TOWN OF GODERICH

GODERICH COAST SHORELINE EROSION

FEASIBILITY STUDY

BMROSS
engineering better communities

TOWN OF GODERICH

GODERICH COAST SHORELINE EROSION

FEASIBILITY STUDY

September 25, 2024

B. M. ROSS AND ASSOCIATES LIMITED
Engineers and Planners
62 North Street
Goderich, ON N7A 2T4
Phone: 519-524-2641
www.bmross.net

File No. 22236

Contents

LIST OF FIGURES

APPENDICES

B. M. ROSS AND ASSOCIATES LIMITED
Engineers and Planners
62 North Street, Goderich, ON N7A 2T4
p. (519) 524-2641 www.bmross.net

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TOWN OF GODERICH
GODERICH COAST SHORELINE EROSION
FEASIBILITY STUDY

1.0 PURPOSE

The Town of Goderich has requested that B. M. Ross (BMROSS) study the feasibility of hardening the Lake Huron shoreline west of Coast Drive. The study area is shown in Figure 1. The toe of the bluff is currently unprotected and actively eroding from wave action.

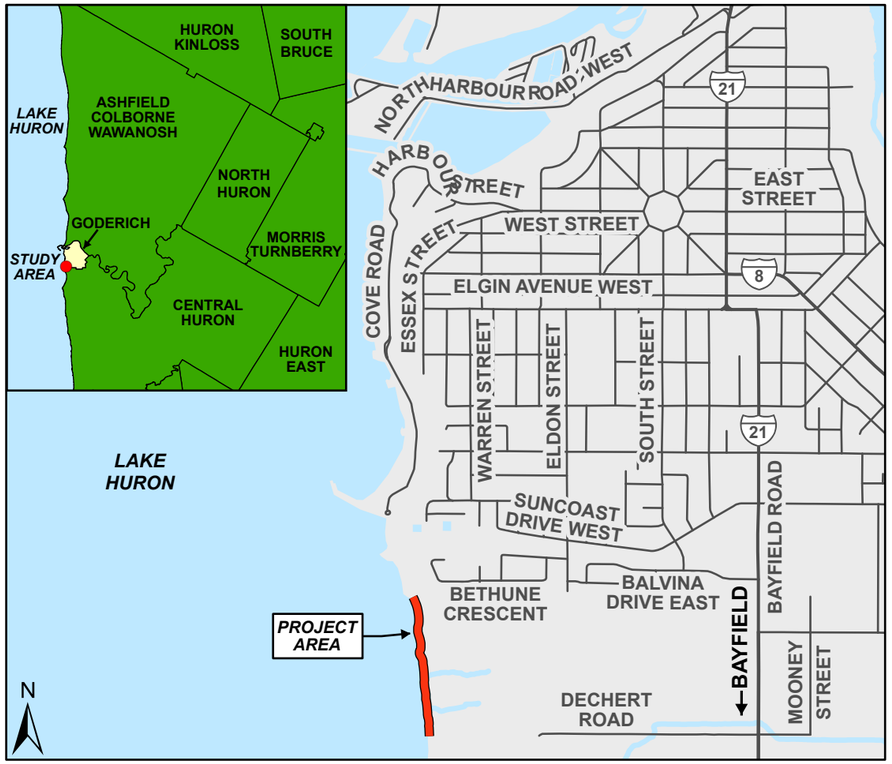
2.0 BACKGROUND

2.1 Shoreline Processes

The shoreline from Amberely to Grand Bend is referred to as the Huron County shoreline, consisting mainly of clay till bluffs (Lake Huron Centre for Coastal Conservation, 2013). Within the broader Great Lakes – St. Lawrence River System, "a primary source of the sediment supply is derived from wave action eroding cohesive bluffs and relatively weak sedimentary bedrock" (MNR, 2001). Locally, approximately 72% of the supply of sand and gravel to the nearshore comes from bluff erosion (Reinders, 1989). Bluff erosion is a natural process and is essential for the maintenance of sand beaches (Lake Huron Centre for Coastal Conservation, 2013).

The nearshore waters of the Lake Huron shoreline provide ecological services to aquatic and terrestrial life. They contain spawning grounds for 90% of Lake Huron's fish species and feeding grounds for shorebirds and waterfowl (Lake Huron Centre for Coastal Conservation).

Hard infrastructure, including ports, marinas, groynes, and revetments, has been installed extensively along the Great Lakes shoreline (Enda Murphy A. C., 2024). Hard infrastructure can have negative impacts on natural systems including the disruption of natural sedimentation processes which impact adjacent shorelines, communities and infrastructure and loss of aquatic habitat (Enda Murphy A. C., 2024).



KEY PLAN
NOT TO SCALE

1. NORTH EXTENT AT BEGINNING OF COAST DEVELOPMENT

2. SHORELINE AT COAST DEVELOPMENT

3. COAST DEVELOPMENT SWM FACILITY AND OUTLET TO LAKE

4. SOUTH EXTENT AT DECHERT ROAD

SITE PHOTOS TAKEN ON APRIL 20, 2022

AERIAL PHOTOGRAPHY OF PROJECT AREA

Tiled service layer: © OpenStreetMap (and) contributors, CC-BY-SA

BMROSS engineering better communities

TOWN OF GODERICH

SHORELINE EROSION PROTECTION

GENERAL LOCATION PLAN

DATE	PROJECT No.
DEC. 15, 2022	22236
SCALE	FIGURE No.
AS SHOWN	1

2.2 History of the Area

The Port of Goderich is located approximately 2 kilometres north of the study area. It is the only deepwater port on the eastern shores of Lake Huron and is utilized for commercial shipping of grain, salt and calcium chloride. Between 1830 and 1850, the first wharves and piers were built at the mouth of the Maitland River in Goderich (Beecroft, 1984). In 1872, the estuary at the mouth of the river was blocked off from the river to create the harbour and a new channel was created to form the new outlet to the lake (Beecroft, 1984). Piers were built to protect the entrance of the harbour with the south pier extending 1400 feet into the lake and the north pier extending 1500 feet into the lake (Beecroft, 1984). In 1904 and 1908, north and south breakwaters were constructed (Beecroft, 1984). The breakwater extending from the river wall was constructed in 1984 and 1985 and extends 610 metres into the lake (Craig T. Bishop, 1990). Recently, additional work has been completed to address issues at the harbour including moderate wave action and sediment accumulation within the navigational channel (LGL Limited and B.M. Ross and Associates Limited, 2014). This work included extending the south pier in 2007 and widening the breakwaters between 2012 and 2014. Maintenance dredging of the harbour is required to maintain a navigational channel into the harbour for large vessels. Currently, material dredged from the harbour is deposited in an approved location offshore or on land.

There are two marinas located at the mouth of the Maitland River. The Maitland Inlet Marina Inc. is located at the north side of the Maitland River. The Maitland Valley Marina and Trailer Park is located at the south side of the Maitland River, north of the river wall. Maintenance dredges occur on a regular basis.

Cove Beach is located approximately 500 metres north of the study area. The Cove Beach groyne was constructed in 1986 as part of a bluff stabilization and beach nourishment project (Craig T. Bishop, 1990). In addition to the installation of the groyne, 185,000 square metres of sand, gravel, cobble and boulder was deposited between the groyne and the Goderich sewage treatment plant (Craig T. Bishop, 1990).

More recently, rock groynes and armour stone revetments have been installed along the shoreline between the harbour and the project study area. Record high lake levels in 2019 caused significant damage to the shoreline and municipal infrastructure located along the shoreline. In 2020, a project was commenced to augment existing armour stone revetments from just south of the Main Beach to just north of the study area. Locations of features can be found in Figure 2.

A portion of the project study area's bluff was graded by the Subdivision's Developer in the winter of 2021. Approximately 460 cubic meters of bluff material was excavated and placed at the toe of the slope.

BMROSS engineering better communities

TOWN OF GODERICH

COAST AREA SHORELINE HARDENING

KEY PLAN

DATE	PROJECT No.
SEPT. 25, 2024	22236
SCALE	FIGURE No.
AS SHOWN	2

2.3 Site Characterization

The area being considered for shoreline protection is approximately 580 meters in length. The bluff, consisting of a cohesive till bluff, is approximately 29 meters high. Within the study area, an existing stormwater outfall is situated approximately 40 m (horizontally) inland from the toe of the bluff.

Recent analysis shows the average annual recession rate of the bluff in the subject area is 0.69 meters per year (Zuzec, 2024). It is estimated that 16% of the bluff material at the site is fine sand or larger (LVM, 2014). Discounting the portion of the bluff at the stormwater outfall that has its banks cut back due to a historic ravine, approximately 1500 m^3 of sand, gravels and cobbles is contributed annually to the Lake Huron sediment budget due to the existing shoreline erosion process within the study area.

3.0 BACKGROUND STUDIES

3.1 NRSI Nearshore Habitat Assessment

Natural Resources Solutions Incorporated (NRSI) conducted a nearshore habitat assessment along the Lake Huron shoreline within the project limits. The field assessment was completed on June 20th, 2023. Existing conditions including substrate, habitat features and aquatic vegetation were documented along 34 transects spaced 20m apart for approximately 680m along the shoreline. Habitat within wadeable areas was assessed from the shoreline up to 20 metres from the shoreline. Water quality parameters, including dissolved oxygen, pH, conductivity, total dissolved oxygen and temperature were recorded.

Strong wave action was observed along the shoreline during the assessment. As observed by the lack of riparian vegetation and active erosion, strong wave action likely occurs regularly within this section of the shoreline. From the waterline, there was a near vertical slope with a height of 1-2m. The slope continued upwards into a steep, grassy hill. The slope consisted of exposed clay and rock face with gravel and sparse vegetation consisting of trees and shrubs. A small gravel beach with a gentle slope was observed within the project study area.

From the shoreline to 5m into the lake, the substrate consisted mainly of cobble and gravel and the average water depth was 0.54m. Concrete slabs and exposed clay substrates were observed occasionally and limited aquatic vegetation was present. These areas could provide refuge and forage habitat for fish within crevices and under overhangs. Small-bodied fish may utilize the area along the shoreline to forage during calm conditions. Between 5m to 10m from the shoreline, substrates consisted of cobble and small boulder with occasional clay and sand patches. The average water depth was 0.73m and woody debris and filamentous algae was observed within this section. There is limited fish habitat within this area. Between 10m to 15m from the shoreline, substrates consisted of cobble to large boulder. This area may provide refuge and foraging areas for fish species. Between 15m and 20m from the shoreline, the substrates consisted of cobble and boulder. Algae was sparsely found throughout this section and the average water depth was 1.04m.

Water quality parameters were measured throughout the study area. Dissolved oxygen levels varied between 10.71 mg/L to 13.23 mg/L. pH levels ranged between 7.88 to 8.25. Water

temperature varied between 15.9 to 20 degrees Celsius. The shallow, littoral zone was turbid at the time of the assessment.

It was determined that limited quality fish habitat was present within the nearshore environment. Fish habitat present included large boulders and concrete slabs with attached algae, crevices and overhangs and dense algae patches. Strong wave action and active erosion likely prevents the growth of shoreline vegetation. The quality of fish habitat increased further from the shoreline due to less wave action and active erosion. There are opportunities to improve fish habitat in this location by installing boulder clusters and root wads.

A copy of the report prepared by NRSI can be found in Appendix A.

3.2 Dredge Material Sampling

According to the Maitland Valley Conservation Authority, an average of 1,600 m^3 of material is dredged annually from the marinas for typical maintenance operations. A grain size analysis was conducted on material that was dredged in the Spring of 2023 (see Appendix B for results). The material was found to be primarily sand, gravels and cobbles, which is expected to be suitable material for beach nourishment.

Under the *Fisheries Act*, deleterious substances that degrade or alter water quality and directly or indirectly harm fish and fish habitat are prohibited from entering a watercourse (Environment and Climate Change Canada, 2024). This includes petroleum products, chemicals, pesticides, heavy metals, industrial, cleaning supplies, wood preservatives, paint, chlorinated water, untreated or undertreated wastewater effluent, fertilizer runoff, livestock waste, sediments, suspended solids and thermally altered water (Environment and Climate Change Canada, 2024).

