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## **GIBBONS POINT PIER AND RANGE TOWER REPLACEMENTS**

### **CONSTRUCTION SPECIFICATION**

**Little Current, ON**

MARITIME AND CIVIL INFRASTRUCTURE

Prepared by: LW

Approved by: BY

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## TABLE OF CONTENTS

SECTION:	011100 GENERAL INSTRUCTIONS .....	3
SECTION:	013300 SUBMITTAL PROCEDURES .....	8
SECTION:	013530 HEALTH AND SAFETY REQUIREMENTS .....	9
SECTION:	013543 ENVIRONMENTAL PROCEDURES .....	11
SECTION:	014500 QUALITY CONTROL.....	15
SECTION:	016100 COMMON PRODUCT REQUIREMENTS .....	17
SECTION:	024116 DEMOLITION OF STRUCTURES.....	19
SECTION:	033000 CONCRETE WORK .....	22
SECTION:	055000 ADHESIVE ANCHORS .....	27
SECTION:	133613 METAL TOWERS.....	30
SECTION:	310000 EARTHWORK.....	33
APPENDIX A:	SITE LOCATIONS AND PHOTOGRAPHS.....	37
APPENDIX B:	SUMMARY OF SUBMITTALS .....	40
APPENDIX C:	NEW TOWER DRAWINGS .....	41
APPENDIX D:	NEW FOUNDATION DRAWINGS.....	73
APPENDIX E:	GEOTECHNICAL INVESTIGATION.....	76



## **SECTION: 011100 GENERAL INSTRUCTIONS**

### **PART 1 - GENERAL**

#### **1.1 Minimum Standards**

- .1 Perform work in accordance with National Building Code of Canada (NBC) and any other code of provincial, territorial or local application. In the case of any conflict or discrepancy, the more stringent requirements shall apply.
- .1 Meet or exceed requirements of:
  - .1 Contract documents; and
  - .2 Specified standards, codes and referenced documents.

#### **1.2 Description of Work**

- .1 Work under this Contract includes but is not limited to the provision of all labour, materials, and equipment required to:
  - .1 Install foundations for two [2] new Aids to Navigation (AtoN) towers;
  - .2 Install the new towers including all appurtenances onto their new foundations;
  - .3 Remove and return existing towers and day marks to Parry Sound CCG base; and
  - .4 Remove existing front and rear tower foundations.
- .2 The following work will be undertaken by others and is hereby excluded:
  - .1 Supply of new day marks for installation on the new towers;

#### **1.3 Submittals**

- .1 Mandatory submittals and schedule for submission are detailed below and in Appendix B. The following identifies general requirements only. The relevant sections must be consulted for a complete listing of mandatory content.
- .2 Detailed Schedule (Mandatory):
  - .1 Deadline:
    - .1 No later than ten [10] working days following award.
  - .2 Deliverables:
    - .1 The contractor shall furnish a high level schedule outlining the major construction milestones. Schedule shall clearly define the anticipated start and finish dates of the



project.

- .2 For fieldwork to proceed, all other mandatory submittals must be received and accepted by Coast Guard.
- .3 Proof of Qualifications (Mandatory):
  - .1 Deadline:
    - .1 No later than ten [10] working days following award.
  - .2 Deliverables:
    - .1 The Contractor shall provide the name and contact information for the following project team members:
      - .1 The Project Manager;
      - .2 The Site Forman; and
    - .2 The contractor shall also provide a detailed list of all subcontractors being used to complete the work described herein (Section 011100 – 1.4).
- .4 Construction Plan (Mandatory):
  - .1 Deadline:
    - .1 No less than ten [10] working days prior to mobilization.
  - .2 Deliverables:
    - .1 A Construction Plan of sufficient detail to demonstrate that the Contractor has considered all the challenges of the project and is prepared to undertake the works in a competent and professional manner in accordance with all legislation. The submission shall include:
      - .1 Project Specific Safety Program (Section 013530);
      - .2 Project Environmental Protection Plan (Section 013543);
      - .3 Detailed Demolition Plan (Section 024116);
      - .4 Foundation Construction Plan (Section 033000);
      - .5 Tower Erection Plan (Section 133613); and
      - .6 Excavation Plan (Section 310000).
- .5 As-built and QA/QC (Mandatory):
  - .1 Deadline:
    - .1 No more than twenty eight [28] calendar days after construction.



.2 Deliverables:

.1 The following documents shall be forwarded upon completion of the contract:

.1 Set of red-lined as-built drawings (Sections 033000 & 133613);

1.4 Contractor Qualifications

.1 The work shall be carried out under the supervision and responsibility of a sole specialized Contractor.

.2 The Contractor must be experienced in the installation of aid to navigation structures or other similar free standing structures.

.3 The Contractor shall designate the following key project members, including any subcontractors. The project members shall have completed projects of similar scope and complexity to the work described herein.

.1 Project Manager: Contact information for the main point of contact for the project shall be provided by the contractor.

.2 Site Forman: Contact information for the main point of contact for the project fieldwork shall be provided by the contractor.

.3 The contractor shall provide a detailed list of all subcontractors being used to complete the work described herein.

.4 Requests to amend the project team, following contract award, must be forwarded in writing. Coast Guard reserves the right to reject any proposal to amend the project team.

1.5 Site Location

.1 Both towers are located at the Compass Minerals Goderich Salt Mine in Goderich, ON:

.1 LL997 Gibbons Point Front Range: 45°58'4.05"N, 81°54'23.85"W

.2 LL998 Gibbons Point Rear Range: 45°58'3.44"N, 81°54'28.44"W

1.6 Existing Conditions

.1 Photographs of the existing towers have been included in Appendix A: Site Locations and Photographs.

.2 Bidders must make their own estimate of the difficulties associated with all phases of the works.

.3 The contractor must include in their costs all expenses related to the difficulties of working at the sites.



- .4 A geotechnical investigation has been completed for this location. A copy of the findings is provided in Appendix E.

#### 1.7 Contractor's Access to Site

- .1 Contractor is responsible for transportation of all labour, materials and equipment to and from the sites, including any and all material furnished or itemized for salvage by Coast Guard.
- .2 Sites accessible by 4WD off-road vehicles. Under ideal conditions the rear range site can be accessed by standard pickup truck.
- .3 All Site access must be arranged through the proper channels prior to each visit.
  - .1 Because the towers are located on private property, access must be granted from property owner as well as the CCG Project Representative. Contact information for each will be forwarded after award.
- .4 Coast Guard must also be notified at least three working days prior to any site access.

#### 1.8 Completion, Scheduling and Planning of the Works

- .1 Work may commence as early as practical following Coast Guard's acceptance and approval of mandatory submissions.
- .2 Site work shall not commence without written authorization of Coast Guard Project Authority.
- .3 Construction work shall be completed no later than October 30, 2020, unless otherwise negotiated and approved in writing.
- .4 Demolition of existing towers shall not commence until the new aids to navigation have been fully commissioned. The Contractor shall allow for up to 3 weeks' time for the commissioning and acceptance of the new range.

#### 1.9 Coast Guard Staging Location

- .1 Items to be supplied by, or salvaged to Coast Guard shall be collected or delivered by the Contractor to the following staging location. The Contractor shall be responsible for all transportation costs between the project site and the identified staging location. Material drop off or access to stored goods outside of regular operating hours shall be at the discretion of Coast Guard and may be subject to cost recovery:

- .1 Staging location:

CCG Base Parry Sound  
28 Waubeek St.



Parry Sound, ON P2A 1B9

- .2 Advise Coast Guard at least three (3) working days prior to pick-up/delivery
- .3 Shipping/Receiving hours: Monday through Friday, 9:00AM to 3:00PM

1.10 Temporary Facilities

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Arrange, pay for, and maintain temporary electrical power supply as required for construction, and water supply as required, in accordance with governing regulations and ordinances.
- .3 Maintain emergency spills kit on-site at all times.

1.11 Fees, Permits, Certificates and Information

- .1 Contractor shall provide authorities having jurisdiction with all information requested.
  - .1 Contractor shall provide copies to Coast Guard of any documentation submitted to other authorities related to the work described in this document.
- .2 Contractor shall pay fees and obtain certificates and permits required.
- .3 Contractor shall furnish certificates and permits when requested.

1.12 Reference Documents

- .1 The most recent publication or edition of any document referenced in this specification should be used unless the referencing clause states that this clause does not apply.

1.13 Required Submissions

- .1 A summary of the minimum mandatory submissions required can be found in Appendix B. This summary is not an exhaustive list of all submissions required for the duration of the project.
- .2 Additional submissions may be required after award.



## **SECTION: 013300 SUBMITTAL PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 General**

- .1 This section specifies general requirements and procedures for the Contractor's submissions of documents to Coast Guard for review.
- .2 For each phase of the project, work shall not progress until all mandatory submittals required before the start of that phase have been received, reviewed and accepted by Coast Guard.
- .3 Where items or information is not produced in SI Metric units, converted values are acceptable.
- .4 Contractor's responsibility for errors and omissions in submission is not relieved by Coast Guard's review of the submitted documents.
- .5 Notify Coast Guard, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Coast Guard's review of submission, unless Coast Guard gives written acceptance of specific deviations.
- .7 Make any changes to submissions that Coast Guard may require consistent with Contract Documents and resubmit as directed by Coast Guard.
- .8 Provide Coast Guard with a written notice, when resubmitting, of any revisions other than those requested by Coast Guard.

#### **1.2 Submission Requirements**

- .1 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.
- .2 Allow three [3] working days, or as stipulated in the specifications, for Coast Guard to review the submission.
- .3 The Contractor's Engineer shall stamp and sign any submissions requiring a Professional Engineer's seal certifying his approval of samples, verification of field measurements, and compliance with Contract Documents.





## **SECTION: 013530 HEALTH AND SAFETY REQUIREMENTS**

### **PART 1 - GENERAL**

#### 1.1 Scope

- .1 The Contractor shall be responsible to develop, implement and enforce a safety program which addresses all elements of the work.

#### 1.2 References

- .1 Work under this section shall be undertaken in strict conformance with the most recent version of all listed references, In the case of any conflict or discrepancy the more stringent requirements shall apply.
  - .1 Canada Labour Code Part II;
  - .2 NRC-CNRC National Building Code of Canada;
  - .3 Ontario Occupational Health and Safety Act and Regulations;
  - .4 Any and all other Provincial/Territorial Regulations and Policies, Worker's Compensation Board Policies or Local municipal regulations pertaining to safety of the contractor's workers.

#### 1.3 Submittals

- .1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of section 013300.
- .2 Project Specific Safety Program
  - .1 Deadline:
    - .1 With Construction Plan
  - .2 Deliverables:
    - .1 Safety Program Document, include:
      - .1 A listing of all activities specific to each phase of the project and their Health & Safety risks or hazards;
      - .2 Detailed descriptions of how the activities are to be carried out as well as methods for mitigating hazards and risks;
      - .3 A listing of personnel responsible for health and safety measures, and Emergency procedures; and
      - .4 Material Safety Data Sheets for hazardous products to be utilized in the execution of



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the works.

