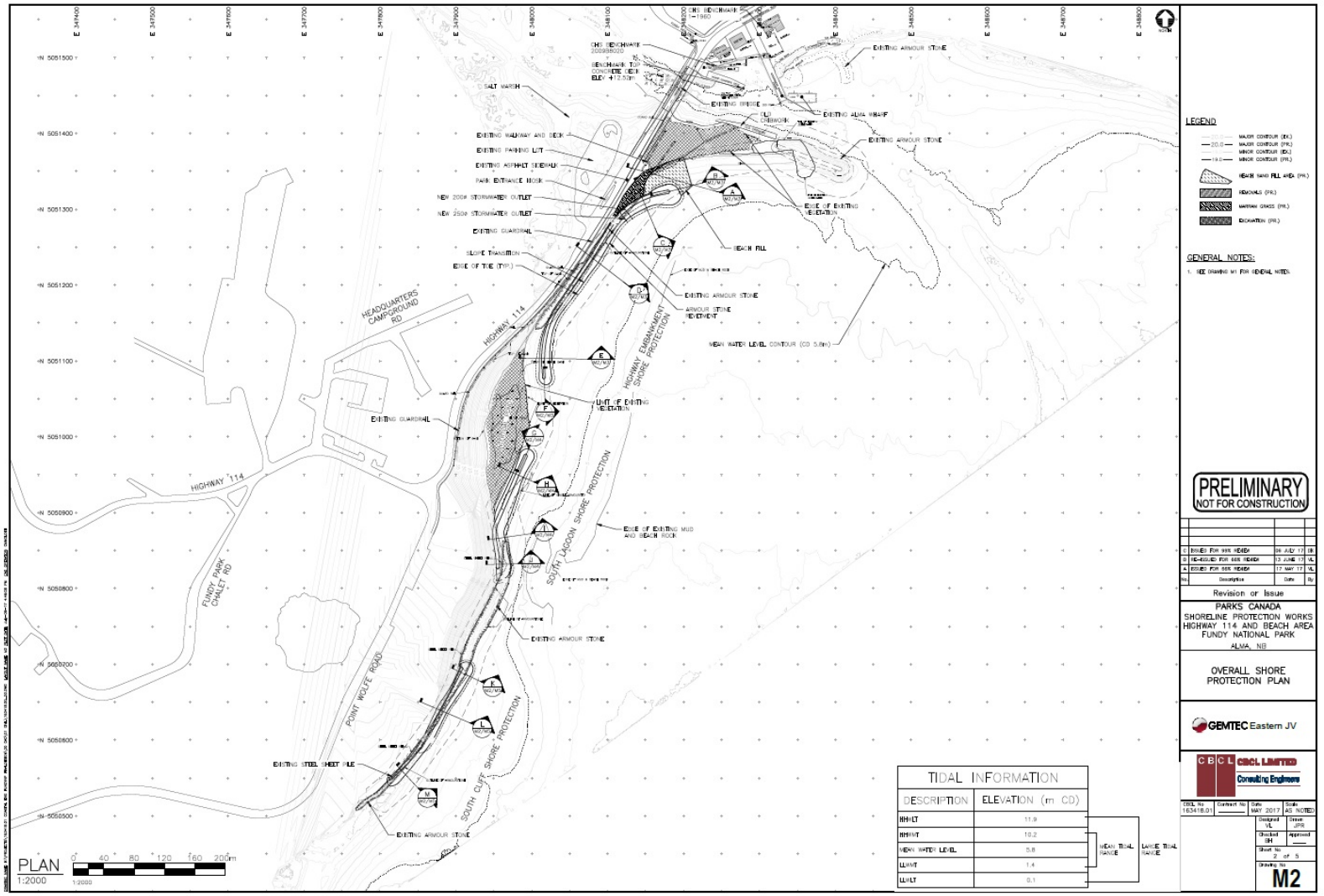


Figure 4. Proposed Shore Protection Plan (CBCL Ltd – Gemtec Eastern JV 2017 - PCA Digital Files).