Dredging material used for beach nourishment would need to be screened to determine if the material could have been exposed to possible contamination based on the size of the project, type of material to be dredged, isolation of material from contaminants and the location of disposal. If warranted based on the screening, detailed review of the project will be completed by the Ministry of Environment, Conservation and Parks (MECP) to determine contaminant testing requirements. Contaminants that may be tested for include:

- Petroleum hydrocarbons (including benzene, toluene, ethylbenzene, xylenes)
- Metals and hydride-forming metals (including antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium and zinc)
- Sodium absorption ratio (SAR) and electrical conductivity
- Any contaminant of potential concern

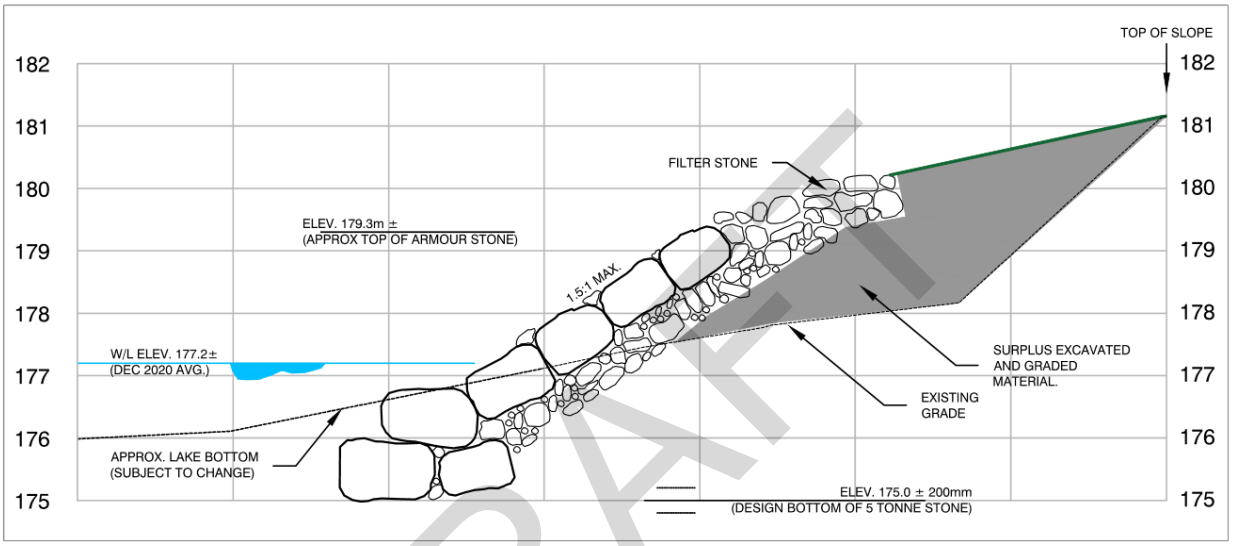
Material dredged from the mouth of the Maitland River was sampled in November of 2023. The results from the samples were compared to the Provincial Sediment Quality Guidelines (PSQG). The guidelines establish a Lowest Effect Level (LEL) and Severe Effect Level (SEL), where the LEL “indicates a level of contamination that can be tolerated by the majority of sediment-dwelling organisms” and the SEL “indicates a level of contamination that is expected to be

detrimental to the majority of sediment-dwelling organisms" (Rachael Fletcher, 2016). Sample results did not contain any high exceedances and no results exceeded any LEL.

4.0 ARMOUR STONE REVETMENT

The proposed shoreline protection would involve the installation of an armour stone revetment at the toe of the slope, over a length of 580 meters. An expected typical cross-section of the revetment is shown in Figure 3.

FIGURE 3 – Typical Revetment Cross-Section



To mitigate impacts, a turbidity curtain would be installed around the in-water work areas for each section as the work progresses. The work would occur between July 1 and March 15 to avoid impacting sensitive timing periods for local fish species including spawning and migration.

5.0 APPROVAL AGENCY COMMENTS ON PROPOSED REVETMENT

5.1 Maitland Valley Conservation Authority

Development and alternations within a regulated area must comply with Ontario regulation 41/24 (O. Reg 41/24) under the *Conservation Authorities Act*. Objectives under O. Reg 41/24 prevent loss of life and property caused by flooding and erosion and ensure that natural resources are conserved and enhanced. The site is located within an area regulated by the Maitland Valley Conservation Authority (MVCA) and a permit must be obtained prior to construction to ensure that project objectives align with O. Reg 41/24.

On February 8, 2023, BMROSS staff met virtually with staff from MVCA to discuss project details. Representatives from Zuzek Inc. were present due to their expert knowledge of coastal environments. The proposed alternatives were presented and MVCA had questions and concerns regarding the alternatives presented. MVCA staff had concerns with the armour stone revetment option and stated that shoreline hardening impacts natural processes along the shoreline and prevents natural erosion that is required to sustain beaches and coastal features downdrift.

Although shoreline hardening projects have been approved by MVCA in the past, MVCA proposes that alternative options be considered due to the potential negative impacts to adjacent properties.

Further correspondence with MVCA indicated that current policies would not permit the installation of an armour stone revetment along the toe of the slope unless a comprehensive coastal study was completed by a qualified coastal engineer, and it was proven that there would be no negative impacts to the slope, adjacent properties and/or shoreline processes. It was noted that there may be no possible way to design a structure that would have no impacts to the slope, adjacent properties and/or shoreline processes and the completion of a coastal study would not guarantee that a permit would be issued. It should be noted that this type of infrastructure is not a permanent solution and there will be need to repair, replace and maintain infrastructure. During the review of the project, cumulative impacts would be considered (i.e. existing structures that impact natural shoreline processes) as well as climate change considerations (i.e. increased lake level and storm events).

5.2 Ministry of Natural Resources

Work on shore lands is regulated under the *Public Works Act*. Activities including the installation of a new erosion control structure or the placement of fill on shore lands requires approval from the Ministry of Natural Resources (MNR). A work permit is issued if the activity is approved by the MNR and includes conditions that must be followed.

On February 6, 2024, BMROSS staff met virtually with MNR staff to discuss project details. The alternatives were presented and MNR stated that a work permit would be required if work was proposed on shorelands. Consultation with First Nations communities and adjacent property owners would be required as part of the work permit requirements. MNR staff stated that there are a significant amount of shoreline hardening projects that have been reviewed and approved by their office in Ontario. MNR supports the use of natural solutions to erosional issues as opposed to the installation of shoreline hardening.

An invitation to meet on-site to discuss the project further and explore the project study area was sent to MNR staff. MNR staff were unable to meet on-site.

5.3 Department of Fisheries and Oceans

In-water activities are reviewed by the Fish and Fish Habitat Protection Program (FFHPP) within the Department of Fisheries and Oceans (DFO). The objective of the FFHPP is to conserve and protect existing fish and fish habitat and restore lost fish habitat. Projects details that impact fish and fish habitat must be reviewed and approved by the FFHPP to ensure compliance with their program objectives and compliance with the *Fisheries Act* and *Species at Risk Act*.

On February 5, 2024, BMROSS staff met virtually with DFO staff to discuss project details. The proposed alternatives were presented, and DFO staff had questions and comments regarding potential future studies, First Nations consultation, project timing, and longevity.

On August 28, 2024, BMROSS staff met on-site with DFO staff to further discuss project details and visualize the site. DFO staff stated that the armour stone revetment project could be

approved by the DFO with the condition that lost fish habitat would be compensated for. They stated that they have approved other similar projects to this in the past.

Meeting notes can be found in Appendix C.

6.0 INDIGENOUS CONSULTATION

6.1 Saugeen Ojibway Nation

On June 27, 2024, BMROSS staff met on-site with SON staff to discuss project details and explore the project study area. Representatives from MVCA were present as well. Potential future studies and investigations were discussed including the potential for archaeological resources within the project study area. The information provided at the meeting was further discussed with SON's technical team.

Meeting notes can be found in Appendix C.

6.2 Kettle and Stony Point First Nation

BMROSS staff consulted with Kettle and Stony Point First Nations on July 16, 2024. On July 29, 2024, staff from Kettle and Stony Point First Nations indicated that they have limited capacity to review project details at this time. The project has been added to their review schedule and they plan to reach out with comments and questions at a later date.

7.0 REQUIRED TECHNICAL STUDIES AND POSSIBLE PROJECT BUDGET

If approval is sought for armouring, a comprehensive coastal study will be required to ensure the structure will not negatively impact the slope, adjacent properties and/or shoreline processes. This study will be reviewed by approval agencies prior to issuance of a permit. The installation of an armour stone revetment will prevent natural erosion in this location, impacting the sediment contribution downdrift. To compensate for lost inputs of sediment, beach nourishment is expected to be needed on an annual basis. Material could potentially be obtained from the Goderich harbour and marina dredges when available, subject to availability from the owners; alternatively, material could be imported from inland aggregate pits. Depositing the material on-site is expected to be required on an annual basis to satisfy permit requirements. Fish habitat will be lost when hardening is completed and will need to be compensated for by creating or improving habitats within the nearshore environment. Monitoring of compensation measures will be required to ensure that fish are utilizing the habitats. In addition, the requirement for repair and maintenance of the structure will need to be reviewed on an annual basis.

The Ministry of Natural Resources guidance suggests a design life of 15 to 25 years for locations with erosion rates of 0.3 m to 0.7 m per year and a design life of 10 to 15 years for locations with erosion rates of 0.7 m to 1.2 m per year. (MNR, 2001). Given that the erosion rate at the subject location is 0.69 m per year, a design life of approximately 15 years is recommended.

Should the hardening and nourishment plan be approved for implementation there will be costs associated with additional study work, installation of the structure, possible DFO compensation,

annual beach nourishment and maintenance. A budget amount for each of these elements is provided below:

7.1 Possible Cost and Budget Breakdown:

- Coastal Study - depending on scope provided by approval agencies:
  $75,000 to $125,000

- Initial Cost to Install Structure - 15 year design life, cost based on similar recent projects:
  $4,000,000

- Fish Habitat Compensation and Monitoring:
  $80,000-$100,000

- Beach Nourishment - annual cost that will depend on the source:
  $40,000 to $70,000

- Repairs, Maintenance and Monitoring – to be completed annually:
  $10,000

As noted above, there is an initial expenditure required to implement the work (approximately $4.3M) followed by annual ongoing costs (approximately $80K). It is possible that the structure installation could be phased over several years should capital budgeting be a concern for a single period.

8.0 CONSIDERATION OF A FEEDER BEACH (Without shoreline protection)

During the February 8, 2023 virtual meeting, MVCA staff supported the sediment nourishment alternative and proposed that this option be explored further, without the installation of shoreline protection. This option would involve depositing a combination of sand, gravel and cobble at the north extent of the project area to enrich the nearshore environment. Conceptually, the material could be sourced from the Goderich harbour and marina dredges. Currently, this material is being deposited offshore and/or hauled and disposed of inland. The current disposal practices effectively removes the sediment from the natural nearshore littoral system.

In further discussions with MVCA staff, it was stated that the feeder beach would be a novel approach to addressing shoreline erosion within MVCA's jurisdiction and it was suggested that a feeder beach may reduce the current erosion rate. Through MVCA's confirmed 4-year Federal program funding to implement sediment bypass techniques for nearshore coastal processes at the Port of Goderich, modeling will be undertaken to determine if a feeder beach using sediment from dredging and other sources has the potential to reduce erosion rates south of the Goderich Groyne and enhance nearshore habitat. The overall intent is to restore sediment that would naturally flow to this area, but is interrupted by historic infrastructure, and removed from the natural littoral system during dredging operations. The quantity of material that is currently

dredged from the marina and harbour exceeds the quantity of sand, gravel and cobble that is contributed to the sediment budget from the bluffs in area that has been proposed to be armoured

During consultation with MNRF and DFO, the agencies expressed that any beach nourishment or feeder beach would require modelling to determine the appropriate placement location for materials. We understand that, through the MVCA grant from ECCC, there is the potential to undertake the required modelling.

At the February 5, 2024 virtual meeting, DFO staff supported the sediment by-pass option and stated that they have approved other projects that are similar in nature to the proposed project. Similar protections within Lake Huron are noted below:

- **Wheatley Harbour Dredging and Beach Nourishment Project:** The Wheatley Harbour was dredged in 2020 and 2021 with a total of 20,000 cubic metres of medium to coarse sand dredged from the harbour approach area (Impact Assessment Agency of Canada, 2020). Material accumulates on the east side of the east pier, within the lee of the detached breakwater, within the harbour entrance and approach channel which negatively impacts access to and from the harbour (Impact Assessment Agency of Canada, 2020). To maintain navigational passage through the harbour, these areas are frequently dredged (Impact Assessment Agency of Canada, 2020). The material was deposited at a location downdrift of the harbour to allow natural dispersion of the sediment along the shoreline through natural lake processes (Impact Assessment Agency of Canada, 2020).
- **Town of Cobourg Harbour Dredging and Beach Nourishment Project:** Annually, the Town of Cobourg dredges sediment that builds up at the mouth of the harbour and within the harbour to maintain navigability (Town of Cobourg, 2020). Dredged material is deposited onto the main beach (Town of Cobourg, 2020).
- **Port of Oshawa Maintenance Dredging and Beach Nourishment Project:** The Hamilton-Oshawa Port Authority conducts regular maintenance dredges at the Port of Oshawa to remove accumulated sediment in the shipping channel (Impact Assessment Agency of Canada, 2024). Maintenance dredging is required to maintain a navigable channel through the harbour and is completed on an as-needed basis (Impact Assessment Agency of Canada, 2024).Sediment deemed suitable for in-water placement is deposited in a nearshore area east of the port to allow for the beneficial re-use of sand along the shoreline (Impact Assessment Agency of Canada, 2024).
- **Cedar Beach Dredging and Beach Nourishment Project**: In 2020, the Town of Kingsville removed 900 cubic metres of sand from the entrance channel at Cedar beach that was causing a navigation hazard (Canadian Impact Assessment Registry, 2021). Dredged material was deposited on Cedar Beach (Canadian Impact Assessment Registry, 2021).

In addition to the nearshore habitat assessment, NRSI completed a preliminary impact assessment assuming that the sediment by-pass was implemented. Although it was concluded that fish habitat within the nearshore environment was limited and of low quality, small bodied, forage fish and predatorial fish still may utilize the nearshore areas. If the sediment by-pass option was implemented, this would result in a loss of low-quality fish habitat along the shoreline. This may also result in the spread of aquatic invasive species including zebra mussels

and the introduction of contaminates negatively impacting aquatic life and the natural environment. This option has a potential to restore and enhance habitat in the nearshore environment by increasing shoreline complexity. Coarser material could result in the development of spawning beds, reefs and areas of refuge. Sand and smaller course material could result in development of spawning grounds, shelter and food sources for fish and contribute to improved water quality and nutrient cycling. The deposited material would buffer the shoreline from wave action which may result in the growth of aquatic vegetation in the nearshore environment increasing the productivity of the ecosystem.