- .3 Proof that a Notice of Project has been filed with the Ontario Ministry of Labour; and
- .4 Contractor shall submit completed Field Level Hazard Assessment (FLHA) forms to Coast Guard upon request.



## **SECTION: 013543 ENVIRONMENTAL PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 Scope of Work**

- .1 The contractor must implement and enforce the following procedures throughout the duration of the work to mitigate potential negative impacts on the surrounding environment.

#### **1.2 References**

- .1 Work under this section shall be undertaken in strict conformance with all listed references, In the case of any conflict or discrepancy the more stringent requirements shall apply.
  - .1 Canadian General Standards Board (CGSB)
  - .2 Transportation of Dangerous Goods
  - .3 Canadian Council of Ministers of the Environment (CCME) Documentation
  - .4 Canadian Environmental Protection Act

#### **1.3 Submittals**

- .1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of section 013300.
- .2 Contractor shall submit an Environmental Protection Plan
  - .1 Deadline:
    - .1 With Construction Plan
  - .2 Deliverables:
    - .1 Submit a plan addressing procedures to be implemented to mitigate any negative impact on the environment. Detail (if applicable):
      - .1 Equipment features (age, spill containment);
      - .2 Staging, refueling, and cleaning areas;
      - .3 Clean-up and/or containment procedures (including concrete/grout);
      - .4 Waste disposal methods and sites; and
      - .5 Sedimentation control measures.



## **PART 2 - PRODUCTS**

### **2.1 General**

- .1 Avoid use of hazardous products. Use environmentally friendly products where practical.

## **PART 3 - EXECUTION**

### **3.1 Construction Area**

- .1 Confine construction activities to as small an area as practical.
- .2 Establish material storage, cleaning, and refueling areas where impacts to the surrounding environment will be negligible or readily mitigated.

### **3.2 Stockpiling of materials**

- .1 Materials must be stockpiled as far from the shoreline as practical. Tarps must be used to control dust and run-off.
- .2 Stockpiled excavated materials shall be skirted using filter fabric to control run-off of fines during rain and to prevent excavation of soils below stockpiles.

### **3.3 Disposal of Wastes**

- .1 Clean-up the site at the end of each working day.
- .2 All waste material is to be disposed of in a legal manner at a site approved by local authorities. Transporter/hauler must be appropriately licensed.
  - .1 Recycle or reuse materials where possible.
- .3 Fires and burning of rubbish on site not permitted.
- .4 Do not bury rubbish and waste materials on site.

### **3.4 Clearing and Grubbing**

- .1 Only clear vegetation that interferes with construction once approved to do so by Coast Guard.

### **3.5 Drainage**

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
  - .1 Suspend works during periods of heavy rainfall and add temporary covers to discourage run-off.
  - .2 Water pumped from excavation shall be adequately treated to ensure that water returning to



the watercourse contains minimal fines. Procedures anticipated for preventing the pumping of fines shall be identified in the environmental protection plan, and may include the following:

- .1 The use of filter bags;
- .2 Straw bale check dams or silt fence;
- .3 Discharge through naturally occurring vegetation.
- .3 The means for controlling silt run-off shall be dependent on the site and the quantity of water pumped, and shall be to the discretion of the CCG site staff.
- .4 Sediment control measures shall be inspected and improved/cleaned/replaced as necessary.

### 3.6 Pollution Control

- .1 Provide methods, means, and facilities to prevent the contamination of soil, water, and atmosphere from the discharge of pollutants produced by construction operations.
- .2 Vehicles, machinery, and equipment shall be in good repair, equipped with emission controls as applicable and operated within regulatory requirements.
- .3 Abide by local noise by-laws.
- .4 Avoid unnecessary idling of vehicles or heavy machinery.
- .5 Limit use of equipment around the shoreline where possible.
- .6 Implement and maintain dust and particulate control measures in accordance with provincial requirements:
  - .1 All bulk material haul equipment shall be appropriately tarped. Watertight vehicles shall be used to haul wet materials
- .7 Designate a cleaning area for tools to limit water use and runoff. Do not allow deleterious materials to enter waterways. Ensure emptied containers are sealed and stored safely for disposal.
- .8 The contractor shall take all necessary precautions to guard against the release of any noxious substance or pollutant to the environment. In the event of any spill the Contractor shall take immediate action to contain the release and mitigate any impact.
  - .1 Materials and equipment to intercept, contain, and clean-up any spill or other release shall be maintained on site throughout the construction period and must be readily accessible at



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all times.

- .2 Any uncontrolled release of a known contaminant (spills, fire/smoke) shall be reported to appropriate Provincial Authority and Coast Guard. Spills of deleterious substances to be immediately contained and cleaned up in accordance with provincial regulatory requirements.
- .3 Provincial Authority: Ontario Spill Action Centre: 1-800-268-6060

### 3.7 Traffic

- .1 Minimize soil compaction by driving, parking vehicles, and walking, etc. on existing paved roadways/laneways. If soil is impacted by compaction, compensate by restoring areas with new soil, as required.
- .1 Avoid the use of heavy machinery in areas of sensitive slopes. Avoid using machinery on land during wet weather.



## **SECTION: 014500 QUALITY CONTROL**

### **PART 1 - GENERAL**

#### **1.1 Inspection**

- .1 Coast Guard or its representative shall have access to the work at all times. If parts of the work are prepared off-site or in a shop, access shall be given to such work throughout the duration of the project.
- .2 In the event the work must be submitted to special testing, inspection or approvals prescribed by Coast Guard in these specifications or provided for in work-site regulations, the request for inspection must be made without unreasonable delay.
- .3 The below list identifies key milestones where the Coast Guard will require an opportunity to take samples/inspect:
  - .1 Location verification: Coast Guard will confirm correct location for installation upon arrival of the Contractor at the sites. The contractor shall be required to provide access to the site at all times to CCG site staff.
  - .2 Pre-tensioning: Coast Guard shall witness the pre-tensioning of the all-thread rods to the prescribed torque values.
  - .3 Installation of towers: Coast Guard shall witness the erection of the new nav-aid towers and witness the operation of the new lights.

#### **1.2 Procedures**

- .1 Provide Coast Guard with advance notice whenever testing is required in accordance with these specifications, so that all parties involved can be present.
- .2 Provide necessary manpower and installations for obtaining and handling samples and material on site.
- .3 Provide access to site if the site is of remote nature whereby the contractor is responsible for providing access to the site

#### **1.3 Rejected Work**

- .1 Remove defective work, whether incorporated into the work or not, which has been rejected by Coast Guard as failing to comply with the contract documents. Replace or re-execute in accordance with the Contract Documents.

#### **1.4 Tests and Mixture Formulas**



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.1 Supply test reports and required mixture formulas.

1.5 Factory Tests

.1 Submit test certificates as prescribed in the relevant section of the specifications.

1.6 Acceptance of Work

.1 Coast Guard will make acceptance visits of work executed by the Contractor at critical milestones identified in the following sections.

.2 The Contractor shall inform Coast Guard at least three [3] working days before these inspection visits.

.3 All work shall be completed in compliance with the specifications before requesting the visit for inspection. If the work is not completed or deemed non-compliant, the Contractor shall be responsible for all costs incurred for subsequent inspections.





## **SECTION: 016100 COMMON PRODUCT REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 General**

- .1 Secure Coast Guard approval of all products to be incorporated into the works. Work shall not commence until product data and/or samples have received Coast Guard approval.
- .2 Supply and/or fabricate material and equipment of prescribed quality, with performance conforming to established standards.
- .3 Use new material and equipment unless otherwise specified.
- .4 Ensure replacement parts may be readily procured.
- .5 Use products from one manufacturer for material and equipment of same type or classification, unless otherwise specified.

#### **1.2 Manufacturer's Instructions**

- .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
- .2 Notify Coast Guard in writing of any conflict between these specifications and manufacturer's instructions; Coast Guard will designate which document is to be followed.

#### **1.3 Compliance**

- .1 When material or equipment is specified by standard or performance specifications, upon request of Coast Guard, obtain an independent testing laboratory report from the manufacturer, stating that material or equipment meets or exceeds specified requirements.

#### **1.4 Substitution**

- .1 Where specific products have been specified, proposals for substitution may only be submitted after award of contract. Such requests must include statements of respective costs of items originally specified and the proposed substitution.
- .2 No substitutions will be permitted without prior written approval of Coast Guard. Substitutions will be considered by Coast Guard only when:
  - .1 Materials specified in Contract Documents, are not available or,
  - .2 Delivery date of materials selected from those materials specified would unduly delay completion of contract or,



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- .3 Alternative materials to those specified which are brought to the attention of and considered by Coast Guard as equivalent to the material specified will result in a credit to the Contract amount.
  - .3 Should the proposed substitution be accepted either in whole or in part, the Contractor must assume full responsibility and costs when such substitution affects other work on the project including any and all design or drawing changes required as a result of substitution.
- 1.5 Submittals
- .1 Provide product specifications and/or samples upon request from Coast Guard.



## **SECTION: 024116 DEMOLITION OF STRUCTURES**

### **PART 1 - GENERAL**

#### **1.1 Scope of Work**

- .1 Work under this section consists of the provision of all labour, materials, and equipment necessary to complete the following activities:
  - .1 Removal and return of existing range towers to CCG staging area (Parry Sound);
  - .2 Removal of existing tower foundations to grade; and
  - .3 Disposal of all waste at a licensed waste disposal facility.

#### **1.2 References**

- .1 Work under this section shall be undertaken in strict conformance with the most recent version of all listed references, in the case of any conflict or discrepancy the more stringent requirements shall apply.
  - .1 Canada Labour Code Part II,
  - .2 NRC-CNRC National Building Code of Canada'
  - .3 Ontario Occupational Health and Safety Act and Regulations,
  - .4 CSA S350-[M1980 (R1998)], Code of Practice for Safety in Demolition of Structures.

#### **1.3 Submittals**

- .1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of section 013300.
- .2 Contractor to provide a Demolition Plan
  - .1 Deadline:
    - .1 With Construction Plan
  - .2 Deliverables:
    - .1 Method of demolition including all associated tasks and schedule;
    - .2 Methods for protecting the site from demolition debris; and
    - .3 The ultimate disposal location of all waste materials and debris.
      - .1 Include documentation detailing regulatory approval for waste disposal facility and



transporter.

.3 Work under this section shall not proceed until written approval of the demolition plan has been received from the Coast Guard.

.4 Submit copies of certified receipts from the disposal sites for all material removed from the work site upon request.

#### 1.4 Existing Conditions

.1 Photos of the existing aids to navigation are included in Appendix A.

### **PART 2 - PRODUCTS**

2.1 Not used.

### **PART 3 - EXECUTION**

#### 3.1 General

.1 Work under this section shall be continuous and proceed without interruption unless otherwise approved by Coast Guard.

.2 Towers shall not be felled without the specific authorization of Coast Guard.