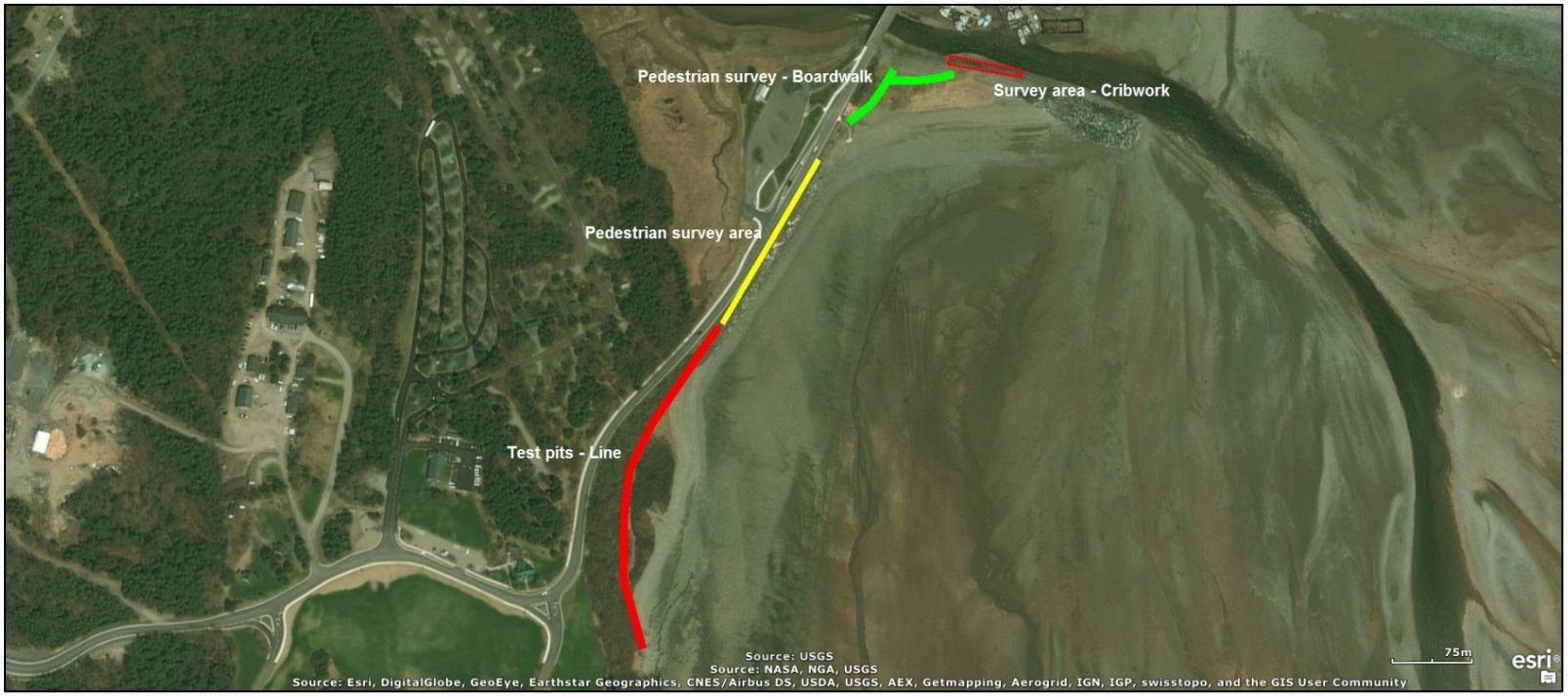
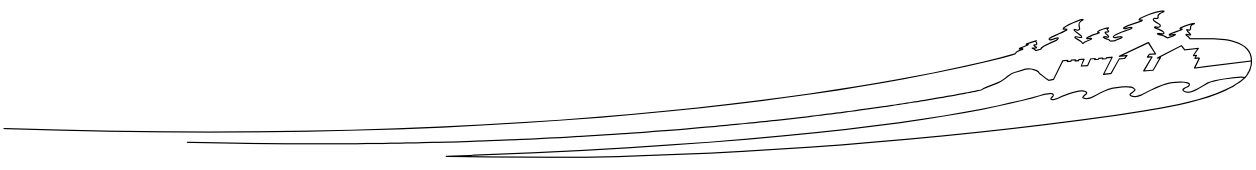


Figure 5. Recommended archaeological survey areas for test pits, pedestrian surveys and recording Cribwork (ESRI 2017 PCA Digital Files).