9.0 BEST MANAGEMENT PRACTICES

The Nature-based Infrastructure for Coastal Flood and Erosion Risk Management design guide was developed by the National Research Council of Canada in 2024 and outlines evidence-based guidance that was developed by engineers, scientists, practitioners from federal, First Nations and municipal governments as well as academia (Enda Murphy A. C., 2024). The guide promotes the use of nature-based solutions to mimic natural processes to minimize coastal flooding and erosion risk (Enda Murphy A. C., 2024)**.** Sediment-based solutions utilize natural processes to distribute deposited sediment to create a barrier that will dissipate wave and storm energy and provide erosion protection (Enda Murphy A. C., 2024). Beach nourishment is commonly completed in conjunction with dredging activities since large quantities of suitable sediment can be sourced from a short distance away and this material can be used for a beneficial use for shore protection instead of being deposited offshore (Enda Murphy A. C., 2024). The natural flow of sediment along the shoreline is interrupted by structures such as jetties which can have long-term impacts for sediment balance (Enda Murphy A. C., 2024). By transporting material from updrift of the structure to the downdrift side of the structure, the sediment balance downdrift of the structure is restored (Enda Murphy A. C., 2024).

In the Provincial Policy Statement (PPS), it is stated that the connectivity and long-term ecological function of natural features should be maintained, restored and improved where possible (Ministry of Municipal Affairs and Housing, 2024). This option would restore the sediment balance that is blocked by barriers updrift of the project study area, improving natural shoreline processes and aligning with objectives in the PPS.

10.0 RECOMMENDATIONS AND CONCLUSIONS

Based on the consultation to date, approval could be obtained for armouring the shoreline if impacts to fish habitat are appropriately mitigated, and it is demonstrated that the work will not impact downdrift erosion. To install the shoreline protection, a capital budget of $4,200,000 is expected to be needed (with a 15 year design life), with an annual maintenance budget (including beach nourishment) of $50,000 to $80,000 over the life of the structure. It is expected that a Schedule “C” Environmental Assessment will be required before new shore protection is constructed.

Through MVCA’s confirmed 4-year Federal program funding to implement sediment bypass techniques for nearshore coastal processes at the Port of Goderich, modeling will be undertaken to determine if a feeder beach using sediment from dredging and other sources has the potential

to reduce erosion rates south of the Goderich Groyne and enhance nearshore habitat. Consideration should be given to deferring pursuing shoreline protection until the sediment bypass modelling is completed.

If you have any questions or require further information, please contact the undersigned.

Yours very truly

B. M. ROSS AND ASSOCIATES LIMITED

Per _____
Stephen Jackson, P. Eng.
Senior Engineer

Per _____
Becky Adams, B. Sc., EP
Planning Ecologist

:es

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APPENDIX A

NRSI Nearshore Habitat Assessment

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

August 10, 2023 Proj.3036

Kelly Vader, MCIP, RPP
B.M. Ross and Associates Ltd.
62 North Street
Goderich, ON N7A 2T4

RE: Nearshore Habitat Assessment, Lake Huron Shoreline, South of Goderich, ON

Natural Resource Solutions Inc. (NRSI) was retained by B.M. Ross and Associates Ltd., to conduct a nearshore habitat assessment along the Lake Huron shoreline associated with the Southcove Development, just south of Rotary Cove Beach, Goderich, Ontario. The shoreline was assessed to understand the potential for impacts to the natural environment associated with the potential erosion protection installation, which may encroach below the high-water mark and into the wetted area along the reach. See Map 1 for the study area location.

This memo report summarizes the methods and results of the nearshore habitat assessment undertaken for the study area.

Field Methodology

Two aquatic biologists documented the existing conditions within the identified shoreline area, which was approximately 680m in length, between 0900 to 1900hrs on June 20, 2023. Transects were established within the study area, and are shown on Map 1. The transects were placed 20m apart from each other, resulting in a total of 34 transects being assessed.

The biologists characterized the shoreline and wetted habitat within the wadeable areas, to a maximum of 20m from the shoreline, to assess the types and quality of aquatic habitats present below the high-water mark.

Results of the Field Investigations

The study area is located along an area of Lake Huron that sees wave action, causing the shoreline to erode and be generally unstable. Areas where erosion is present, typically results in slopes being more vertical with limited amounts of vegetation. The area at the top of the slope is slated to be a residential development. Appendix I provides a photolog of the site, showing the habitat characteristics. Further, Map 1 shows the locations of the transects, as well as boulders, algae patches, and other fish habitat features within the study area.

Generally, the depths throughout the assessed locations were what would be expected to see, increasing from the shoreline out to the maximum area assessed. The majority of the transects had wadeable habitat with the exception of transect 29 at the 20m mark. No areas with deeper pools were also observed.

Along the shoreline, from the wetted edge (0m) to 5m out into the lake, the substrates were primarily cobble and gravel. The depth gradually increased from the wetted edge to the 5m

mark, with the average water depth being 0.54m. Between transect 1 and transect 3, there were numerous submerged concrete slabs, which are shown on Map 1. From transect 4 to transect 17, exposed clay substrate was observed frequently. The shoreline was observed to be actively eroding through this segment, as shown through the exposed clay. Limited to no aquatic vegetation was observed within this area, with limited algae being present as well. Due to the wave action and limited water depth, habitat for fish would be generally limited, aside from a few features.

Between transect 1 and transect 3, the submerged concrete slabs, may provide fish refuge in crevices and under overhangs. Between transects 6 and 8 woody debris was present, mainly in the form of vegetation roots, which could serve as refuge for fish from predators and wave action, as well as a forage area (i.e., aquatic insects). Transect 10 also provided the same opportunity for protection and feeding with woody debris, as well as an undercut bank cutting 46cm into the shore. On calm days it is possible that small bodied fish may utilize the areas close to shore (0-5m) for food sources.

From the shoreline inwards the slope was generally near vertical at the water line along the entire area, from 1m to 2m in height. This continued upwards into a steep, grassy hill towards what would be top of slope associated with the development. The slope mainly consisted of exposed clay and rock face, with some gravel and sparse vegetation, including trees and shrubs. There were frequent areas of active erosion, creating turbid conditions up to 10m or more from the shoreline. A few exceptions to this were observed, as at transect 1 through 3, the slope was gentle to moderate leading into the water. A small amount of canopy cover provided by trees was present 1m to 2m from the shoreline inland at transect 1, but was absent at the transect 2 and 3. Natural vegetation comprised of grasses and other ground cover did not begin until approximately 2m from the shoreline inland at these transects. Between transect 20 to 34, a gravel beach with a gentle slope began at the wetted shoreline adjacent to the shear drop. Near transect 20, the exposed shoreline is approximately 1m wide and grows wider to approximately 5m leading up to transect 34.

Continuing outwards into the Lake from 5m to approximately 10m, the substrates were comprised primarily of cobble and small boulders, with some areas of clay and occasional sandy patches. The water depth continued to gradually increase and at the 10m mark was an average of 0.73m. Larger patches of sandy substrate were observed along transect 17 to 19. The areas of exposed clay between transects 4 and 17 continued, and mounds of submerged clay were observed from 5m out to the 20m mark. This created turbid conditions up to 10m from the shoreline through these transects. At transect 16 a large decaying tree was present on the bottom through this area. Filamentous algae were also observed on the cobble and boulder substrates from transects 17 through 25, although it became less dense at transects 20 and 21. Algae was especially dense through this area from transect 22 through 25, extending up to 20m from the shore in some areas.

The turbid conditions and lack of areas for refuge seen at the 5m to 10m mark likely make conditions unsuitable for fish. However, the larger boulders and filamentous algae patches could provide limited fish habitat. The decaying tree at transect 16 could provide habitat to both small and large-bodied fish. Schools of small fish, which NRSI staff were unable to identify, were observed throughout the areas of thick algae from transect 23 through 25. Additional schools were also observed 5m -15m from the shoreline at transects 26, 28 and 29 around boulders with thick attached algae.

Continuing from the 10m to the 15m mark, the substrates were similar to what was observed within the 5 to 10m area, with cobble and small boulders. Exposed clay was also present within the same transects previously identified. A row of large boulders, about 2m in diameter each, were located approximately 10m from the shore line between transect 22 and 27. The average depth along the 15m mark was 0.90m.

As discussed previously, the large boulders could provide some fish refugia and food source through their overhang and attached algae, respectively. These could also could provide habitat and wave protection for fish.

Finally, from the 15m location to the assessment extent at 20m, the substrates were a little larger with cobble and boulders ranging in sizes. Generally, algae in this area was absent to sparse, and other aquatic vegetation was not observed. The average depth along the 20m mark was 1.04m.

In-situ water quality parameters were sampled along transects 31 to 34, and transect 9, every 5m from shoreline, up to, and including 20m. The average water quality from these transects is provided below in Table 1. Metrics varied across the sampled sections and are likely similar along the entire shoreline. Parameters from transect 9 were expected to vary due to an excess of clay clouding the area. While dissolved oxygen (DO) levels were slightly higher, all other metrics at transect 9 varied little from those collected from transects 31 to 34. DO levels varied from 10.71mg/L to 13.23mg/L, or 116.6% to 139.7%, with an average of 12.38mg/L or 128.9% across transects 31 to 34. At transect 9, DO averaged higher at 14.82mg/L or 148.2%. pH levels varied from 7.88 to 8.25 across the shoreline, with an average pH of 8.07. Temperature varied from 15.9°C to 20.0°C, and generally decreased with increasing distance from the shoreline. The average temperature along the transects was 17.5°C.

Table 1. Summary of Water Quality Parameters

Transect Number	Water Quality Parameters					
	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	pH	Conductivity (mS)	Total Dissolved Solids (ppt)	Temperature (°C)
34	12.13	125.8	8.03	0.21	0.11	16.9
33	12.22	127.0	7.97	0.21	0.10	17.34
32	12.59	130.2	8.08	0.21	0.11	17.82
31	12.60	132.6	8.15	0.22	0.10	18.32
9	14.82	148.2	8.13	0.21	0.10	16.73

While flow conditions were not directly measured, strong wave action was observed across the shoreline from 0-10m. Areas of actively eroding shoreline at 0-5m and a lack of riparian vegetation both indicate that the shore regularly experiences wave action. As discussed above, active shoreline erosion was observed from transect 4 southwards to transect 17 at 0-5m. This created large clouds of eroded clay in the waters adjacent to the shoreline, reaching to 5-10m from the shoreline, with occasional upwellings also occurring as far as 15-20m from shore.

Summary of Fish Habitat

Limited quality fish habitat was sporadically present along the area that was assessed, but this habitat still may be a constraint and require consideration as part of the shoreline protection works. Along the assessed shoreline area there are many large boulders and concrete slabs, often with attached algae, crevices, and overhangs which could provide shelter and refuge for

small fish. Potential for fish habitat, as well as the quality, increases the further out into the Lake Huron, where there is less wave action and active erosion, as well as larger substrates and more variety to the substrates.

Dense algae patches which were present greater than 5m up to and past 20m from the wetted shoreline from transects 21 through 25 could also provide a forage area for small bodied fish. Noteworthy areas of suitable habitat are detailed below.

As discussed previously, the strong wave action seen frequently along the shoreline likely prevents growth of shoreline vegetation. This relates to the sparse to non-existent riparian vegetation observed along the shoreline. It also creates turbulent conditions which can be a limiting factor for small fish.

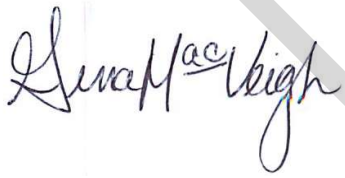
An opportunity to increase fish habitat could be adding more boulder along the shoreline, as observed from transects 22 through 27, or root wads (pending if this would result in potential failure to the erosion protection).

Due to the presence of fish and habitat, although limited, a Request for Review (RfR) should be submitted to the Department of Fisheries and Oceans Canada (DFO) Fish and Fish Habitat Protection Program (FFHPP) once detailed design drawings have been prepared. Pending the scope of the activities, it is anticipated that works will require a Letter of Advice for the activities, but it may result in an Authorization being required under the Fisheries Act, which ultimately would be determined through the RfR process. Implementation of standard mitigation measures will be required to avoid the harmful alteration, disruption, or destruction (HADD) of fish and fish habitat.

This information has been provided to inform B.M. Ross and Associates Ltd. of the existing conditions nearshore along Lake Huron within the study area. Please contact the undersigned for any questions or for further information.

Sincerely,

Natural Resource Solutions Inc.