.3 Demolition work of the existing foundations and towers shall not commence until the new towers has been fully commissioned by Coast Guard. The Contractor shall allow for two full days after tower erection for commissioning work.

#### 3.2 Protection

.1 Prevent movement, settlement or damage of adjacent structures/vegetation.

.2 Implement effective controls to catch/collect all tower debris during demolition, specifically paint.

.3 Implement effective controls to prevent injury to workers, property, and local traffic.

#### 3.3 Preparation

.1 Erect warning signs and barricades.

.2 Ensure all environmental protection/mitigation measures are in place.

.3 Ensure facilities have been de-energized.

.4 Ensure all items identified for salvage have been removed and stored.

#### 3.4 Demolition

.1 Demolish existing foundations flush to grade. Any concrete piers, anchor bolts or other protruding



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members shall be cut flush to grade.

- .2 Ensure that demolition does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .3 Ensure demolition is undertaken safely. If at any period during demolition the safety of the Contractor's staff cannot be maintained take preventative measures, stop work and immediately notify Coast Guard.

### 3.5 Disposal

- .1 All material for disposal is to be disposed of off-site at a licensed disposal/recycling facility.

### 3.6 Restoration

- .1 The site in its entirety must be restored to an equal or greater condition after completion of construction.



## **SECTION: 033000 CONCRETE WORK**

### **PART 1 - GENERAL**

#### **1.1 Scope of Work**

- .1 Work under this section includes the supply of all labour, material and equipment required to complete the following:
  - .1 Install two [2] reinforced concrete foundations to support the new towers as per drawings provided;
  - .1 Install square 2.8m H x 1.2m W CCG foundation (Appendix D) at front range LL997.
  - .2 Install square 1.5m H x 1.5m W STEM Northern Ontario classification foundation (Appendix D) at rear range.
  - .2 Installation of bearing grout between completed foundation and tower base/anchor plate;
  - .3 Any and all provisions necessary to ensure that the anticipated performance of the placed concrete will be obtained if work is undertaken in cold weather.

#### **1.2 References**

- .1 Work under this section shall be undertaken in strict conformance with the most recent version of all listed references, In the case of any conflict or discrepancy the more stringent requirements shall apply.
  - .1 Canada Labour Code Part II,
  - .2 NRC-CNRC National Building Code of Canada,
  - .3 Ontario Occupational Health and Safety Act and Regulations,
  - .4 ASTM A615-15 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete reinforcement
  - .5 CAN/CSA-A23.1-04 Concrete Materials and Methods of Concrete Construction
  - .6 CAN/CSA A23.2-04 Methods of Test and Standard Practices for Concrete
  - .7 CAN/CSA A23.3-04 Design of Concrete Structures
  - .8 CAN/CSA-G30.18 Billet Steel Bars for Concrete Reinforcement
  - .9 CAN/CSA S269.3 Concrete Formwork

#### **1.3 Performance Requirements**



.1 The foundation shall be designed to perform as reasonably expected for a life of 50 years.

#### 1.4 Submittals

.1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of section 013300.

##### .2 Foundation Construction Plan

###### .1 Deadline:

.1 With Construction Plan

###### .2 Deliverables:

.1 Contractor shall provide a high level summary of mix properties and admixtures to demonstrate compliance with Coast Guard criteria;

.2 Provide MSDS (pre-mixed products only);

.3 Concrete Placement Plan identifying the location of the source of ready mix concrete, the haul route and any other relevant information required to demonstrate a plan for getting the concrete into the forms in a timely manner;

.4 Finishing procedures;

.5 Curing methods and schedule;

.6 Strength requirements for structural stability (removal of forms);

.7 Clean-up procedures; and

.8 Mitigation measures to account for hot or cold temperatures where reasonably anticipated during the construction period.

##### .3 As-Built Drawings:

###### .1 Deadline:

.1 No later than twenty-eight [28] calendar days after project completion

###### .2 Deliverables:

.1 A complete set of as-built drawings detailing any and all amendments or revisions to the previously submitted design drawings or documentation indicating final works are as detailed in design drawings.

.2 Provide one [1] electronic copy (.pdf) format or one [1] hard copy.



## 1.5 Quality Assurance

- .1 Coast Guard's minimum inspection requirements are detailed herein.
- .2 The Contractor shall be responsible to notify Coast Guard of the date and time that the works may be inspected. Notice must be provided no less than five [5] working days in advance to permit scheduling of quality assurance testing.
- .3 All deficiencies in the works identified at the time of inspection shall be remedied to the satisfaction of Coast Guard, at the Contractor's expense. Work shall not progress until inspections have been completed and the Contractor has been provided with written notice to proceed with the works.
  - .1 Upon completion of formwork and placement of reinforcement;
  - .2 During execution of concrete placement;
- .4 The below list identifies key milestones for which Coast Guard will require an opportunity to take samples, inspect, or witness testing:
  - .1 Subgrade verification: Coast Guard will arrange for a Geotechnical Engineer to inspect the sub-grade upon completion of any excavating where a design bearing surface is to be achieved. The Engineer shall indicate in writing that the sub-grade surface conditions are acceptable.
    - .1 The Contractor shall inform Coast Guard no less than five [5] working days prior to beginning any excavation and foundation installation cannot proceed without a Geotechnical Engineer's approval.
    - .2 Concrete testing: Coast Guard will arrange for concrete testing of air, slump and strength during the pour.
      - .1 The Contractor shall inform Coast Guard no less than five [5] working days prior to the day of the pour and be prepared to provide concrete samples. Testing shall consist of, at minimum, a test for slump, air entrainment and strength (4 cylinders: one [1] 7 day, two [2] 28 day and one [1] to verify concrete strength before tower erection).
    - .3 Final completion: The Coast Guard will conduct final inspection upon completion of the tower installation.

## **PART 2 - PRODUCTS**

### 2.1 General

- .1 All concrete materials shall conform to specifications referenced in CAN/CSA-A23.1-04.





## 2.2 Formwork

- .1 Formwork shall be in accordance with CAN/CSA S269.3.

## 2.3 Concrete

- .1 Concrete shall possess the minimum characteristic detailed in the Contract Drawings;
- .2 Concrete supplier shall be a holder of a valid "Certificate of Ready Mixed/Mobile Mix Concrete Production Facilities" as issued by the Ready Mixed Concrete Association of Ontario (RMCAO).
- .3 Concrete mix to be determined by Contractor and shall be indicated on engineering plans.
  - .1 The use of calcium chloride as an admixture is not permitted.

## **PART 3 - EXECUTION**

### 3.1 General

- .1 Concrete must be placed, finished, and cured in accordance with the Contractor's submitted construction plan and the engineered drawings.
  - .1 Installation shall be undertaken in accordance with the engineered drawings and accompanying materials as contained in the Contractor's Summary Report.
  - .2 Locations shall be in conformance with positions detailed in (Appendix A).
    - .1 Installation of the towers and foundations must not disturb the integrity of the existing facilities or the continued operation of the existing light station.

### 3.2 Preparation

- .1 Preparation shall not commence until bearing surfaces have been inspected by a geotechnical engineer.
- .2 Remove all deleterious material.
- .3 Construct forms and reinforcement in accordance with the engineer's specifications.
- .4 All exposed 90° edges shall be chamfered.

### 3.3 Placement

- .1 Concrete placement shall not commence until formwork and reinforcement have been inspected by Coast Guard.
- .2 Contractor shall place, finish and cure concrete as per CAN CSA A23.1 making all adjustments necessary to account for climatic conditions anticipated during the curing period.



- .3 Concrete shall be placed in one continuous pour.
  - .1 The development of cold joints shall be avoided. Alternately, cold joints must be previously approved in writing by CCG.
- .4 Finish exposed concrete surfaces to provide a lightly brushed non-skid surface, unless otherwise specified in the submitted design.
- .5 Cut control joints where specified.
- .6 Contractor shall provide samples as required during placement operation for the performance of quality assurance testing.
- .7 Concrete shall be finished so as to slope gently away from the center of the slab. No water shall pond on the finished surface.

### 3.4 Curing

- .1 Shall be undertaken in accordance with CAN CSA A23.1 and the Contractor's approved construction plan.
  - .1 Curing regimen employed must take into account local climatic conditions reasonably anticipated to occur during the curing period.

### 3.5 Grout

- .1 Supply and install load bearing grout between the top of each foundation and each tower base.
  - .1 Edges of grout shall be chamfered.

### 3.6 Inspection

- .1 Concrete pour(s) to be witnessed by Coast Guard representative. Concrete testing to CAN/CSA-A23.2 by a third party testing laboratory shall be arranged by the contractor. Contractor shall provide samples as required during concreting operation for test purposes.



## **SECTION: 055000 ADHESIVE ANCHORS**

### 1.1 Scope of Work

- .1 Work of this section includes the supply of all labour, material, and equipment, necessary to complete the following activities:
  - .1 Drilling and installation of vertical dowel bars in to competent bedrock as per STEM foundation drawings for rear foundation;

### 1.2 Related Sections

- .1 Section 033000 Concrete Work
  - .1 Section details further requirements for the installation of the required foundation elements.

### 1.3 References

- .1 Work under this section shall be undertaken in strict conformance with the most recent version of all listed references, In the case of any conflict or discrepancy the more stringent requirements shall apply.
  - .1 Canada Labour Code Part II,
  - .2 NRC-CNRC National Building Code of Canada,
  - .3 Ontario Occupational Health and Safety Act and Regulations.

### 1.4 Submittals

- .1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of section 013530.
- .2 Drilling Plan:
  - .1 Deadline:
    - .1 With Construction Plan.
  - .2 Deliverables:
    - .1 Description of the equipment that will be utilized to drill into bedrock;
    - .2 Description of the methods that will be implemented to stabilize the drilling equipment, and to ensure verticality of holes;
    - .3 Description of how epoxying activities will occur;
    - .4 Provide material specifications for the epoxy adhesive to be used;
    - .5 Provide cut-sheets for the reinforcing bars to be used;



- .6 Describe how works will be undertaken to mitigate impacts on the surrounding watercourse.

### 1.5 Quality Assurance

- .1 Coast Guards minimum inspection requirements are detailed below.
  - .1 The Contractor shall be responsible to notify Coast Guard of the date and time that the works may be inspected. Notice must be provided no less than three (3) working days in advance to permit scheduling of quality assurance testing.
  - .2 All deficiencies in the works identified at the time of inspection shall be remedied to the satisfaction of Coast Guard, by the Contractor at their expense.
  - .3 Work shall not progress until inspections have been completed and the Contractor has been provided with written notice to proceed with the works.
  - .4 Coast Guard is to confirm location of foundation prior to drilling;
  - .5 Coast Guard is to witness drilling and epoxying of vertical bars;

## **PART 2 - PRODUCTS**

### 2.1 Dowels

- .1 Vertical bars installed in existing bedrock are to be as detailed in Appendix D, Drawings.

### 2.2 Epoxy Adhesive

- .1 Epoxy Adhesive used for vertical bars to be HILTI HIT-RE 500 V3 as per STEM drawings;
  - .1 Alternates must be approved by CCG PA.