APPENDIX V

DFO-FPP Letter of Advice



Fisheries and Oceans Canada | Pêches et Océans Canada

Fisheries Protection Program
343 Université Avenue
P.O. Box 5030
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NOV 3 2017

Our file

17-HGLF-00258

Ms. Chyann Kirby
Senior Environmental Specialist, Environmental Services
Public Works & Government Services Canada
P.O. Box 7350
189 Prince William Street
Saint John, NB
E2L 2B9

Subject: **[Bay of Fundy – Alma Shoreline Protection] – Implementation of Measures to Avoid and Mitigate Serious Harm to Fish and Prohibited Effects on Listed Aquatic Species at Risk**

Dear Ms. Kirby:

The Fisheries Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received the proposal on September 1, 2017. We understand that the proponent (Parks Canada) proposes to:

- Construct a temporary access road with crushed gravel placed over geo-fabric and install snow fencing around the worksite.
- Remove and replace an existing steel corrugated pipe and a plastic corrugated pipe.
- Build the erosion protection structure by placing two layers of 3-5 tonne armour stone (2.3 m thick) on top of two layers of 300-500 kg filter stone (1 m thick) on top of a geogrid.
- Toe the amour stone into the beach at a depth of 1 meter with either screened beach or excess excavated cobble material or excavated cobble material.
- Allow water flow to the intertidal pond in order to maintain the function of the wetland system.
- Complete work in dry during low tide.

Our review considered the following information:

- The *Request for Review* form, dated September 1, 2017.
- The Parks Canada Basic Impact Analysis, titled *Alma Shoreline Protection, Fundy National Park*, dated September 25, 2017.
- Emails received from the proponent on September 26, October 11, October 18 and October 27, 2017.

The proposal has been reviewed to determine whether it is likely to result in serious harm to fish which is prohibited under subsection 35(1) of the *Fisheries Act* unless authorized. The proposal

has also been reviewed to determine whether it is likely to affect listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act,* unless authorized.

To avoid and mitigate the potential for serious harm to fish, we recommend implementing the measures listed below:

- If any changes occur in the turbidity of the water in the vicinity of the work area as a result of activities, the work should immediately stop to determine if further mitigation measures are required.
- Machinery will not be allowed in the water.
- All material removed from or brought to the site should be stored in a place and manner to prevent the release of sediment or other material into any watercourse.
- All work should be carried out during low tides.

Provided that the proponent incorporates these measures into the plans, the Program is of the view that the proposal will not result in serious harm to fish or prohibited effects on listed aquatic species at risk. As such, an authorization under the *Fisheries Act* or a permit under the *Species at Risk Act* is not required.

Should plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains the proponent's responsibility to avoid causing serious harm to fish and avoid prohibited effects on listed aquatic species at risk, any part of their critical habitat or the residences of their individuals.

It is also the proponent's Duty *to Notify* DFO if they have caused, or are about to cause, serious harm to fish that are part of or support a commercial, recreational or Aboriginal fishery. Such notifications should be directed to http://www.dfo-mpo.gc.ca/pnw-ppe/violation-infraction/index-eng.html.

It remains the proponent's responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to the proposal.

If you have any questions with the content of this letter, please contact Angeline LeBlanc at our Moncton office at (506) 851-4881 or by email at angeline.leblanc@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

George P. Brown
Senior Fishery Protection Biologist
Fisheries Protection Program