Gina MacVeigh, F.W.T.
Senior Aquatic Biologist

MAP

441600 441650 441700

4841900 4841850 4841800

T1_0 T1_5 T1_10 T1_15 T1_20 T2_0 T2_5 T2_10 T2_15 T2_20 T3_0 T3_5 T3_10 T3_15 T3_20 T4_0 T4_5 T4_10 T4_15 T4_20 T5_0 T5_5 T5_10 T5_15 T5_20 T6_0 T6_5 T6_10 T6_15 T6_20 T7_5 T7_0

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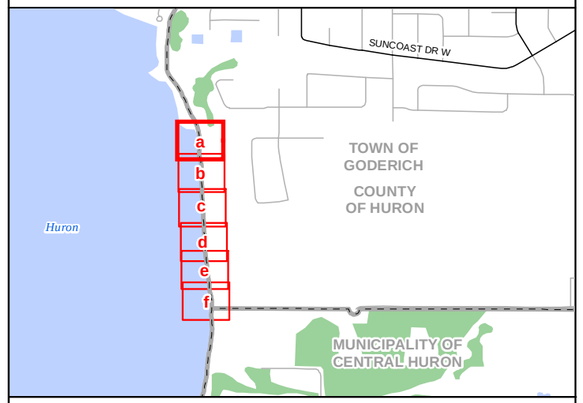
Map 1a

North Huron Goderich Nearshore Habitat Assessment

Shoreline Assessment: Key Features



Legend

- Transect Point (June 20, 2023) *
- Clay Mounds
- Culvert
- Broken Concrete Slabs
- Woody Debris

** 0m is where the wetted edge was documented at the time of the assessment.*

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 3036
Date: August 9, 2023

NAD83 - UTM Zone 17
Size: 11x17"
1:500

N

0 10 20 30 Metres

441600 441650 441700 441750

4841800 4841750 4841700

T6_20 T6_15 T6_10
T7_5 T7_0
T7_10
T7_20 T7_15
T8_5 T8_0
T8_20 T8_15 T8_10
T9_20 T9_15 T9_10 T9_5 T9_0
T10_5 T10_0
T10_20 T10_15 T10_10
T11_0
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T12_5 T12_0
T12_15 T12_10
T12_20

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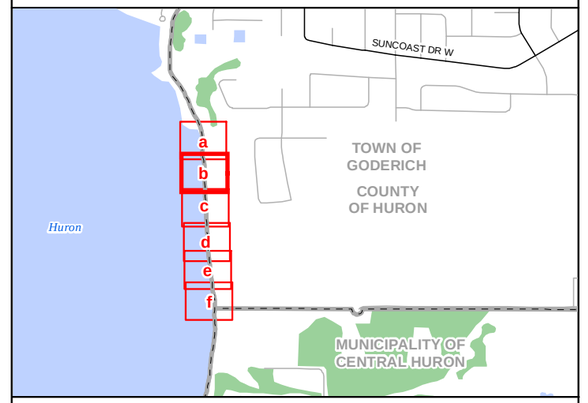
Map 1b

North Huron Goderich Nearshore Habitat Assessment

Shoreline Assessment: Key Features



Legend

- Transect Point (June 20, 2023) *
- Culvert
- Undercut Bank
- Actively Eroding Shoreline
- Clay Mounds
- Woody Debris

** 0m is where the wetted edge was documented at the time of the assessment.*

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 3036
Date: August 9, 2023

NAD83 - UTM Zone 17
Size: 11x17"
1:500

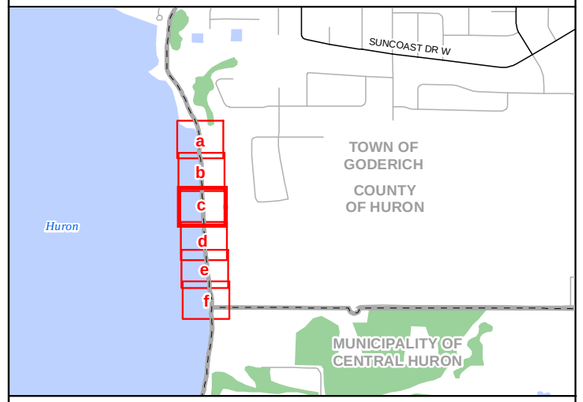
N

0 10 20 30 Metres

Map 1c

North Huron Goderich Nearshore Habitat Assessment

Shoreline Assessment: Key Features



441650 441700 441750

4841650 4841600

T12_20
T13_20 T13_15 T13_10 T13_5 T13_0
T14_15 T14_15 T14_10 T14_5 T14_0
T15_20 T15_15 T15_10 T15_5 T15_0
T16_20 T16_15 T16_10 T16_5 T16_0
T17_20 T17_15 T17_10 T17_5 T17_0
T18_20 T18_15 T18_10 T18_5 T18_0

Legend

- Transect Point (June 20, 2023) *
- Clay Mounds
- Culvert
- Actively Eroding Shoreline
- Clay Mounds
- Woody Debris

** 0m is where the wetted edge was documented at the time of the assessment.*

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 3036
Date: August 9, 2023

NAD83 - UTM Zone 17
Size: 11x17"
1:500

N

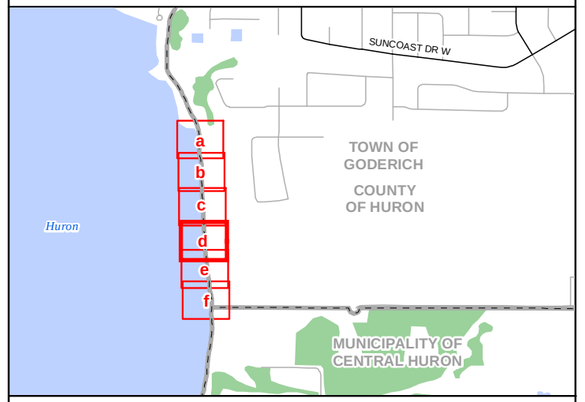
0 10 20 30 Metres

Path: X:\3036_Goderich_Shoreline_Hardening\NRSI_3036_Map1_ShorelineAssessment_KeyFeatures_1K_2023_08_09_KEF.mxd

Map 1d

North Huron Goderich Nearshore Habitat Assessment

Shoreline Assessment: Key Features



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4841550 4841500

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T21_20 T21_15 T21_10 T21_5 T21_0

T22_20 T22_15 T22_10 T22_5 T22_0

T23_20 T23_15 T23_10 T23_5 T23_0

T24_20 T24_15 T24_10 T24_5 T24_0

Legend

- Transect Point (June 20, 2023) *
- Permanent Watercourse
- Undercut Bank
- Culvert
- Gravel Beach
- Large Boulders

** 0m is where the wetted edge was documented at the time of the assessment.*

Project: 3036 Date: August 9, 2023	NAD83 - UTM Zone 17 Size: 11x17" **1:500**

N

0 10 20 30 Metres

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441650 441700 441750

4841450

4841400

T23_20 T23_15 T23_10 T23_5 T23_0

T24_20 T24_15 T24_10 T24_5 T24_0

T25_20 T25_15 T25_10 T25_5 T25_0

T26_20 T26_15 T26_10 T26_5 T26_0

T27_20 T27_15 T27_10 T27_5 T27_0

T28_20 T28_10 T28_15 T28_5 T28_0

T29_15 T29_10 T29_5 T29_0

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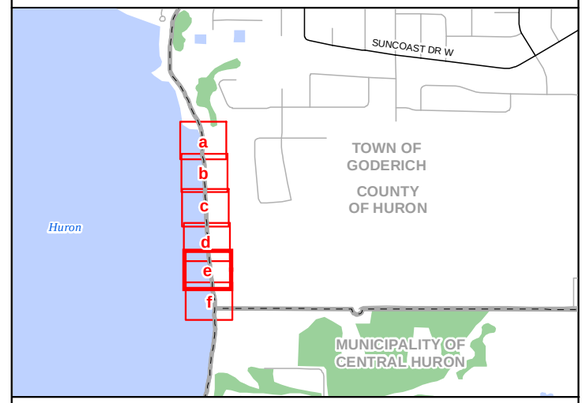
Map 1e

North Huron Goderich Nearshore Habitat Assessment

Shoreline Assessment: Key Features



Legend

- Transect Point (June 20, 2023) *
- Permanent Watercourse
- Undercut Bank
- Culvert
- Dense Algae Patch with Fish Observed
- Gravel Beach
- Large Boulders

** 0m is where the wetted edge was documented at the time of the assessment.*

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 3036
Date: August 9, 2023

NAD83 - UTM Zone 17
Size: 11x17"
1:500

0 10 20 30 Metres

N

441650 441700 441750

4841350 4841300

T29_15 T29_10 T29_5 T29_0

T30_20 T30_15 T30_10 T30_5 T30_0

T31_20 T31_10 T31_15 T31_5 T31_0

T32_15 T32_10 T32_5 T32_0

T33_15 T33_20 T33_10 T33_5 T33_0

T34_15 T34_20 T34_10 T34_5 T34_0

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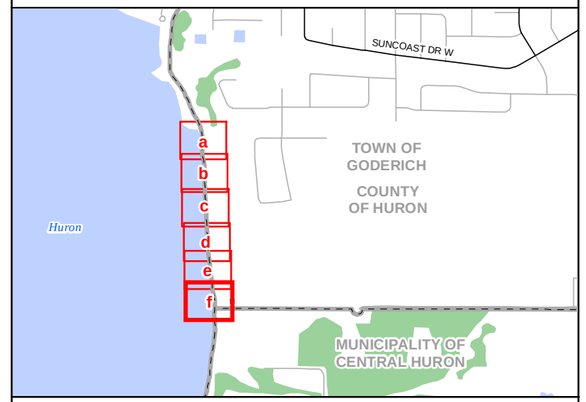
Map 1f

North Huron Goderich Nearshore Habitat Assessment

Shoreline Assessment: Key Features



Legend

- Transect Point (June 20, 2023) *
- Culvert
- Dense Algae Patch with Fish Observed
- Gravel Beach

** 0m is where the wetted edge was documented at the time of the assessment.*

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 3036
Date: August 9, 2023

NAD83 - UTM Zone 17
Size: 11x17"
1:500

0 10 20 30 Metres

N

APPENDIX I

Aquatic Habitat Photolog

Photo Log

Project #3036 - Lake Huron, Goderich Shoreline Assessment
June 20, 2023

Photo 1: Photo facing South at Transect 1

Photo 2: Photo facing north at Transect 1

Photo 3: Transect 1

Photo 4: Transect 2

Photo 5: Photo facing North at Transect 3

Photo 6: Photo facing South at Transect 3

Photo 7: Transect 4

Photo 8: Transect 5

Photo 9: Cobble at Transect 6

Photo 10: Photo facing North at Transect 6

Photo 11: Photo facing South at Transect 6

Photo 12: Transect 6

Photo 13: Transect 7

Photo 14: Photo facing north at Transect 7

Photo 15: Photo facing South at Transect 7

Photo 16: Transect 8

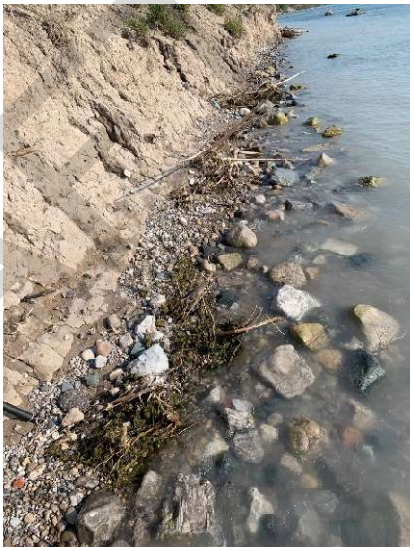


Photo 17: Photo facing South at Transect 8

Photo 18: Transect 9

Photo 19: Photo taken just North of Transect 10

Photo 20: Transect 10

Photo 21: Photo facing North at Transect 11

Photo 22: Photo facing South at Transect 11

Photo 23: Transect 11

Photo 24: Transect 12

Photo 25: Transect 13

Photo 26: Transect 14

Photo 27: Transect 15

Photo 28: Transect 16

Photo 29: Facing north at Transect 17

Photo 30: Transect 17

Photo 31: Transect 18

Photo 32: Transect 19

Photo 33: Drain

Photo 34: Drain

Photo 35: Drain

Photo 36: Transect 20

Photo 37: Transect 21

Photo 38: Facing South from Transect 22

Photo 39: Transect 22

Photo 40: Photo facing South at Transect 22, dense algae floating and on the ground

Photo 41: Undercut bank (0.46m deep) at Transect 23

Photo 42: Transect 23

Photo 43: Transect 24

Photo 44: Photo facing North at Transect 25

Photo 45: Photo facing South at Transect 25

Photo 46: Transect 25

Photo 47: Transect 26

Photo 48: Transect 27

Photo 49: Transect 28

Photo 50: Transect 29

Photo 51: Transect 30

Photo 52: Transect 31

Photo 53: Transect 32

Photo 54: Transect 33

Photo 55: Transect 34

APPENDIX B

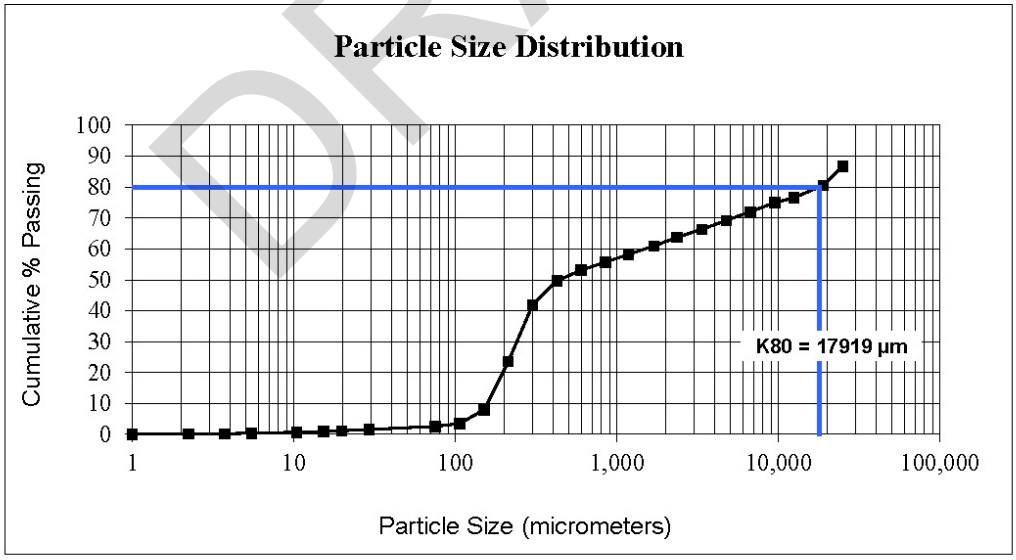
Grain Size Analysis

SGS Minerals Services
Particle Size Distribution

Sample : S1 Test : 0 CA15299-NOV23

Microns	% Passing	Microns	% Passing
25,000	86.7	300	41.8
19,000	80.6	212	23.5
12,500	76.5	150	7.9
9,500	75.0	106	3.4
6,700	72.0	75	2.6
4,750	69.2	29	1.5
3,350	66.3	20	1.1
2,360	63.8	15	0.9
1,700	61.0	10	0.6
1,180	58.2	5	0.3
850	55.8	4	0.2
600	53.1	2	0.1
425	49.7	1	0.0