## **PART 3 - EXECUTION**

### 3.1 Fabrication

- .1 Vertical rebar to be epoxied in to bedrock prior to installation of remaining rebar.

### 3.2 Installation

- .1 Installation shall be carried out as per the installation directions on the appended drawings.
- .2 The location for foundation placement to be verified by on-site CCG representative.
- .3 The elevation of the top of the pier will be as determined by CCG representative. Please refer to foundation drawing in Appendix D.



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- .1 Provisions shall be made to allow for variance in the lengths of the drilled rebar from that of the drawings, based on field conditions.



## **SECTION: 133613 METAL TOWERS**

### **PART 1 - GENERAL**

#### **1.1 Scope of Work**

- .1 Work under this section includes the supply of all labour, material, and equipment required to complete:
  - .1 The transportation of the towers, dayboards and all associated hardware to site from the designated staging area;
  - .2 The installation of the towers detailed in the Appendix C;
    - .1 LL997 Gibbons Point Front Range requires a 16' pipe mast tower
    - .2 LL998 Gibbons Point Rear Range requires a 20' pipe mast tower
- .2 Work of this section excludes:
  - .1 Fabrication of the towers (CCG)
  - .2 Supply of the navigational lantern and appurtenant equipment (CCG)
  - .3 The installation and commissioning of a lantern on each the towers (CCG).

#### **1.2 References**

- .1 Work under this section shall be undertaken in strict conformance with all listed references. In the case of any conflict or discrepancy the more stringent requirements shall apply.
  - .1 Canada Labour Code Part II
  - .2 NRC-CNRC National Building Code of Canada

#### **1.3 Quality Assurance**

- 1.4 CCG's minimum inspection requirements are detailed below. The Contractor shall be responsible to notify CCG of the date and time that the works shall be inspected. Notice must be provided no less than three [3] working days in advance to permit scheduling of quality assurance testing. All deficiencies in the works identified at the time of inspection shall be remedied to the satisfaction of CCG, by the Contractor at their expense. Work shall not progress until inspections have been completed and the Contractor has been provided with written notice to proceed with the works.
  - .1 Upon completion of the work an inspection will take place to ensure tower is plumb and that light is operating correctly.



## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 All materials shall be supplied by CCG.

## **PART 3 - EXECUTION**

### **3.1 Fabrication**

- .1 Fabrication has been completed by the CCG. This includes everything shown on the drawing which comprises the tower in Appendix C.

### **3.2 Protective Coatings**

- .1 The tower and all hardware are hot dip galvanized. The contractor shall be prepared to make repairs to the coating as needed.

### **3.3 Handling of Material and Transportation**

- .1 Estimated weight of the tower is 375 kg (+/- 825 lbs.)
- .2 Estimated weight of a dayboard is 25 kg (55lbs).
- .3 The Contractor must take all necessary precautions to avoid damage to the tower members or to tower coating during transport, unloading and erection. All components or damaged members must be replaced to the satisfaction of Coast Guard at the expense of the Contractor.
- .4 It is the responsibility of the Contractor to ensure that the tower sections, particularly the joints are protected from bending and alignment damage.
- .5 The contractor shall identify how they would like the tower packaged for shipping shortly after award. This will be coordinated by CCG.

### **3.4 Placement of Tower**

- .1 The tower shall be fitted to the foundation anchor bolts.
  - .1 Each bolt shall have one [1] heavy hex levelling nut below tower base and two [2] heavy hex nuts above base.
  - .2 Heavy flat washers shall be placed between heavy hex nuts and tower base (top and bottom)
- .2 Contractor must ensure a 50 mm gap between pier and tower base as per appended drawings.
- .3 Contractor shall tighten the first nut using turn of nut method associated to the length of bolt provided. The second nuts shall be snug tight to lock into place the two nuts.



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.4 Non-shrink, gassing, cementitious grout shall be placed between top of foundation and tower base.

.1 Sika M-Bed Standard or equal.





## **SECTION: 310000 EARTHWORK**

### **PART 1 - GENERAL**

#### **1.1 General**

- .1 Work under this section includes the supply of all labour, material and equipment required to complete the following:
  - .1 The excavations for the installation of the tower base foundations, including:
    - .1 Stripping and stockpiling of existing topsoil or granular materials to expose subgrade or bedrock;
    - .2 Backfilling of the excavation, including:
      - .1 Supply of all required materials;
      - .2 Supply of imported granular materials (if necessary); and
      - .3 Placement and/or compaction of granular material.
  - .2 The restoration of all disturbed areas within the work site;

#### **1.2 References**

- .1 Work under this section shall be undertaken in strict conformance with the most recent version of all listed references. In the case of any conflict or discrepancy, the more stringent requirements shall apply.
  - .1 Canada Labour Code Part II
  - .2 NRC-CNRC National Building Code of Canada
  - .3 Ontario Occupational Health and Safety Act and Regulations
  - .4 CAN/CSA-A23.1-04 Concrete Materials and Methods of Concrete Construction
  - .5 Any and all other Provincial/Territorial Regulations and Policies; Worker's Compensation Board Policies; Local municipal regulations; pertaining to work of this section.

#### **1.3 Submittals**

- .1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of section 013300.
- .2 Excavation Plan
  - .1 Deadline:



.1 With Construction Plan

.2 Deliverables:

.1 The Excavation Plan shall outline the Contractor's planned excavation and backfill procedures and should detail the following.

.1 Proposed side slopes and control measures;

.2 Dewatering measures, if necessary;

.3 Measures to be taken to prevent exposed soils from freezing;

.4 Stockpile locations and methods for controlling erosion;

.5 Backfill equipment types and procedures. Contractor shall provide methods for undertaking backfill placement in cold weather, if reasonably anticipated;

.6 Include shop drawings of any shoring or bracing required. Drawings must be stamped by a licensed professional engineer;

#### 1.4 Existing Conditions

.1 A geotechnical investigation has been completed at this site and a copy of the report is included in Appendix E.

.2 Prior to commencing excavation, document the condition of all existing structures, landscaping, roadways and other adjacent facilities anticipated to be impacted by the work.

.3 Before commencing work under this section, the Contractor must:

.1 Establish the location of all buried services that may interfere with the execution of work; and

.2 Hire and arrange for a surveyor to conduct a field survey.

.1 The purpose will be to ensure that the new towers are installed in the correct positions and face the required direction.

.2 It shall be the contractor's responsibility to establish markers in addition to those provided by the surveyor such that references will not be obstructed or altered by excavation or construction activities and can then be used to accurately verify the proper location of each tower.

.4 All work of this section shall be witnessed by Coast Guard or its representative unless permission is received in writing otherwise.

#### 1.5 Quality Assurance

.1 Coast Guard's minimum inspection requirements are detailed herein.



- .2 The Contractor shall be responsible to notify Coast Guard of the date and time that the works may be inspected. Notice must be provided no less than five [5] working days in advance to permit scheduling of quality assurance testing.
- .3 All deficiencies in the works identified at the time of inspection shall be remedied to the satisfaction of Coast Guard, at the Contractor's expense. Work shall not progress until inspections have been completed and the Contractor has been provided with written notice to proceed with the works.
  - .1 Subgrade verification: Coast Guard will arrange for a Geotechnical Engineer to inspect the sub-grade upon completion of any excavating where a design bearing surface is to be achieved. The Engineer shall indicate in writing that the sub-grade surface conditions are acceptable.
    - .1 The Contractor shall inform Coast Guard no less than five [5] working days prior to beginning any excavation and foundation installation cannot proceed without a Geotechnical Engineer's approval.

## **PART 2 - PRODUCTS**

### **2.1 General**

- .1 All materials described in this section shall be supplied by the Contractor.
  - .1 Water shall be free of deleterious materials.
  - .2 Backfill may consist of stockpiled native (excavated) materials and must not be frozen.
  - .3 Granular materials shall be as per approved design drawings.

### **2.2 Backfill**

- .1 Either 19mm [3/4"] clear crush stone (gravel) or granular B per OPSS 1001

## **PART 3 - EXECUTION**

### **3.1 Site Preparation**

- .1 Prior to commencing excavation, document the condition of all existing structures, landscaping, roadways and other adjacent facilities anticipated to be impacted by the work.
- .2 Install any features required to protect existing infrastructure.

### **3.2 Excavation**

- .1 Strip topsoil over areas impacted by new construction and stockpile materials on-site;



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- .2 Side slopes must be maintained around the perimeter of the excavation in accordance with provincial legislation;
- .3 Take all reasonable precautions to minimize the disturbance of the existing vegetation;
- .4 Install measures as detailed in Construction Plan to prevent excavation from freezing.

### 3.3 Backfill

- .1 Ensure that surrounding soil is unfrozen or take measures to thaw frozen materials;
- .2 Backfill to be placed in uniform lifts to a maximum depth of 0.2 m (8 in) and compacted to 95% SPMDD.

### 3.4 Restoration

- .1 Restore all disturbed areas within work sites and along haul routes. Fill and grade all ruts. Ensure positive drainage away from completed and existing foundations.
- .2 Excavated materials shall be used given the following priority:
  - .1 Backfill around new foundation;
  - .2 Removed from site.



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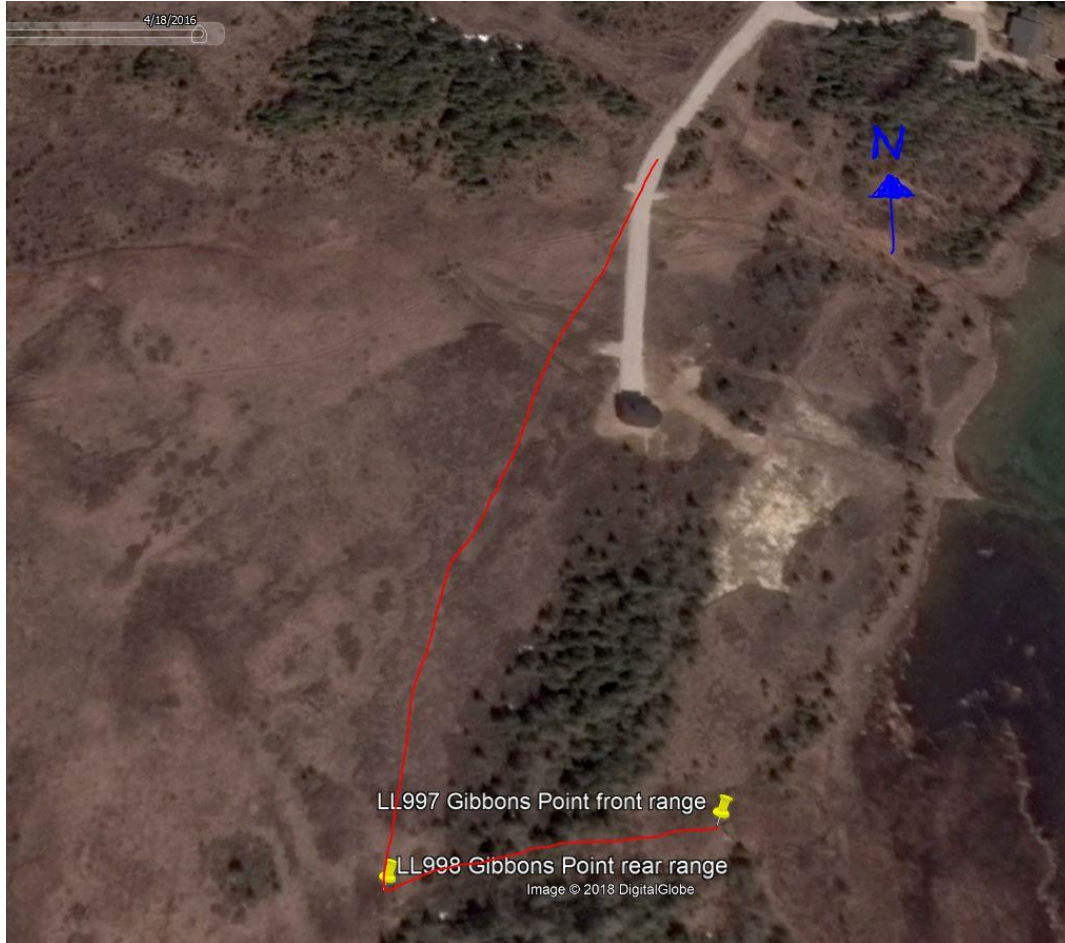
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## APPENDIX A: SITE LOCATIONS AND PHOTOGRAPHS



**Figure 1: Project Site**  
Little Current, ON



**Figure 2: Project Site**

LL997 Gibbons Point Front Range: 45°58'4.05"N, 81°54'23.85"W

LL998 Gibbons Point Rear Range: 45°58'3.44"N, 81°54'28.44"W





Figure 3: LL997 Gibbons Point Front Range



Figure 4: LL998 Gibbons Point Rear Range



## **APPENDIX B: SUMMARY OF SUBMITTALS**

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### **Following Contract Award**

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<b>Deadline</b>	<b>Submission Description</b>	<b>Reference Section(s)</b>
<b>10 working days following award</b>	Detailed schedule	011100 – 1.3.2
	Proof of Qualifications	011100 – 1.3.3
<b>10 working days prior to mobilization</b>	Construction Plan	
	a) Project Specific Safety Program	013530 – 1.3.2
	b) Project Environmental Protection Plan	013543 – 1.3.2
	c) Detailed Demolition Plan	024116 – 1.3.2
	d) Foundation construction Plan	033000 – 1.4.2
	e) Tower Erection Plan	133613 – 1.3.2
	f) Excavation Plan	310000 – 1.3.2
<b>28 calendar days after construction</b>	As-built and QA/QC documents	011100 – 1.3.5
		033000 – 1.3.3
		133613 – 1.3.3
<b>Upon request of Coast Guard</b>	Completed Field Level Hazard Assessment (FLHA) forms	013530 – 1.3.3
	Product specifications and/or samples	016100 – 1.5
	Copies of certified receipts from the disposal sites	024116 – 1.3.4

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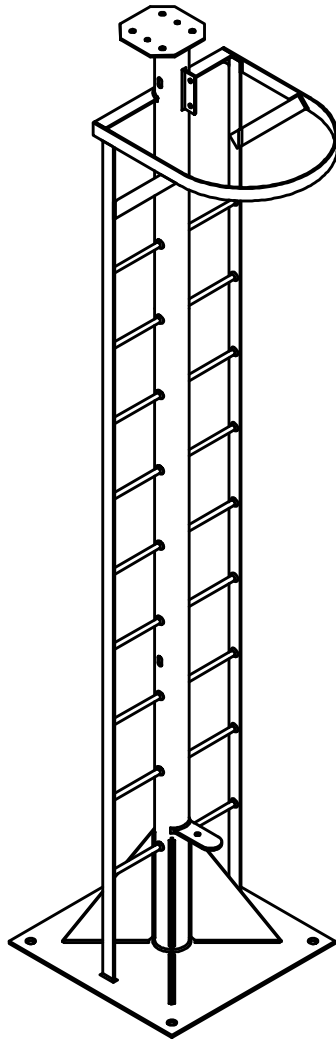
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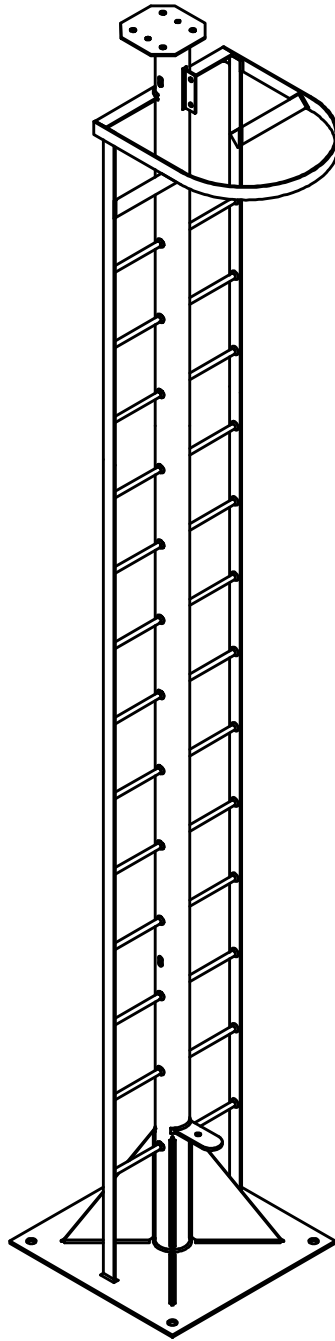
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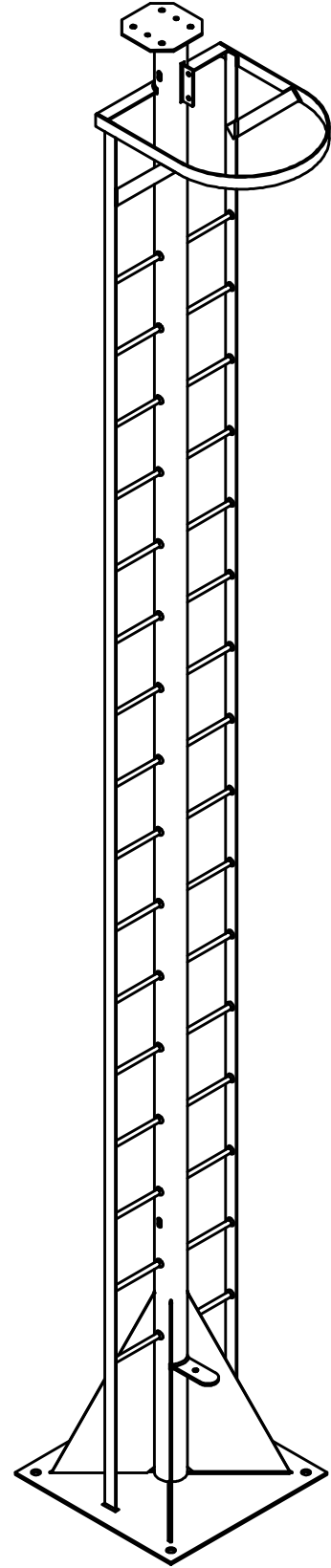
## **APPENDIX C: NEW TOWER DRAWINGS**



12' PIPEMAST




16' PIPEMAST



20' PIPEMAST

inches 0 1 2 3 4

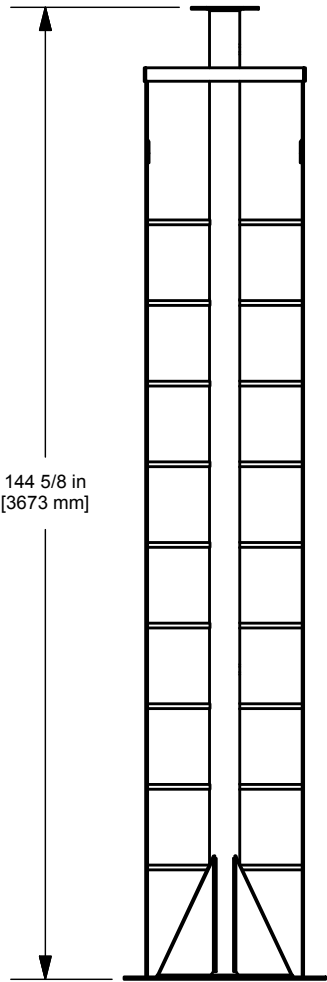
millimeters 0 1 2 3 4 5 6 7 8

 Fisheries and Oceans Canada Canadian Coast Guard	Pêches et Océans Canada Garde côtière Canadienne	Asset - Actif	designed - conception	date
		12', 16', AND 20' PIPEMASTS		BH
Drawing - Dessin	approved - approuvé			date
CCG ref. no. - no. réf. GCC EWTM-8010-6	scale - échelle AS SHOWN		BY	2017-12-11
			drawing no. - no. dessin EWTM-8010-6	sheet-feuille 1/25
				rev 0

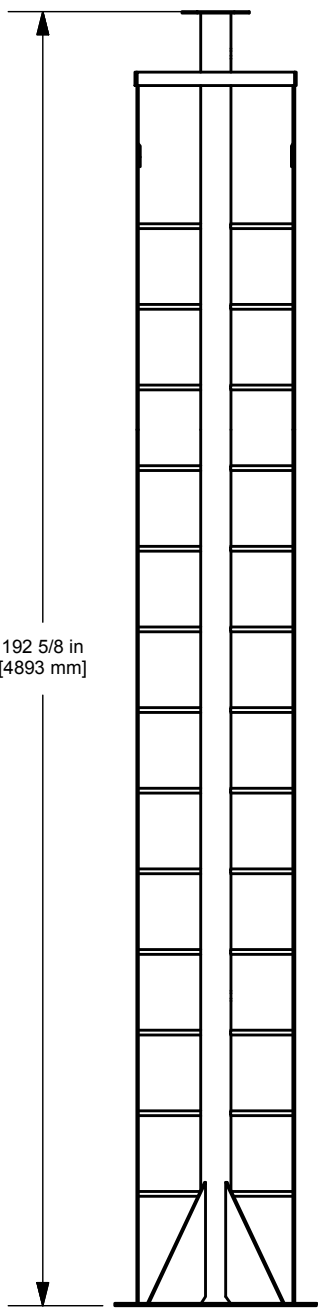
File / Fichier: 12', 16' and 20' Pipemasts.dwg

inches  
0  
1  
2  
3  
4  
pouces

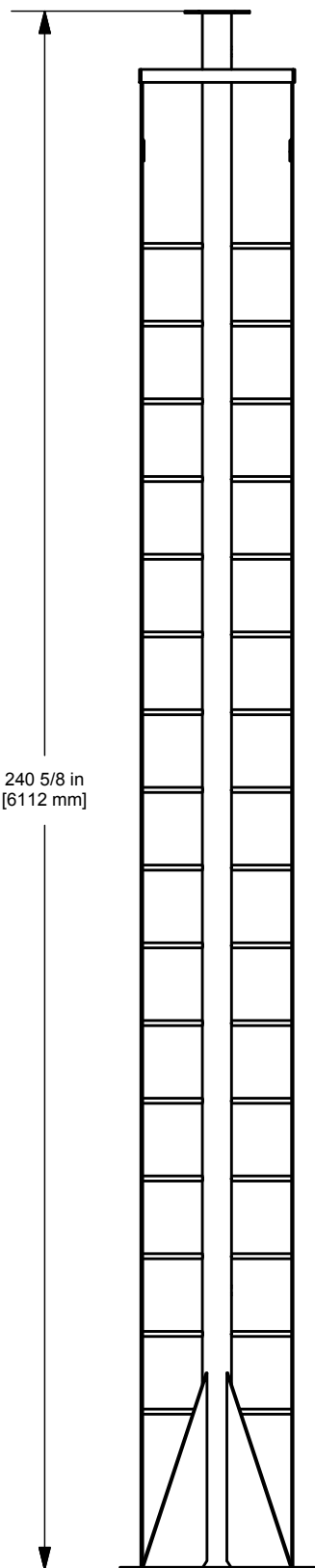
millimeters  
0  
1  
2  
3  
4  
5  
6  
7  
8  
millimètres