	Microns		Microns
K80	17,919	**K30**	245
K50	440	**K10**	161

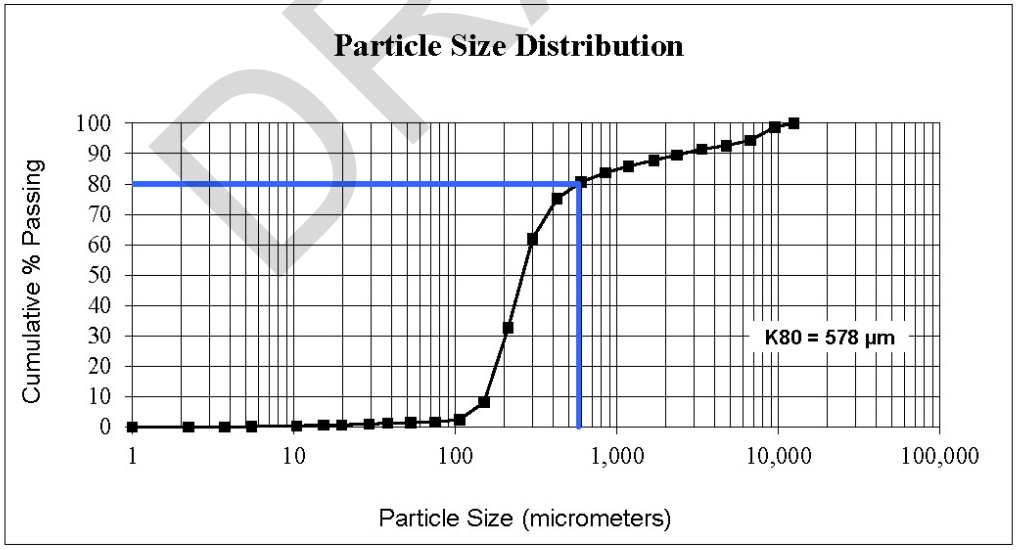


SGS Minerals Services
Particle Size Distribution

Sample : S3 Test : 0 CA15299-NOV23

Microns	% Passing	Microns	% Passing
12,500	100.0	150	8.2
9,500	98.7	106	2.4
6,700	94.4	75	1.7
4,750	92.6	53	1.4
3,350	91.4	38	1.3
2,360	89.6	29	1.0
1,700	87.8	20	0.7
1,180	85.9	15	0.6
850	83.7	10	0.4
600	80.6	5	0.2
425	75.2	4	0.1
300	62.0	2	0.1
212	32.7	1	0.0

	Microns		Microns
K80	578	**K30**	207
K50	267	**K10**	158



APPENDIX C

Meeting Notes

B. M. ROSS AND ASSOCIATES LIMITED
Engineers and Planners
62 North Street, Goderich, ON N7A 2T4
p. (519) 524-2641 **www.bmross.net**

File No. 22236

TOWN OF GODERICH
MEETING WITH MAITLAND VALLEY CONSERVATION AUTHORITY
Zoom Meeting with MVCA - Notes
February 8, 2023

Location: Via Zoom
Time Started: 10:00 a.m. **Time Ended:** 11:30 a.m.

In Attendance:

Anna Soleski	-	Maitland Valley Conservation Authority (MVCA)
Patrick Huber-Kidby	-	MVCA
Peter Zuzek	-	Zuzek Inc.
Steve Jackson	-	B. M. Ross & Associates Ltd. (BMROSS)
Kelly Vader	-	BMROSS

Meeting Details:

1. The meeting began with a round of introductions. Steve thanked everyone for attending and explained that the purpose of the meeting was to research, on behalf of the Town of Goderich, whether hardening of the shoreline adjacent to the Coast Development, would be a permitted or desirable activity. He added that Natural Resource Solutions Inc. (NRSI) has been retained to compete an aquatic habitat assessment of the affected shoreline this summer.

2. Steve provided additional background information on why the Town was considering this project. Essentially, the owners of the Coast Development have asked the Town whether it would be possible and, the Town subsequently asked BMROSS to investigate the feasibility.

3. Peter asked who owns the bluff area. Steve responded that the Town of Goderich owns the bluff, as recommended by the County of Huron during the Plan of Subdivision review phase.

4. Patrick said that the MVCA is trying to move away from the traditional hardening of the shoreline approach that has historically occurred within the watershed.

5. Peter explained that continued erosion of the bluffs is needed to sustain beaches downdrift from the eroding shoreline areas. If all of the bluffs are protected, the beaches will disappear. Peter then showed an example of a new development in Newcastle where the development was set back from the shoreline a sufficient distance to allow the bluff to continue to erode.

6. Steve asked if MVCA is in a position to make a formal statement about the shoreline protection that can be provided to the Town of Goderich.

7. Patrick mentioned that he felt the concept of beach enrichment should be explored further, rather than responding to the request from the Town of Goderich with simply a negative response.

Patrick went on to say that MVCA is working with Dick Peever on a dredging application for his marina at the north end of Goderich. Perhaps it would be possible to use the dredged material for beach nourishment rather than trucking the material away.

8. The group discussed possible locations for placement of material for beach enrichment and it was generally agreed that the south extent of the dog beach, where the coast property begins, would be a potential location. The shoreline juts out at the north extent of the development site providing a potential access point for trucks to dump sediment.

9. Kelly expressed concern over potential impacts to fish habitat. She mentioned that previously SON had expressed concerns over potential impacts to whitefish spawning habitat that would result from shoreline protection works. Patrick said that he thought DFO would be supportive of the concept, since they approved the bank regrading along this section of shoreline that resulted in large amounts of sediment being added to the lake at the shoreline.

10. Peter showed the group substrate information that was recently collected as part of the MVCA shoreline work that shows water depths and substrate types at various transects along the shoreline.

11. Peter asked when white fish populations spawn. Kelly said she was unsure but would investigate further.

12. Steve suggested that a pre-consultation meeting with MVCA, DFO, MNRF and SON would be a good starting point to review the potential for a sediment enrichment program.

13. Peter mentioned that there might be opportunities to pursue funding opportunities for a beach enrichment project like this.

14. Steve asked if it would be helpful to know the makeup of the material dredged adjacent to the marina at the north end of Goderich. Peter agreed that the information would be helpful. He indicated that a mix of material would be helpful for the beach enrichment program ranging from fine sand to small cobbles.

15. It was agreed that BMROSS will draft a letter to MVCA asking for their input on the shoreline protection component of the project, as well as the beach enrichment concept. BMROSS will also ask MVCA if it is possible to access available information for this section of the shoreline, such as transects shown by Peter.

16. Kelly agreed to prepare meeting notes.

17. The meeting concluded at 11:30 a.m.

Should there be any errors or omissions to these meeting notes, please notify the undersigned.

Meeting Notes Prepared by:

Kelly Vader, Environmental Planner
B. M. ROSS AND ASSOCIATES LIMITED

KV:hv
Distribution (via email):
All in attendance

B. M. ROSS AND ASSOCIATES LIMITED
Engineers and Planners
62 North Street, Goderich, ON N7A 2T4
p. (519) 524-2641 www.bmross.net

File No. 22236

TOWN OF GODERICH
GODERICH COAST SHORELINE EROSION
Zoom Meeting with Department of Fisheries and Oceans - Notes
February 5, 2024

Location: Via Zoom
Time Started: 10:00 a.m. **Time Ended:** 11:15 a.m.

In Attendance:	Paul Kraly	-	Department of Fisheries and Oceans (DFO)
	Emily Morton	-	DFO
	Steve Jackson	-	B. M Ross & Associates Limited (BMROSS)
	Becky Adams	-	BMROSS
	Patrick Huber-Kidby	-	Maitland Valley Conservation Authority (MVCA)
	Peter Zuzek	-	Zuzek Inc.
	Jennifer Ogrodnick	-	DHI

Meeting Details:

1. The meeting began with a round of introductions. Steve provided background information regarding the project and history of shoreline features in the Goderich area including the Goderich harbour, Maitland River, marinas, Goderich treatment plant, Goderich shoreline and groyne at Rotary Cove. He explained BMROSS's and MVCA's involvement with the project.

2. Steve discussed the options presented to the DFO in the submitted request for review. He further discussed the feeder beach option. Material dredged from the Goderich harbour and marinas is currently being offloaded into the middle of the lake which is contributing to a sediment loss along the shoreline. By placing dredged material in the project area, south of Rotary Cove, sediment would remain in the littoral environment and reduce shoreline erosion in this location.

3. Patrick discussed his involvement with the project. Funding applications have been submitted to Natural Resources Canada's Climate-Resilient Coastal Communities Program and Environment and Climate Change Canada's Great Lakes Freshwater Ecosystem Initiative. The feeder beach alternative would allow for a positive reuse of material dredged from the Goderich harbour and marinas instead of offloading material into the middle of the lake.

4. Steve explained how Natural Resources Solutions Incorporated (NRSI) completed a habitat assessment and assessed habitat in the nearshore environment within the project area. Fish habitat in the nearshore environment was poor quality due to turbid waters and limited cover material. Fish habitat was limited to boulder and algae clusters sparsely present throughout the nearshore environment. No sensitive fish habitat features were identified in the nearshore environment.
5. For the feeder beach alternative, Steve explained that previously dredged material from the Goderich harbour and marinas consists of 98% sand and the rest cobble. Prior to dumping, the dredged material would be tested for contaminants and pollutants.

6. Paul had a question regarding the feeder beach option. He asked about monitoring that would be completed. Steve explained that the water treatment plant is located north of the project area along the Goderich shoreline. Water quality testing would be completed to ensure that water quality is maintained. Peter and Jen stated that technical studies and modelling would be completed to simulate where sediment will go depending on the location and timing of placement. Patrick stated that by keeping sediment within the littoral environment, this will help create and maintain fish habitat features along the shoreline.

7. Paul asked about project timing for the feeder beach alternative and the longevity of the project. Steve mentioned that the project would be ongoing and would be a designated location for placing dredged material from the Goderich harbour and marina. First nation communities have not been contacted yet. They may be concerned about impacts to whitefish populations. They will be contacted to discuss the project and determine if they have any concerns. Becky stated that the MNRF has some initial comments regarding the project, and they would like any in-water work to occur outside of Ontario's restricted activity timing window, which is between July 1 and March 15 based on fish species records for this location.

8. Emily stated that we would need to obtain appropriate approvals for any dredging work. She stated that there are other examples of this work occurring within the Great Lakes and they have been approved by DFO. Information that the DFO needs as part of the project includes the timing of the project, location of placement, approval from residents in the area, and modelling of where the material will end up. Approval for placement of dredged material can be incorporated into permits for dredging. They have no concerns regarding SAR fish species. Lake Sturgeon is present in Lake Huron but there are no initial concerns regarding this. They can only issue approval for an extended period of time.

9. Steve stated that BMROSS will put together a meeting note with a summary of the meeting and will send it to the DFO and all parties involved for approval.

10. The meeting concluded at 11:15 a.m.

Should there be any errors or omissions to these meeting notes, please notify the undersigned.

Meeting Notes Prepared by:

Becky Adams, Planning Ecologist
B. M. ROSS AND ASSOCIATES LIMITED

RSA:hv
Distribution (via email)
All in attendance

B. M. ROSS AND ASSOCIATES LIMITED
Engineers and Planners
62 North Street, Goderich, ON N7A 2T4
p. (519) 524-2641 **www.bmross.net**

File No. 22236

TOWN OF GODERICH
GODERICH COAST SHORELINE EROSION
Zoom Meeting with Ministry of Natural Resources - Notes
February 6, 2024

Location: Via Zoom
Time Started: 9:00 a.m. **Time Ended:** 9:35 a.m.

In Attendance:	Aisha Wiens	-	Ministry of Natural Resources (MNR)
	James Groenwold	-	MNR
	Steve Jackson	-	B. M Ross & Associates Ltd. (BMROSS)
	Becky Adams	-	BMROSS
	Patrick Huber-Kidby	-	Maitland Valley Conservation Authority (MVCA)
	Anna Soleski	-	MVCA
	Peter Zuzek	-	Zuzek Inc.