144 5/8 in  
[3673 mm]



192 5/8 in  
[4893 mm]



240 5/8 in  
[6112 mm]

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Asset - Actif	<b>12', 16', AND 20' PIPEMASTS</b>		designed - conception	date
Drawing - Dessin			approved - approuvé	date
<b>PIPEMAST SIZES</b>		BY	2017-12-11	
		drawing no. - no. dessin	sheet-feuille	rev
		EWTM-8010-6	2/25	0

designed - conception	date	
BH	2017-12-11	
approved - approuvé	date	
BY	2017-12-11	
drawing no. - no. dessin	sheet-feuille	rev
EWTM-8010-6	2/25	0



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## APPENDIX D: NEW FOUNDATION DRAWINGS

## CONCRETE & EPOXY

FORMS MAY EITHER BE KEPT DE-WATERED OR CONTAIN STANDING WATER DURING CONSTRUCTION, PROVIDED REQUIREMENTS FOR EACH CASE ARE MET AS FOLLOWS:

IF INSIDE OF FORM IS KEPT DE-WATERED AND DRY DURING PLACEMENT OF REINFORCING AND POURING OF CONCRETE, CONCRETE MAY BE POURED IN CONVENTIONAL MANNER (CHUTE). ENSURE DRILLED HOLES ARE FREE OF STANDING WATER WHEN EPOXYING THE VERTICAL REBAR.

IF INSIDE OF FORM IS NOT KEPT DEWATERED AND WILL HAVE STANDING WATER DURING PLACEMENT OF REINFORCING AND POURING OF CONCRETE, THEN A TEMPLATE FOR DRILLING THE HOLES FOR THE VERTICAL BARS SHALL BE USED. ALSO, THE CONCRETE SHALL BE PLACED USING THE TREMIE METHOD, AND THE MIX DESIGN TO HAVE ANTI-WASH ADDITIVE.

IN GENERAL, CONTRACTOR SHALL BE EXPERIENCED IN PLACING EPOXYED REBAR IN WET OR SUBMERGED CONDITIONS AS REQUIRED.

CONFORM TO CSA STANDARDS CAN3-A23.1-A23.3 AND THEIR SUPPLEMENTS.

TOLERANCES: CONFORM TO CSA STANDARD CAN3-A23.1

PORTLAND CEMENT WATER AND AGGREGATES TO CONFORM TO CSA A23.1 AND CAN3-A5.

AIR ENTRAINMENT ADMIXTURE: TO CSA STANDARD A266.1.

CHEMICAL ADMIXTURES: TO CSA STANDARD A266.2.

CURING/SEALING COMPOUND: TO ASTM C309.

ALL REINFORCING STEEL SHALL BE GRADE 400 MPa, CSA G30.18, EPOXY COATED.

INSTALL EPOXY ADHESIVE IN CONFORMANCE WITH MANUFACTURER'S INSTRUCTIONS. EPOXY ADHESIVE TO BE HILTI HIT-RE 500 V3.

USE VIBRATORS FOR PLACEMENT OF CONCRETE.

FOR READY-MIX CONCRETE THE MAXIMUM TIME PERMITTED BETWEEN CHARGING THE MIXER AND FINAL DEPOSIT IS 90 MINUTES. THERE IS NO TOLERANCE FOR ADDITIONAL TIME SPANS UNLESS A CONCRETE RETARDER IS USED.

EXPOSED CONCRETE SHALL BE FREE FROM HONEYCOMBING, VOIDS, LOSS OF FINES, VISIBLE FLOW LINES AND COLD JOINTS, CHIPS AND SPALLS.

PROTECT FRESH CONCRETE FROM PREMATURE DRYING, SUNSHINE, EXCESSIVELY HOT OR COLD TEMPERATURES AND MECHANICAL INJURY, MAINTAIN AT A RELATIVELY CONSTANT TEMPERATURE FOR AS LONG AS REQUIRED FOR HYDRATION OF THE CEMENT AND CURING OF THE CONCRETE.

SUPPLEMENTAL ADMIXTURES IMPACTING PLASTIC AND HARDENED PERFORMANCE SHALL BE SUBJECT TO APPROVAL OF COAST GUARD.

PLACEMENT OF REINFORCEMENT TO BE CONFIRMED BY COAST GUARD PRIOR TO CONCRETE PLACEMENT.

CONTRACTOR TO PROVIDE CONCRETE TESTING FOR 7 DAY AND 28 DAY COMPRESSIVE STRENGTH. ALSO PROVIDE TESTING FOR SLUMP AND AIR CONTENT. TESTING REPORTS TO BE SUBMITTED TO COAST GUARD FOR REVIEW.

TOWER SHALL NOT BE ERECTED UNTIL CONCRETE TESTING INDICATES AT LEAST 75% OF 28 DAY COMPRESSIVE STRENGTH

REFER TO COAST GUARD SPECIFICATIONS FOR FURTHER CONCRETE REQUIREMENTS

### CLASS OF CONCRETE

PROVIDE NORMAL DENSITY CONCRETE TO ACHIEVE THE FOLLOWING PROPERTIES:

- CLASS OF EXPOSURE: C-1
- CEMENT TYPE: 10
- MINIMUM COMPRESSIVE STRENGTH: 5076psi (35MPa)
- MAXIMUM WATER CEMENT RATIO: 0.50
- AIR ENTRAINMENT: 5%-8%
- NOMINAL SIZE OF COURSE AGGREGATE: 3/4" (20MM)
- SLUMP AT 3" ±1" (75MM ±25MM)
- CURING REGIME TYPE: 2, (7 DAYS TOTAL AT >10°C)

## SUBMITTALS

CONTRACTOR SHALL SUBMIT A SUMMARY OF CONCRETE PROPERTIES WITH CONSTRUCTION PLAN. SUBMIT TO COAST GUARD FOR REVIEW.

SUBMIT REBAR SHOP DRAWINGS FOR COAST GUARD REVIEW

FORMWORK AND FALSEWORK SHALL BE AS DETAILED IN APPROVED CONSTRUCTION PLAN. FOR DE-WATERED INSTALLATION, THE CONSTRUCTION PLAN SHALL SHOW ENGINEERED METHOD OF KEEPING WATER OUT OF THE FORM, EITHER WITH CAISSON AROUND FORM, OR USING THE FORM ITSELF.

CURING SHALL BE COMPLETED IN ACCORDANCE WITH APPROVED CONSTRUCTION PLAN

ANY ALTERNATE PRODUCTS OR PROCEDURES MUST BE APPROVED BY THE COAST GUARD

## BEDROCK

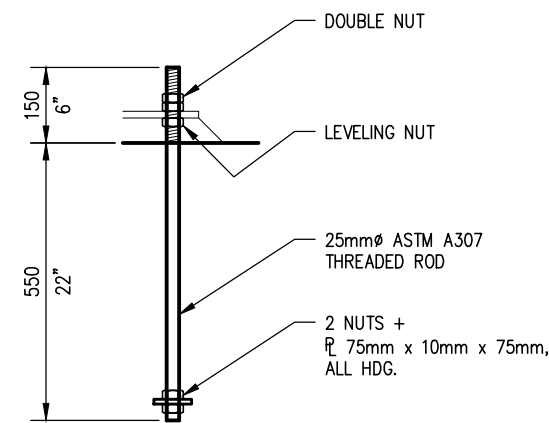
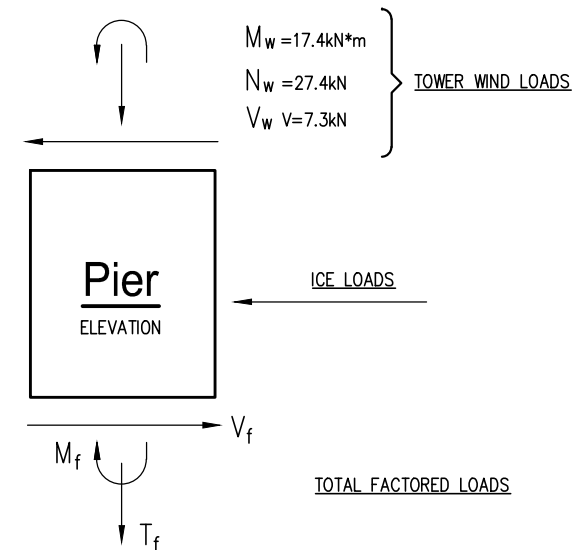
VERTICAL REBAR SHALL BE EMBEDDED IN COMPETENT BEDROCK HAVING A MINIMUM COMPRESSIVE STRENGTH OF 5076 psi (35 MPa). SUITABILITY OF BEDROCK TO EITHER BE VERIFIED BY A GEOTECHNICAL ENGINEER, OR APPROVED BY COAST GUARD PERSONNEL.

## DESIGN LOAD NOTES

**TOWER WIND LOADS:** WIND TOWER LOADS AS PROVIDED BY CANADIAN COAST GUARD, AND ARE SHOWN FACTORED

**ICE LOADS:** ICE LOADS HAVE BEEN DETERMINED IN ACCORDANCE WITH THE CANADIAN HIGHWAY BRIDGE DESIGN CODE CAN/CSA-S6.

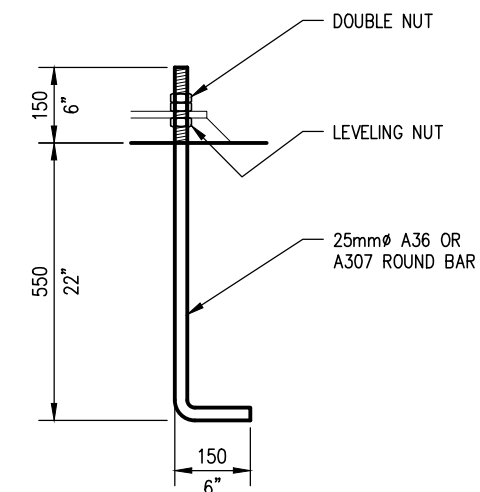
**TOTAL FACTORED LOADS:** FOR TOTAL FACTORED DESIGN FORCES AND MOMENTS ON BASE OF PIER, SEE DWGS. s2.0 AND s3.0 AS APPLICABLE.



\* ALL COMPONENTS HOT DIP GALVANIZED.

### Typ. Anchor Bolt Detail

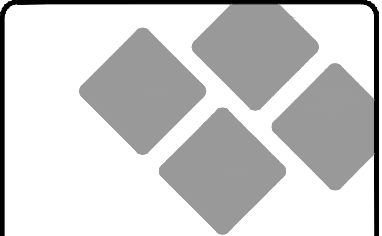
SCALE: 1:15



\* ALL COMPONENTS HOT DIP GALVANIZED.

### Alternate Anchor Bolt Detail

SCALE: 1:15



**STEM**  
ENGINEERING GROUP

### REVISIONS:

NO.	DESCRIPTION	DATE

SEAL:



CLIENT:

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CANADIAN COAST GUARD

PROJECT:

FOUNDATION FOR 16'-0"  
PIPEMAST NAVIGATION  
BEACONS

DRAWING:

GENERAL NOTES  
DESIGN LOADS  
ANCHOR BOLT DETAIL

SCALE: N.T.S.

PLOT SCALE: 1:1

STEM PROJ. NO: 17266

CAD FILE: 17266 s0.0

FORMAT SIZE: 280mmx432mm

DRAWN: TAB

DESIGNED: DMAC

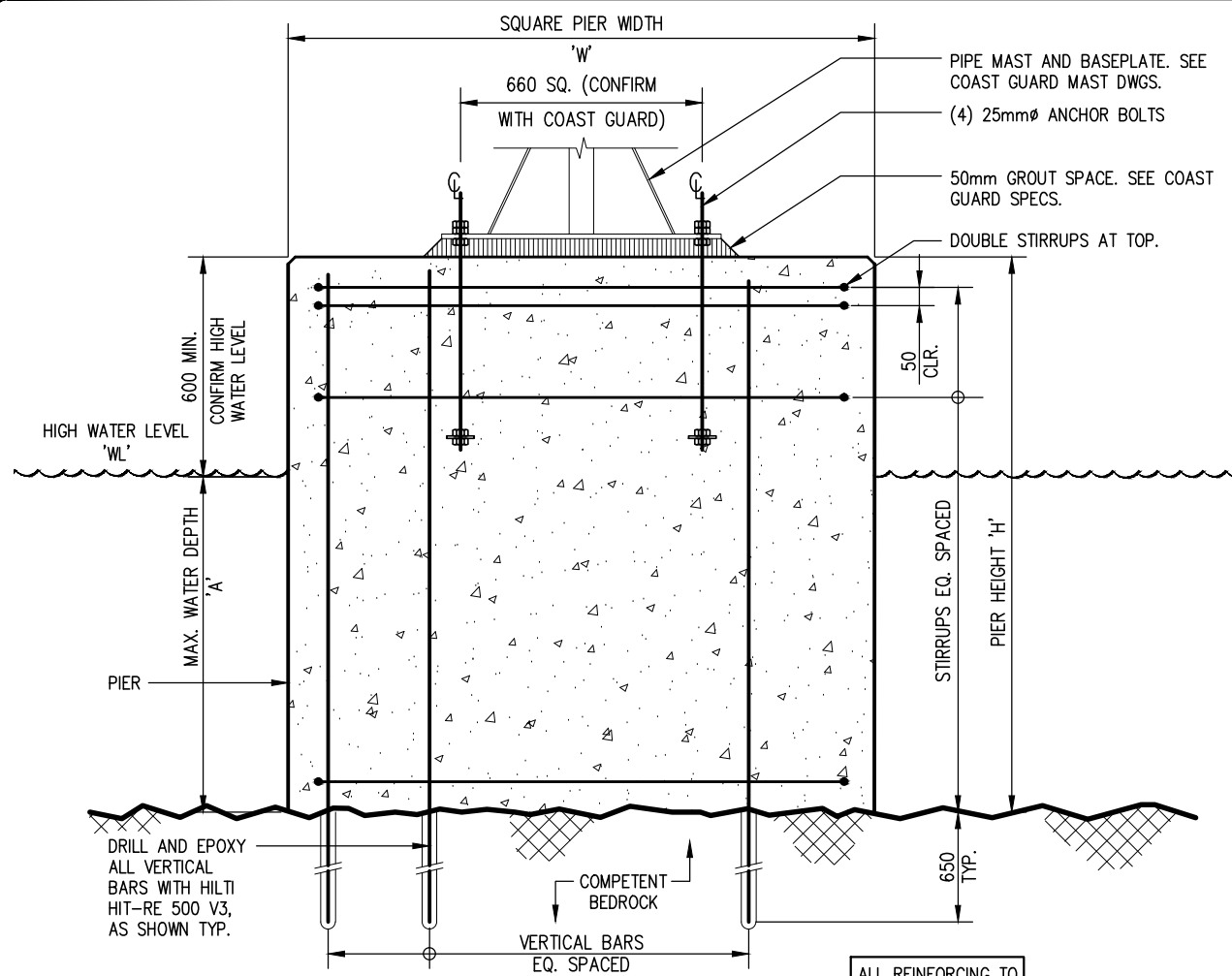
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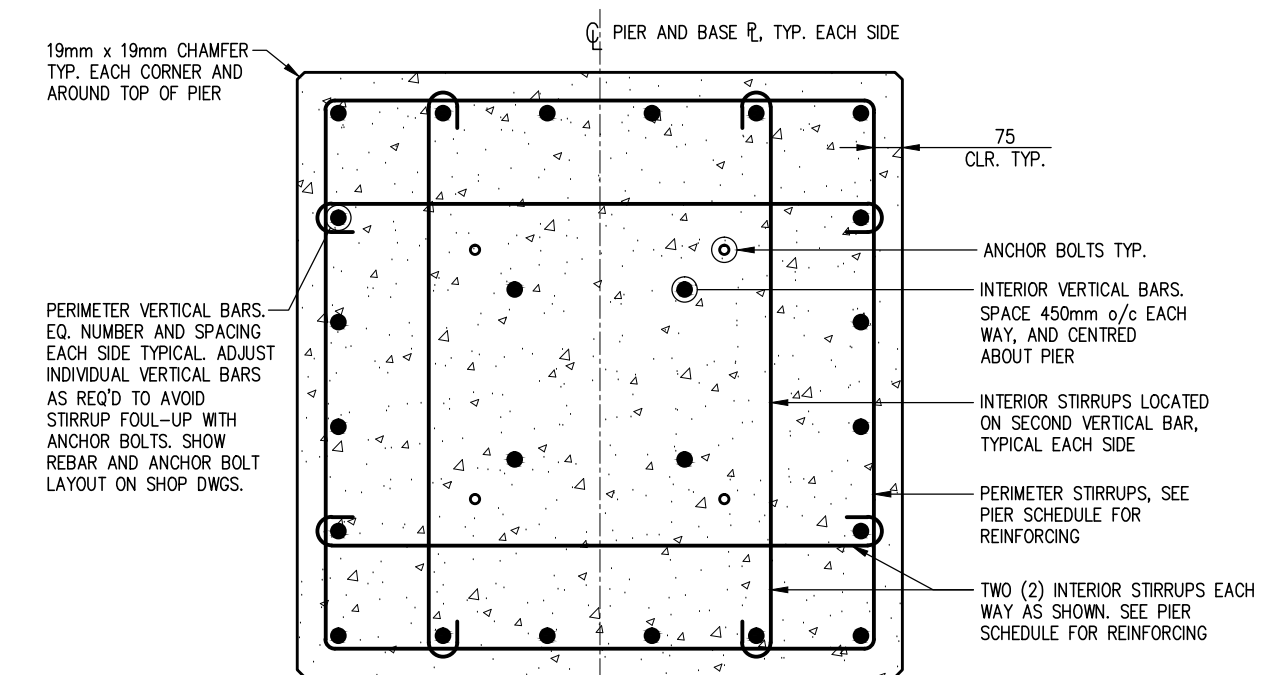
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1 OF 4