Meeting Details:

1. The meeting began with a round of introductions. Steve provided background information regarding the project and history of shoreline features in the Goderich area. He explained BMROSS's and MVCA's involvement with the project. BMROSS is completing a feasible study for solutions to address shoreline erosion within the project area, west of Coast Development.

2. Steve discussed the options presented to the MNR in the submitted work permit application.

3. Patrick discussed his involvement with the project. Funding applications for this project have been submitted to Natural Resources Canada's Climate-Resilient Coastal Communities Program and Environment and Climate Change Canada's Great Lakes Freshwater Ecosystem Initiative. Funding will help support technical studies required if the feeder beach alternative is implemented.

4. Patrick further discussed the feeder beach alternative and explained that material dredged from the Goderich harbour and marinas is currently being offloaded into the middle of the lake which is contributing to a sediment loss along the shoreline. By placing dredged material in the project area, sediment would remain in the littoral environment and reduce shoreline erosion in this location. This would maintain fish habitat within the littoral environment. Currently funding for this project is unknown, but there is support from other stakeholders and agencies.

5. Steve explained that First Nation communities will be contacted about the project to determine if they have any initial concerns.

6. Steve asked if Aisha or James had any initial questions or concerns about the proposed project.

7. Aisha stated that First Nation communities would be contacted as part of the permitting process. A work permit application would be required. They would need to review the details submitted in the application, but she has no initial concerns about the general concept of the project.

8. James stated that in the application form for this project, we would need to provide an aerial view of the project area, landowner permission for work occurring on neighboring properties and recent photos of the site.

9. For the feeder beach alternative, Peter stated that technical studies and modelling would be completed to simulate where sediment would go depending on the location and timing of placement. The modelling would also be able to predict how long it would be retained and how it would move. Design drawings would be able to be submitted with the application.

10. Steve stated that study work needs to be completed prior to the submission of an application.

11. Steve stated that BMROSS will put together a meeting note with a summary of the meeting and will send it to the MNR and all parties involved for approval.

12. Aisha stated that they are able to assist with the permit application and review details as the project progresses.

13. Steve stated that Saugeen Objiway Nation and other impacted First Nations communities have not yet been contacted regarding the project.

14. James stated that as part of the application process, First Nations communities would need to be contacted. It would be useful if all agencies could meet with SON to address all questions and concerns together and save time for the community. It would be helpful if MNR could share their First Nations contacts with BMROSS and MVCA.

15. Steve asked to withdraw the MNR work permit application and states that we will resubmit once further studies have been completed and a design has been developed.

16. James asked about the timeline of the project. Patrick stated that the project will likely occur in 2027.

17. Becky asked if Aisha or James are aware of other feeder beach projects in Ontario. James stated that they are not aware of any but there are a lot of shoreline hardening projects and they would like to see natural solutions to these problems. Peter stated that he is aware of many feeder beach projects in Ontario.

18. Anna noted that the site would be monitored to assess erosion and case studies would be completed to support the project.

19. The meeting concluded at 9:35 a.m.

Should there be any errors or omissions to these meeting notes, please notify the undersigned.

Meeting Notes Prepared by:

B. M. ROSS AND ASSOCIATES LIMITED
Becky Adams, Planning Ecologist

RSA:hv
Distribution (via email)
All in attendance

B. M. ROSS AND ASSOCIATES LIMITED
Engineers and Planners
62 North Street, Goderich, ON N7A 2T4
p. (519) 524-2641 www.bmross.net

File No. 22236

TOWN OF GODERICH
GODERICH COAST SHORELINE EROSION
Zoom Meeting with Saugeen Ojibway Nation - Notes
June 27, 2024

Location: On-site (south of Cove Road)
Time Started: 10:30 a.m. **Time Ended:** 12:00 p.m.

In Attendance:	Natalie Kuipers	-	Saugeen Ojibway Nation (SON)
	Steve Jackson	-	B. M. Ross & Associates Limited (BMROSS)
	Becky Adams	-	BMROSS
	Patrick Huber-Kidby	-	Maitland Valley Conservation Authority (MVCA)

Meeting Details:

1. The meeting began with a round of introductions. Steve provided background information regarding the project and recent history of shoreline features in the Goderich area including the Goderich harbour, marinas, Goderich shoreline and groyne at Rotary Cove. He explained BMROSS's and MVCA's involvement with the project.

2. Everyone hiked to the site and discussed the project limits and alternatives.

3. Patrick discussed funding opportunities for the project. Steve discussed which studies would be required to implement the project.

4. Steve asked Natalie if she had any initial concerns, comments or questions.

5. For the feeder beach alternative, Natalie inquired about the standards that would be used to assess the quality of the deposited sediment. Steve stated that they would be based on standards set by the Ministry of Environment, Conservation and Parks. If material is considered contaminated, it would be deposited appropriately on land. A copy of the standards will be forwarded to SON.

6. Steve stated that a nearshore habitat assessment was completed by NRSI in conjunction with the project. Fish habitat in the nearshore environment was poor due to turbid waters and limited cover material. Fish habitat was limited to boulder and algae clusters sparsely present throughout the nearshore environment. No sensitive fish habitat features were identified in the nearshore environment. A copy of the report will be forwarded to SON.

7. Steve inquired if an archaeological assessment at the toe of the slope and/or at the top of the slope would be required by SON. Natalie stated that she would discuss this with SON's archaeologist. Natalie stated that the site may be of marine archaeological interest, and this should be further assessed.

8. Natalie inquired if we had consulted with other First Nations communities and recommended we consult with Kettle & Stony Point First Nations.

9. Natalie stated that she will discuss information presented today with SON's technical team and will follow up with any concerns they may have.

10. Steve stated that BMROSS will put together a meeting note with a summary of the meeting and will send it to all parties involved for approval.

11. The meeting concluded at 12:00 p.m.

Should there be any errors or omissions to these meeting notes, please notify the undersigned.

Meeting Notes Prepared by:

B. M. ROSS AND ASSOCIATES LIMITED
Becky Adams, Planning Ecologist

RSA:hv
Distribution (via email)
All in attendance

APPENDIX D

NRSI Impact Assessments

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

September 25, 2024 Proj.3036A

Becky Adams, B.Sc., EPt
B.M. Ross and Associates Ltd.
62 North Street
Goderich, ON N7A 2T4

RE: Lake Huron Shoreline Preliminary Impact Assessment, Goderich, ON – Shoreline Hardening Option

Natural Resource Solutions Inc. (NRSI) was previously retained by B.M. Ross and Associates Ltd. (B.M. Ross), to conduct a nearshore habitat assessment along the Lake Huron shoreline associated with the Southcove Development, just south of Rotary Cove Beach, Goderich, Ontario. The shoreline was assessed to understand the potential for impacts to the natural environment associated with the potential erosion protection installation, which may encroach below the high-water mark and into the wetted area along the reach. See Map 1 for the study area location.

Based on consultation with approval agencies and the results of the nearshore habitat assessment (NRSI 2023), B.M. Ross identified two (2) option to address erosion within the study area, including a sediment by-pass (concept 1) and shoreline hardening (concept 2). The sediment bypass option involves using dredged materials collected from maintenance dredging at the Goderich harbor and two Goderich marinas for deposition along the shoreline in the northern portion of the study area. Following consultation with the Department of Fisheries and Oceans Canada (DFO), B.M. Ross proposed an alternative option to mitigate erosion utilizing an armour stone revetment along the shoreline (Appendix I). B.M. Ross has indicated that a final design has not been selected. Therefore, this report provides a high-level assessment of potential impacts based on the preliminary shoreline hardening concept. This technical memorandum summarizes the potential impacts and/or improvements to fish and fish habitat, identifies potential constraints, and outlines requirements to inform the due diligence process for selecting the preferred alternative.

Existing Conditions

The study area is located along the shoreline of Lake Huron, southwest of Bethune Crescent in Goderich, Ontario (Map 1). The shoreline has been significantly impacted by wave action, leading to erosion and instability. The ongoing erosion has resulted in steep, vertical slopes with limited vegetation. To the east, the surrounding lands proposed for residential development are characterized by agricultural lands, an existing residential dwelling, and natural vegetation communities (Coast Drive, Shearwater Trail, and Warrant Street (Map 1)).

A habitat assessment was conducted using transects spaced 20m apart to characterize the existing conditions within the nearshore area on June 20, 2023 (Map 1). Along the shoreline, from the wetted edge (0m) to 5m out into the lake, the substrates were primarily cobble and gravel. Between 5m to approximately 10m, the substrates were comprised primarily of cobble and small boulders, with some areas of clay and occasional sandy patches. Areas of

submerged concrete slabs were observed within the northern extent of the study area. Frequent areas of exposed clay substrates, likely resulting from wave action and erosion of overlaying materials, were observed from the central study area to the northern extent. Evidence of erosion was observed along the shoreline throughout the northern portion of the study area, and limited to no aquatic vegetation was present to provide soil stability. Occasional woody debris was observed within the study area as well.

The inland slope adjacent to the study area was near vertical at the wetted edge, ranging from 1-2m in height. Further inland, the slope was characterized by a steep, grassy hill to the top of slope, where the proposed development is planned. Along this slope, areas of exposed clay and rock faces, with gravel and sparse vegetation (trees and shrubs) were observed. Due to run-off and ongoing shoreline erosion, the shallow, littoral zone along the Lake Huron shoreline was observed to be turbid at the time of assessment.

Background data from the DFO Aquatic SAR Mapping (2024) indicates that Shortnose Cisco (*Coregonus reighardi*) is found (or potentially found) within the study area. Shortnose Cisco is known to inhabit clear, cold, deepwater habitats in Lake Huron, ranging in depths from 22 to 110m (Fisheries and Oceans Canada 2012). Therefore, it is unlikely that Shortnose Cisco utilize the shallower shoreline habitats present within the study area.

Proposed Shoreline Hardening

Preliminary drawings of the proposed shoreline hardening indicate that armour stone would be installed at the toe of slope, with the existing grade raised approximately 3m to create the new top of slope. The placement of 5-tonne stones would occur within the high-water mark of Lake Huron, extending below the existing substrates at an elevation of approximately 175m (Appendix I). The armour stone would be installed at a maximum slope of 1.5: 1 beyond the existing grade. Filter stone would be installed at the top of slope to provide a base for the large 5 tonne stone, allowing for surface water runoff infiltration. Excess materials from excavation and dredging would be used to enhance the existing grade and increase the top of slope from an elevation of 179.3m to approximately 181m. The extent of the shoreline hardening would extend along the shoreline of Lake Huron from the northern to southernmost project limits (Appendix I).

Potential Impacts

Habitat modification refers to changes or alterations of an aquatic ecosystem that reduces its suitability to support fish and other aquatic species. The proposed shoreline hardening, extending from the northern to southern project limits within the shallow littoral zone of Lake Huron introduces uncertainties due to the lack of detailed design. As a result, it is difficult to challenging to precisely quantify the area impact along the Lake Huron shoreline. The installation of stone would occur within the high-water mark would reduce the overall availability of fish habitat within the study area. Following the DFO Pathway of Effects, several alterations to existing habitat may result from the proposed shoreline hardening revetment including changes in shoreline morphometry, aquatic vegetation, substrate composition, hydraulics, food supply, habitat structure and cover, and sediment concentrations.

Despite the identification of low-quality fish habitat throughout the study area during preliminary assessment, several species of fish may still inhabit nearshore areas characterized by cobble, gravel, and sand. These areas primarily support small-bodied forage fish while predatorial species may utilize these habitats for foraging on small-bodied fish and invertebrates, with the potential for seasonal spawning activities to occur.

Based on the preliminary concept, the placement of materials is expected to slightly reduce the availability of fish habitat or contributing habitat through removal of foraging resources and converting them to dry land. This would result in a loss of low-quality fish habitat although this marginal habitat is abundant along the nearby shoreline of Lake Huron. As per correspondence with B.M. Ross, it has been identified that the DFO would require compensation for the loss of fish habitat, described below.

Potential Habitat Enhancement and Compensation

Habitat restoration plays an important role in re-establishing lost ecosystem functions by creating, or enhancing high-value habitat. The proposed shoreline hardening aims to mitigate the negative effects of shoreline erosion at this location, including reducing the accumulation of excess fragmented organic and inorganic materials. Additionally, the proposed shoreline hardening and required off-setting (compensation) provides the opportunity to restore and enhance degraded, low-quality fish habitat present either within the study area or at a location deemed acceptable by the DFO. The DFO gives priority to enhancement and offsetting that focus on the restoration of degraded fish habitat, pursuant to paragraph 34.1(1)(f) of the *Fisheries Act*. Based on the proposed concept, any loss of fish habitat due to placement of fill within the high-water mark will require off-setting and enhancement of existing habitats as a condition of authorization under the *Fisheries Act*.

The erosion within this section of the Lake Huron shoreline has been observed to increase turbidity within the study area. Increased turbidity and sedimentation have been shown to impede visibility, limit sunlight penetration, and may damage fish gills (DFO 2000). Sedimentation and turbidity are significant contributors to declines of aquatic organisms, beginning at the primary production level and cascading negatively through depleted food availability within the trophic system (Henley et al. 2000). The reduction of light penetration as a result of turbidity leads to decreased quantities of plant material (primary production), and therefore decreases the abundances of fish food organisms (secondary production) (DFO 2000). The sedimentation may also impede visibility of predator species that rely on sight for forage at certain concentrations; or alternatively, may decrease the ability for predator avoidance by increasing contrast within the water column (DFO 2000). The effects of turbidity and sedimentation therefore may disrupt the trophic system within aquatic habitats. Significant amounts of suspended solids may also restrict the capabilities of fish respiration by clogging or damaging respiratory surfaces through abrasion in gill rakers (DFO 2000). Additionally, the decreased light penetration limits the ability for aquatic macrophytes to complete photosynthesis processes and persist within shallow littoral habitats that afford shoreline protection against erosion (DFO 2000). Consequently, the mitigation of erosion within this location may produce positive impacts to the existing fish community utilizing nearshore habitats in the study area.

The placement of dredged materials offers an opportunity for habitat restoration and enhancement within the study area by improving fish habitat quality. This can be achieved by increasing shoreline complexity and adding structure through the placement of coarser materials. These coarser materials could promote the development of spawning beds, reefs, and provide refuge for fish (DFO 2019a). Sand, and smaller course material provides habitat for various organisms that form the base of the food chain, such as insects and other invertebrates, which are essential food sources for many freshwater fish species. The DFO recognizes the value of sand within freshwater ecosystems, particularly in terms of supporting fish habitat and ecosystem health. Sand plays a crucial role in providing spawning grounds, shelter, and food sources for fish, as well as contributing to water quality and nutrient cycling.

Depending on the final design, the proposed shoreline hardening may also act as a buffer against wave action. Promoting the recolonization of aquatic vegetation in the shallow littoral zone. This, in turn, could enhance primary production, and subsequently increase secondary production, further supporting the local fish community.

Due to the overall reduction of available fish habitat within the study area, DFO has indicated that compensation will be required to permit the loss of this marginal habitat. Measures to offset (compensate) are implemented to counterbalance residual impacts on fish and fish habitat, with a goal of providing measurable benefits. Offsetting measures may be applied either where the habitat loss occurs, or otherwise may be employed elsewhere at a location deemed to be degraded and requiring enhancement (DFO 2019a). Offsetting may include restoring degraded habitat to improve fish production, enhancing existing habitat to, or creating new, productive and sustainable fish habitat where none existed previously (DFO 2019a).

The offsetting employed to compensate for the loss of fish habitat should follow select principles for application. Measures to offset should support fisheries management objectives and give priority to the restoration of degraded fish habitat (DFO 2019a). Ideally, they should contribute to objectives outlined in fisheries management plans, if applicable. The selection of the offsetting measures is typically made in coordination with DFO, but may also draw upon the knowledge of Indigenous groups, fisheries managers, local organizations, and stakeholders (DFO 2019a). If the offsetting is carried out a location other than the study area, a clear and robust rationale is required, and should be communicated to potentially affected parties.

Offsetting efforts should proportionally address the adverse effects resulting from the loss of fish habitat along the Lake Huron shoreline. The most effective measures benefit local fish populations and habitats that currently use or could potentially use the shoreline habitats, and preference should be given to offsetting projects in close proximity to the study area (DFO 2019a). Should opportunities be limited within vicinity of the study area, the offsetting measures should be implemented within the same watershed. Compensation is generally preferred to be completed in advance of any work that may impact fish or fish habitat, or otherwise include provisions to account for any lag time between the impact and restoration.

Offsetting measures should provide benefits to the ecosystem that are greater than what would have occurred without their implementation. Coincidental positive benefits from the proposed shoreline hardening cannot be considered as part of the offsetting (DFO 2019a). The offsetting measures should be designed and implemented to generate self-sustaining benefits over the long term. The benefits of the offsetting measures will therefore require effectiveness monitoring following implementation to confirm that the compensation is functioning as intended and continues to provide benefits to fish and fish habitat.

Based on the proposed project design, the offsetting measures are recommended to focus on habitat restoration and enhancement opportunities. Habitat restoration involves the physical modification of existing fish habitat to return them to an improved or unimpaired condition, or to improve the overall habitat quality (DFO 2019a). This may entail adding structure, such as coarse material or large woody debris to improve habitat features such as spawning beds, reefs, etc., increase shoreline complexity, stabilize shorelines or riverbanks, improving access to off-channel habitats, removal of anthropogenic barriers to fish passage, establishing or enhancing vegetated areas in lakes, or improving hydraulic conditions to favor certain functions of fish habitat (DFO 2019a).

Recommendations and Next Steps

Fish habitat is protected under the federal *Fisheries Act*, which prohibits the harmful alteration, disruption, and destruction (HADD) to fish and fish habitat. Fish habitat is also afforded protection under provincial and local legislation, including the *Planning Act* per the Provincial Policy Statement (2020), Huron County Official Plan (2021), and Town of Goderich Official Plan (2017).

Due to the presence of fish and habitat within the Lake Huron nearshore area within the footprint of the proposed shoreline hardening revetment, a Request for Review (RfR) is required for submission to the Department of Fisheries and Oceans Canada (DFO) Fish and Fish Habitat Protection Program (FFHPP) once detailed design drawings have been prepared. Based on the proposed deposition of boulder within the high-water mark of Lake Huron, and potential disruption and/or removal of fish habitat, it is likely that the works would require a Fisheries Act Authorization, which will ultimately be determined through the RfR process. Implementation of standard mitigation measures will be required to avoid the harmful alteration, disruption, or destruction (HADD) of fish and fish habitat. Projects requiring authorization under the *Fisheries Act* or permits under the *Species at Risk Act* may also require a federal environmental or impact assessment.

As the proposed shoreline hardening concept may involve the deposition of fill within the high-water mark, leading to residual effects on fish and fish habitat, off-setting measures such has compensation are anticipated to be included as a condition under the *Fisheries Act* authorization. Based on the correspondence between B.M. Ross and DFO, it is anticipated that offsetting will be required to compensate for lost habitat associated with the proposed shoreline hardening alternative. As a result, the development of an off-setting plan, compensation design, monitoring plan, and effectiveness monitoring of may be required to support the proposed shoreline hardening option (DFO 2019a).

Offsetting and enhancement measures should consider the contribution to the productivity of fisheries by the fish or fish habitat likely to be affected (DFO 2019b). For projects where the impacts are relatively small, proponents need to qualitatively document the key impacts to fish and fish habitat and their associated links to components of productivity, such as growth, performance, survival, migration, and reproduction (DFO 2019b). The choice of appropriate offsetting measures should be guided by the restoration priority for degraded fish habitat, as outline in paragraph 34.1(1)(f) of the *Fisheries Act*, fisheries management objectives, and the expected harmful impacts to fish habitat.

Although the Shortnose Cisco has been identified within Lake Huron and the vicinity of the study area through background review, this species is known to primarily inhabit pelagic habitats, and is unlikely to be impacted by the proposed works. It is anticipated that no permitting under the federal *Species at Risk Act* or provincial *Endangered Species Act* would be necessary, to be confirmed with DFO and MECP correspondence.

Lake Huron and its' tributaries are also regulated by the Maitland Valley Conservation Authority (MVCA) according to Ontario Regulation 164/06 (Government of Ontario 1990). Under O.Reg. 164/06, development is prohibited within areas adjacent or close to shoreline of the Great Lakes that may be affected by flooding, erosion or dynamic beaches, including the 100 year flood level plus an allowance of 15m for wave uprush and other water-related hazards, the predicted long term stable slope projected from the existing stable toe of the slope, or from predicted location of toe of the slope, areas of a dynamic beach associated with waterfront lands plus a 30m inland allowance, or 15m inland from Lake Huron. Development may be granted by the MVCA

if it is determined that the proposed work will not adversely impact flood control, erosion, dynamic beaches, or the conservation of land. A such, in order to carry out the proposed shoreline hardening, approval from the MVCA would be required to proceed.

During construction, DFO Interim Codes of Practice should be applied to shoreline hardening. Additionally, standard erosion and sediment control measures, such as sediment control fencing, turbidity curtains etc., should be installed to isolate the work site to mitigate against run-off, or sedimentation into adjacent natural habitats. All erosion control measures should be inspected and monitored, and repairs should be completed as necessary. All materials and equipment for the purpose of the site preparation and construction should be operated and stored in a manner that prevents any materials from leaving the site. Following completion of construction and site stabilization, all erosion and sediment control measures and accumulated sediment are to be removed.

This information has been provided to inform B.M. Ross and Associates Ltd. of the potential implications and requirements associated with the proposed shoreline hardening option based on a preliminary, high-level concept. A more detailed assessment would be required to fully quantify the impacts associated with the proposed concept following a detailed design. Please contact the undersigned for any questions or for further information.

Sincerely,

Natural Resource Solutions Inc.

Sam Catry, F.W.T., B.A.
Aquatic Biologist

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MAP

441500 441750 442000 442250 442500

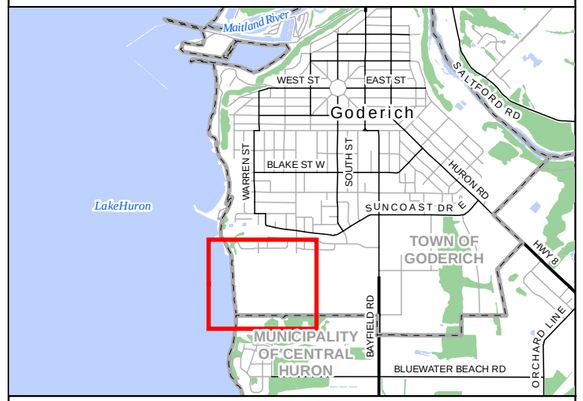
4842000 4841750 4841500 4841250

BETHUNE CRES
BRIMICOMBE CRES
ELDON ST
BALVINA DR W
LEE CRES
WARREN ST
SHEARWATER TRAIL
COASTLINE
DECHERT RD

Map 1

North Huron Goderich Shoreline Hardening

Study Area



Legend

- Study Area (630m x 20m)
- Secondary Road
- Permanent Watercourse
- Unevaluated Wetland

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 3036
Date: June 15, 2023

NAD83 - UTM Zone 17
Size: 11x17"
1:3,500

0 50 100 150 200 Metres

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NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

April 3, 2024 Proj.3036A

Becky Adams, B.Sc., EPt
B.M. Ross and Associates Ltd.
62 North Street
Goderich, ON N7A 2T4

RE: Lake Huron Shoreline Preliminary Impact Assessment, Goderich, ON – Sediment By-Pass Option

Natural Resource Solutions Inc. (NRSI) was previously retained by B.M. Ross and Associates Ltd. (B.M. Ross), to conduct a nearshore habitat assessment along the Lake Huron shoreline associated with the Southcove Development, just south of Rotary Cove Beach, Goderich, Ontario. The shoreline was assessed to understand the potential for impacts to the natural environment associated with the potential erosion protection installation, which may encroach below the high-water mark and into the wetted area along the reach. See Map 1 for the study area location.

Based on consultation with approval agencies and the results of the nearshore habitat assessment (NRSI 2023), B.M. Ross indicated that the preferred option to address erosion within the study area was to mitigate utilizing a sediment by-pass. The concept entails the use of dredged materials collected from maintenance dredging at the Goderich harbor and two Goderich marinas for deposition along shoreline habitats in the northern portion of the study area. B.M. Ross has indicated that a definite design has not been selected, and therefore this report addresses potential impacts at a high level based on the preliminary concept. This technical memorandum summarizes potential impacts and/or improvements to fish and fish habitat, potential constraints, and identify requirements to inform the due diligence process for selecting the preferred alternative.

Existing Conditions

The study area is located along the shoreline of Lake Huron, southwest of Bethune Crescent in Goderich, Ontario (Map 1). The shoreline habitat is impacted by wave action, which has caused the shoreline to erode and become unstable. Significant erosion within the study area has resulted in steep, vertical slopes with limited amounts of vegetation. The surrounding lands proposed for residential development to the east are characterized by agricultural lands, an existing residential dwelling, and natural vegetation communities (Coast Drive, Shearwater Trail, and Warrant Street (Map 1)).

A habitat assessment utilizing transects 20m apart was used to characterize the existing characteristics within the nearshore area on June 20, 2023 (Map 1). Along the shoreline, from the wetted edge (0m) to 5m out into the lake, the substrates were primarily cobble and gravel. From 5m to approximately 10m, the substrates were comprised primarily of cobble and small boulders, with some areas of clay and occasional sandy patches. Areas of submerged concrete slabs were observed within the northern extent of the study area. Frequent areas of exposed clay substrates were observed ranging from the central study area to the northern extent, likely

a result of wave action and erosion of overburden substrates. Evidence of erosion was observed along the shoreline throughout the northern portion of the study area, and the shoreline contained limited to no aquatic vegetation to provide soil stability. Occasional woody debris was observed within the study area as well.

The inland slope adjacent to the study area was near vertical at the wetted edge, from 1-2m in height. Further inland, the slope was characterized by a steep, grassy hill to the top of slope, where the proposed development would be located. Along this slope, areas of exposed clay and rock faces, with gravel and sparse vegetation (trees and shrubs) were observed. Due to the run-off and erosion along the shoreline, the shallow, littoral zone along the Lake Huron shoreline was observed to be turbid at the time of assessment.

Background data from the DFO Aquatic SAR Mapping (2024) indicates that Shortnose Cisco (*Coregonus reighardi*) is found (or potentially found) within the study area. Shortnose Cisco is known to inhabit clear, cold, deepwater habitats in Lake Huron, ranging in depths from 22 to 110m (Fisheries and Oceans Canada 2012). Therefore, it is unlikely that Shortnose Cisco utilize the shallower shoreline habitats present within the study area.

Proposed Sediment By-Pass

Preliminary drawings of the proposed sediment by-pass are unavailable, and therefore the impact assessment is based upon a high-level summary of the proposed works. Erosion present along the shoreline of Lake Huron is proposed to be mitigated utilizing sediment by-pass of dredged materials from maintenance dredges at the Goderich Harbor and two Goderich marinas. The collected dredged material will be placed within the northern extent of the study area. The exact location of sediment deposit has not been determined, but is anticipated to be placed along the shoreline, and may include deposition within the high-water mark. The dredged materials proposed for deposition primarily consists of sand and cobble. Based on the limited detail surrounding the proposed design, the assessment of potential impacts associated with the creation of the sediment by-pass are high-level and based on a broad scale associated with the general study area.

Potential Impacts

Habitat Modification or Degradation

Habitat modification refers to changes to the function of an aquatic ecosystem that makes it less suitable to support fish and other aquatic species. The proposed sediment by-pass is anticipated to be located along shoreline habitats in the northern extent of the study area. Due to the uncertainties and lack of detailed design, it is difficult to directly speak to quantifiable areas or numbers, however it is possible that deposition would occur within the high-water mark, and therefore reduce the overall availability of fish habitat within the study area. Following the DFO Pathway of Effects table, several alterations to existing habitat may result from the proposed sediment by-pass. These include changes in shoreline morphometry, aquatic vegetation, substrate composition, hydraulics, food supply, habitat structure and cover, and sediment concentrations.

Despite the low-quality fish habitat identified throughout the study area through the preliminary assessment, several species of fish may inhabit nearshore areas characterized by cobble, gravel, and sand, primarily small-bodied, forage fish. Additionally, predatorial fish may utilize these habitats for foraging on small-bodied fish and invertebrates, with the potential for seasonal spawning activities to occur.

The placement of dredged material this may reduce the amount of available fish habitat, or contributing habitat through removal of foraging sources for creation of dry land resulting in a loss of low-quality fish habitat. This marginal habitat is likely abundant along the shoreline of Lake Huron within close proximity to the study area. However, the quantifiable amount cannot be determined until detailed design completion.

Introduction of Contaminates and Aquatic Invasive Species

The proposed source of materials for deposition are from dredged materials associated with maintenance dredges at the Goderich Harbor and two Goderich Marinas. The introduction of aquatic invasive species (e.g., Zebra Mussels (*Dreissena polymorpha*)) is often associated with the use of boats and equipment associated with watersports and recreational fishing (DFO 2004; Therriault et al. 2013). Due to the high traffic of recreational boats within the previously identified source locations, there is potential that the dredged materials may contain traces of aquatic invasive species that are able to persist in transport and deposition. The introduction of aquatic invasive species can disrupt aquatic ecosystems by outcompeting native species for food and space, and can degrade habitat by affecting water quality, or by transporting diseases and/or parasites (DFO 2004; Therriault et al. 2013). Due to the close proximity and connectivity of the Maitland River, Goderich Harbor and Goderich Marina's to the study area, it is anticipated that the introduction of invasive species is unlikely; however, the introduction of contaminates from dredged material is possible. As a result, sediment contaminate testing and treatment (if required) would be required following dredging ensuring that it meets regulatory standards and poses minimal risk to the environment prior to deposition.

Metals and metal containing pollutants have many functions in boat operation, maintenance, and repair, including zinc, copper, mercury, nickel, and more (USEPA 2001). In addition to heavy metals present within marina sediments, other pollutants associated with anti-fouling (anti-rust) paints, hydrocarbons associated with fuel, and even faecal coliforms may be stored in sediments (Guerra-Garcia et al. 2021). These contaminants may enter the water through accidental spills, recreational boating, dumping, leaching, surface water runoff, and more nonpoint sources USEPA 2001). Sediment serves as a storage of contaminants and greatly influences the quality of interstitial habitats (soil pore space) and the overlying water column through physical and chemical processes (Guerra-Garcia et al. 2021). Within marinas and harbors, contaminants and pollutant concentrations tend to be higher than natural systems as a result of harbor activities (Guerra-Garcia et al. 2021).

The inputs of pollutants and other contaminants within aquatic ecosystems can impact the aquatic ecosystem directly or indirectly. Many aquatic organisms feed by sifting through substrates or feed upon filter food particles out of the water column (USEPA 2001). These organisms ingest the pollutants adhered to or mixed with sediment or suspended particles, which are then accumulated in their tissues rather than being excreted (USEPA 2001). These pollutants will bioaccumulate as the individuals are preyed upon by larger organisms. Additionally, the presence of these chemicals may alter the benthic community, on which fish rely on for forage (USEPA 2001). As such, there may be indirect impacts resulting from alterations to the trophic system following decline in available benthic invertebrates for forage. As a result, sediment contaminant and potential treatment would be required following dredging and prior to deposition to ensure that any pollutants present within the substrates are eradicated prior to deposition, as discussed in Recommendations and Next Steps, below.

Potential Habitat Enhancement

Habitat restoration plays an important role through elevation of lost ecosystem functions by creating, or enhancing high-value habitat. The sediment by-pass option is proposed to mitigate

against the negative effects of shoreline erosion within this location, including the mitigation of excess fragmented organic and inorganic materials. Additionally, the proposed sediment by-pass provides the opportunity to restore and enhance degraded, low-quality fish habitat present within the study area. The DFO gives priority to enhancement and offsetting that focus on the restoration of degraded fish habitat, pursuant to paragraph 34.1(1)(f) of the *Fisheries Act*. Based on the proposed concept, the loss of overall availability of fish habitat due to placement of fill within the high-water mark may require off-setting and enhancement of existing habitats as a condition of authorization under the *Fisheries Act*.

The erosion within this section of the Lake Huron shoreline has been observed to create high turbidity within the study area. Increased turbidity and sedimentation have been shown to impede visibility and sunlight penetration, and may damage fish gills (DFO 2000). Sedimentation and turbidity are significant contributors to declines of aquatic organisms beginning at the primary production level and cascading negatively through depleted food availability within the trophic system (Henley et al. 2000). The reduction of light penetration as a result of turbidity leads to decreased quantities of plant material (primary production), and therefore decreases the abundances of fish food organisms (secondary production) (DFO 2000). The sedimentation may also impede visibility of predator species that rely on sight for forage at certain concentrations; or alternatively, may decrease the ability for predator avoidance by increasing contrast within the water column (DFO 2000). The effects of turbidity and sedimentation therefore may disrupt the trophic system within aquatic habitats. Significant amounts of suspended solids may also restrict the capabilities of fish respiration by clogging or damaging respiratory surfaces through abrasion in gill rakers (DFO 2000). Additionally, the decreased light penetration limits the ability for aquatic macrophytes to complete photosynthesis processes and persist within shallow littoral habitats that afford shoreline protection against erosion (DFO 2000).

The placement of dredged materials may provide opportunity for habitat restoration and enhancement within the study area by improving available fish habitat quality through increasing shoreline complexity and increasing structure through placement of coarser materials. These coarser materials could yield the development of spawning beds, reefs, and afford refuge for fish (DFO 2019a). Sand, and smaller course material provides habitat for various organisms that form the base of the food chain, such as insects and other invertebrates. These organisms are an essential food source for many freshwater fish species. The Department of Fisheries and Oceans (DFO) recognizes the value of sand within freshwater ecosystems, particularly in terms of supporting fish habitat and ecosystem health. Sand plays a crucial role in providing spawning grounds, shelter, and food sources for fish, as well as contributing to water quality and nutrient cycling. Pending the design, the proposed sediment by-pass option may also act as a buffer against wave action and allow aquatic vegetation to recolonize the shallow littoral zone along the shoreline, and afford increased primary production, and subsequently afford improved secondary production.

Recommendations and Next Steps

Fish habitat is protected under the federal *Fisheries Act*, which prohibits the harmful alteration, disruption, and destruction (HADD) to fish and fish habitat. Fish habitat is also afforded protection under provincial and local legislation, including the *Planning Act* per the Provincial Policy Statement (2020), Huron County Official Plan (2021), and Town of Goderich Official Plan (2017).

Due to the presence of fish and habitat within the Lake Huron nearshore area adjacent and within the proposed sediment deposition, a Request for Review (RfR) is required for submission

to the Department of Fisheries and Oceans Canada (DFO) Fish and Fish Habitat Protection Program (FFHPP) once detailed design drawings have been prepared. Based on the proposed deposition of sediments, anticipated to occur within the high-water mark of Lake Huron, and potential disruption and/or removal of fish habitat, it is likely that the works would require a Fisheries Act Authorization, which will ultimately be determined through the RfR process. Implementation of standard mitigation measures will be required to avoid the harmful alteration, disruption, or destruction (HADD) of fish and fish habitat. Projects requiring authorization under the *Fisheries Act* or permits under the *Species at Risk Act* may also require a federal environmental or impact assessment.

As the proposed sediment by-pass concept may result in the deposition of fill within the high-water mark and have residual effects on fish and fish habitat, off-setting measures may be required as a condition under the *Fisheries Act* authorization. Similarly, the proposed concept affords the ability to enhance existing fish habitat within the study area. As such, the development of an off-setting plan may be required to support the proposed sediment by-pass option (DFO 2019a). Enhancement and off-setting measures should consider the contribution to the productivity of relevant fisheries by the fish or fish habitat that is likely to be affected (DFO 2019b). For projects where the impacts are relatively small, proponents need to qualitatively document the key impacts to fish and fish habitat and their associated links to components of productivity, such as growth, performance, survival, migration, and reproduction (DFO 2019b). The choice of appropriate offsetting measures should be guided by the restoration priority for degraded fish habitat, as outline in paragraph 34.1(1)(f) of the *Fisheries Act*, fisheries management objectives, and the expected harmful impacts to fish habitat.

Despite the potential presence of Shortnose Cisco within the study area, this species is known to inhabit pelagic habitats, and is unlikely to be impacted by the proposed works. It is anticipated that no permitting under the federal *Species at Risk Act* or provincial *Endangered Species Act* would be necessary, to be confirmed with DFO and MECP correspondence.

Lake Huron and its' tributaries are also regulated by the Maitland Valley Conservation Authority (MVCA) according to Ontario Regulation 164/06 (Government of Ontario 1990). Under O.Reg. 164/06, development is prohibited within areas adjacent or close to shoreline of the Great Lakes that may be affected by flooding, erosion or dynamic beaches, including the 100 year flood level plus an allowance of 15m for wave uprush and other water-related hazards, the predicted long term stable slope projected from the existing stable toe of the slope, or from predicted location of toe of the slope, areas of a dynamic beach associated with waterfront lands plus a 30m inland allowance, or 15m inland from Lake Huron. Permission to develop may be granted by the MVCA, if it is of the opinion the control of flooding, erosion, dynamic beaches, or the conservation of land will not be affected by the development. A such, in order to carry out the proposed sediment by-pass, approval from the MVCA would be required to proceed.

As the sediment by-pass is proposing to utilized dredged materials from marinas and harbors for deposition within or adjacent to the high-water mark, sediment contaminant analysis and remediation would be required to ensure that pollutants, contaminants, meets regulatory standards and potentially present aquatic invasive species are eradicated prior to deposition to mitigate against the introduction. Sediment contaminant analysis and remediation will ensure adherence to regulations under the *Aquatic Invasive Species Regulations* and under the fish and fish habitat protection and pollution prevention provisions of the *Fisheries Act*. Under the provisions, the deposit of all deleterious substances into water frequented by fish or to any place where it may enter water frequented by fish, is prohibited.

During construction, DFO Interim Codes of Practice should be applied to the proposed construction of the sediment by-pass, as relevant. Additionally, standard erosion and sediment control measures, such as sediment control fencing, should be installed surrounding the work site in advance of site preparation to mitigate against run-off into adjacent natural habitats. All erosion control measures should be inspected and monitored, and repairs should be completed as necessary. All materials and equipment for the purpose of the site preparation and construction should be operated and stored in a manner that prevents any materials from leaving the site. Following completion of construction and site stabilization, all erosion and sediment control measures and accumulated sediment are to be removed.

This information has been provided to inform B.M. Ross and Associates Ltd. of the potential implications and requirements associated with the proposed sediment by-pass option based on a preliminary, high-level concept. A more detailed assessment would be required to fully quantify the impacts associated with the proposed concept following a detailed design. Please contact the undersigned for any questions or for further information.

Sincerely,

Natural Resource Solutions Inc.

Sam Catry, F.W.T., B.A.
Aquatic Biologist

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MAP

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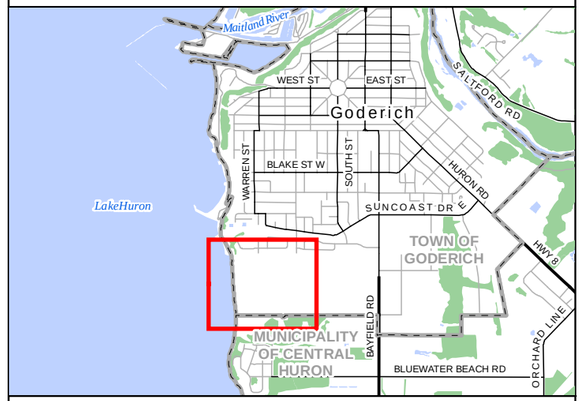

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