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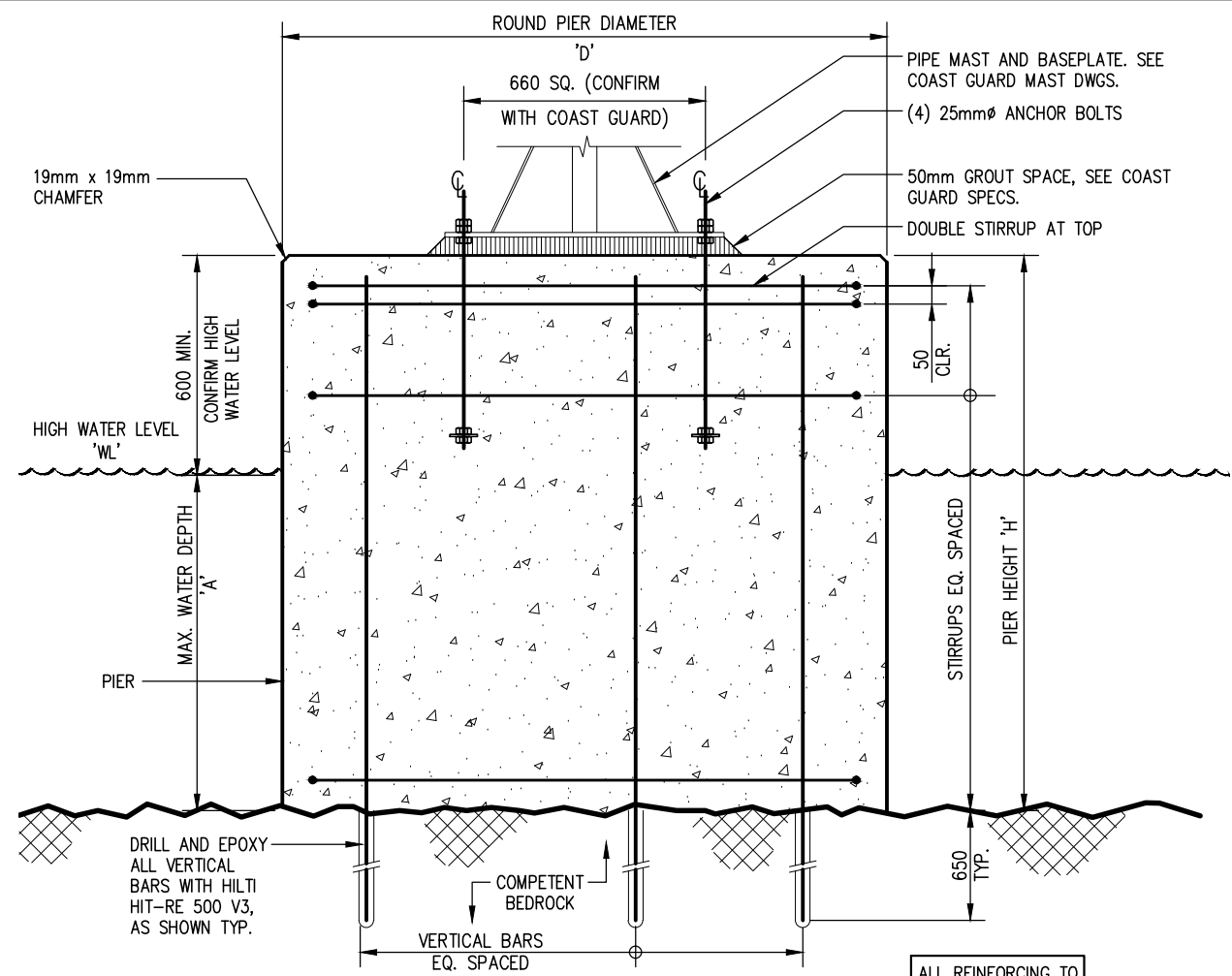
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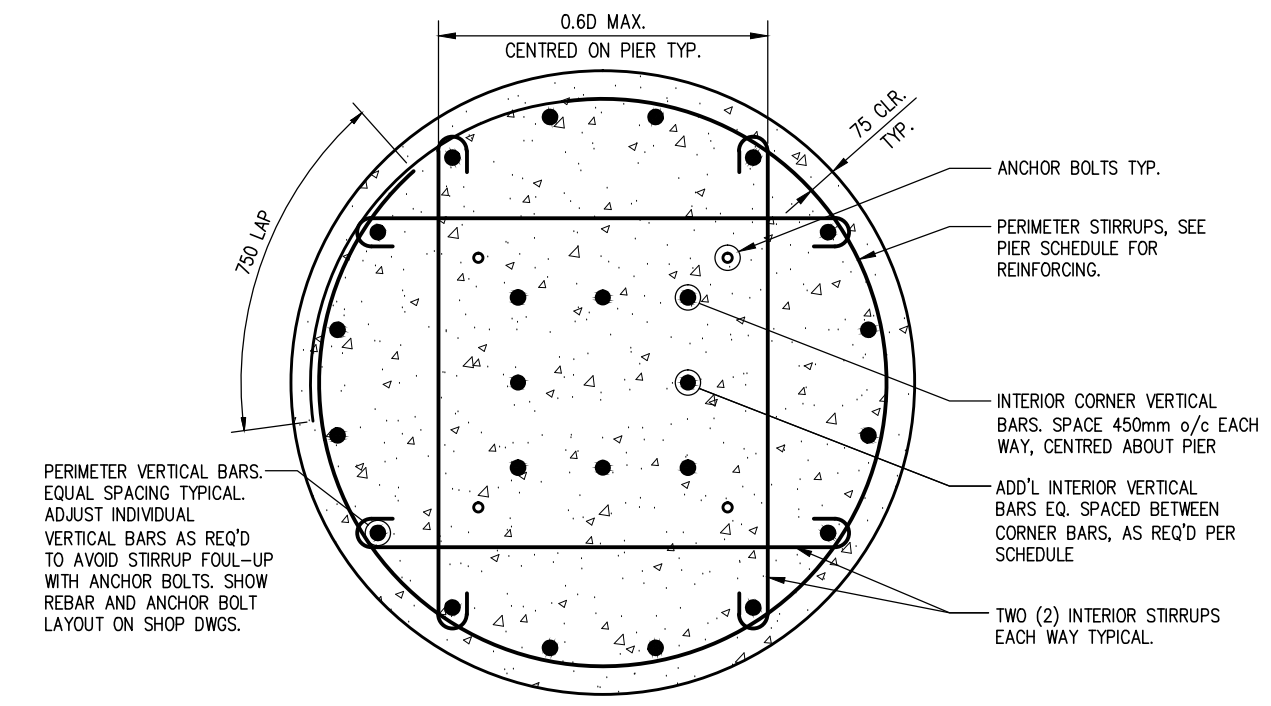
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**4.87m (16') PIPEMAST FOUNDATION PIER**

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NORTHERN ONTARIO PIER SCHEDULE, SEE DWG. s3.0.



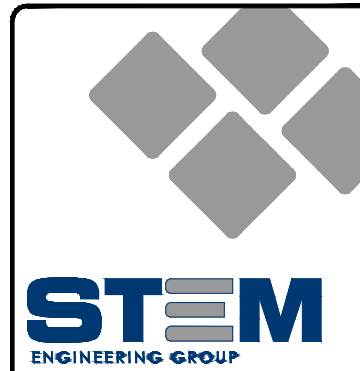
SECTION-VIEW (ROUND PIER)



PLAN-VIEW (ROUND PIER)

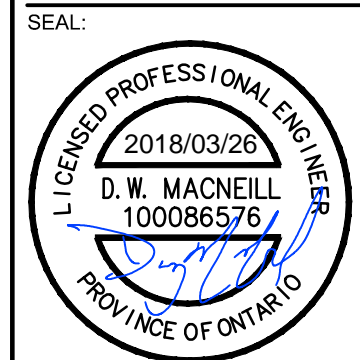
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REVISIONS:

NO.	DESCRIPTION	DATE



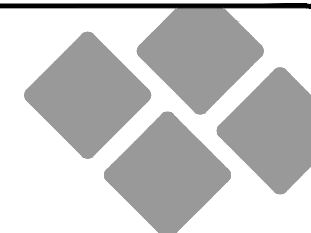
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FISHERIES AND OCEANS  
CANADIAN COAST GUARD

PROJECT:  
FOUNDATION FOR 16'-0"  
PIPEMAST NAVIGATION  
BEACONS

DRAWING:  
SQUARE PIER DETAILS  
ROUND PIER DETAILS

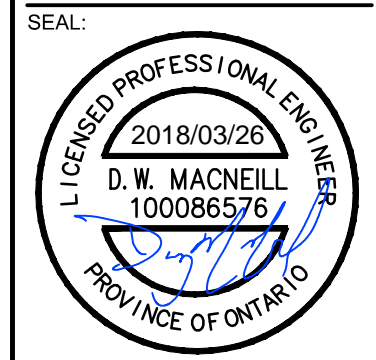
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DESIGNED:	DMAC
CHECKED:	DMAC
DATE:	18.03.26





**STEM**  
ENGINEERING GROUP

REVISIONS:		
NO.	DESCRIPTION	DATE



CLIENT:  
FISHERIES AND OCEANS  
CANADIAN COAST GUARD

PROJECT:  
FOUNDATION FOR 16'-0"  
PIPEMAST NAVIGATION  
BEACONS

DRAWING:  
PIER SCHEDULES  
NORTHERN ONTARIO

SCALE: AS NOTED  
PLOT SCALE: 1:1  
STEM PROJ. NO: 17266  
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FORMAT SIZE: 280mmx432mm  
DRAWN: TAB  
DESIGNED: DMAC  
CHECKED: DMAC  
DATE: 18.03.26

DRAWING:  
4 OF 4 **s3.0**

**Square Pier: 'Northern Ontario' Classification: North of Ottawa and Extends to Kenora & Big Woods Lake as the Limit**



Freezing Index 3000 F° Deg. Days

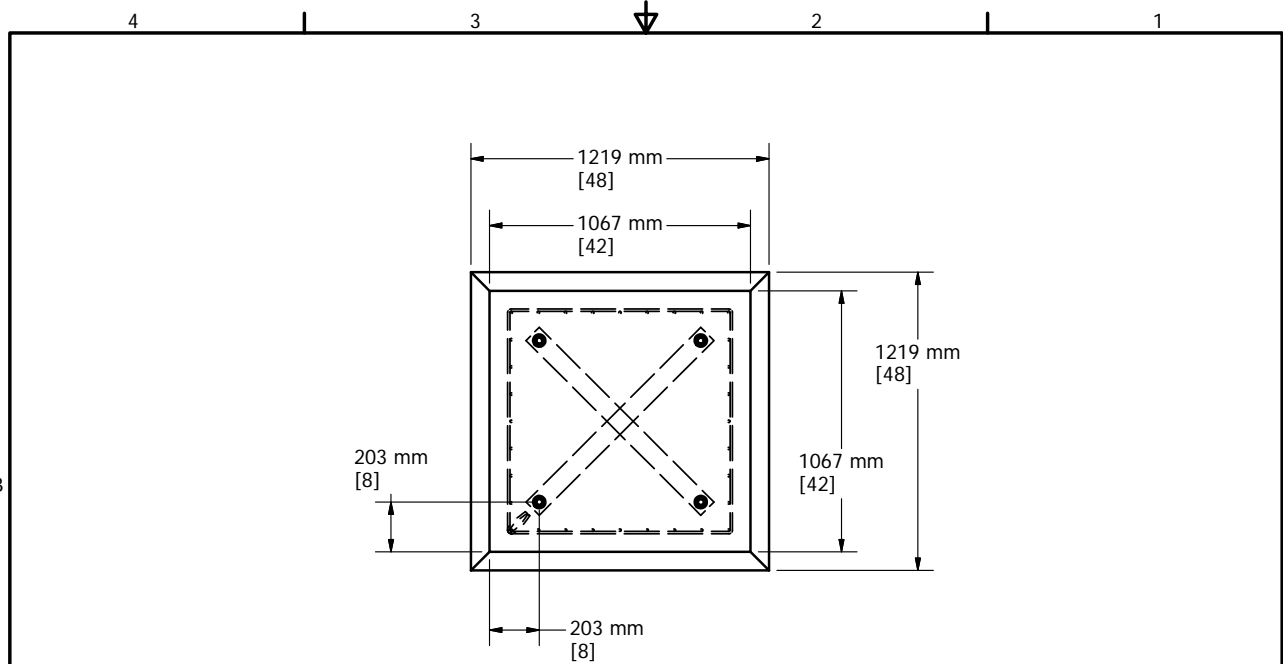
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0.000	0.600	1.050	8-25M's	0	15M's @300	0	0	9	22	-43
0.305	0.905	1.050	12-25M's	0	15M's @300	0	305	630	114	139
0.610	1.210	1.200	16-30M's	4-30M's	15M's @300	0	610	1433	456	651
0.915	1.515	1.500	20-35M's	4-35M's	15M's @300	15M's @300	832	2438	1237	1233
1.220	1.820	1.800	24-35M's	4-35M's	15M's @300	15M's @300	832	2924	2373	1220
1.525	2.125	1.900	28-35M's	4-35M's	15M's @300	15M's @300	832	3086	3447	1202
1.830	2.430	2.000	32-35M's	4-35M's	15M's @300	15M's @300	832	3248	4619	1180

**Round Pier: 'Northern Ontario' Classification: North of Ottawa and Extends to Kenora & Big Woods Lake as the Limit**

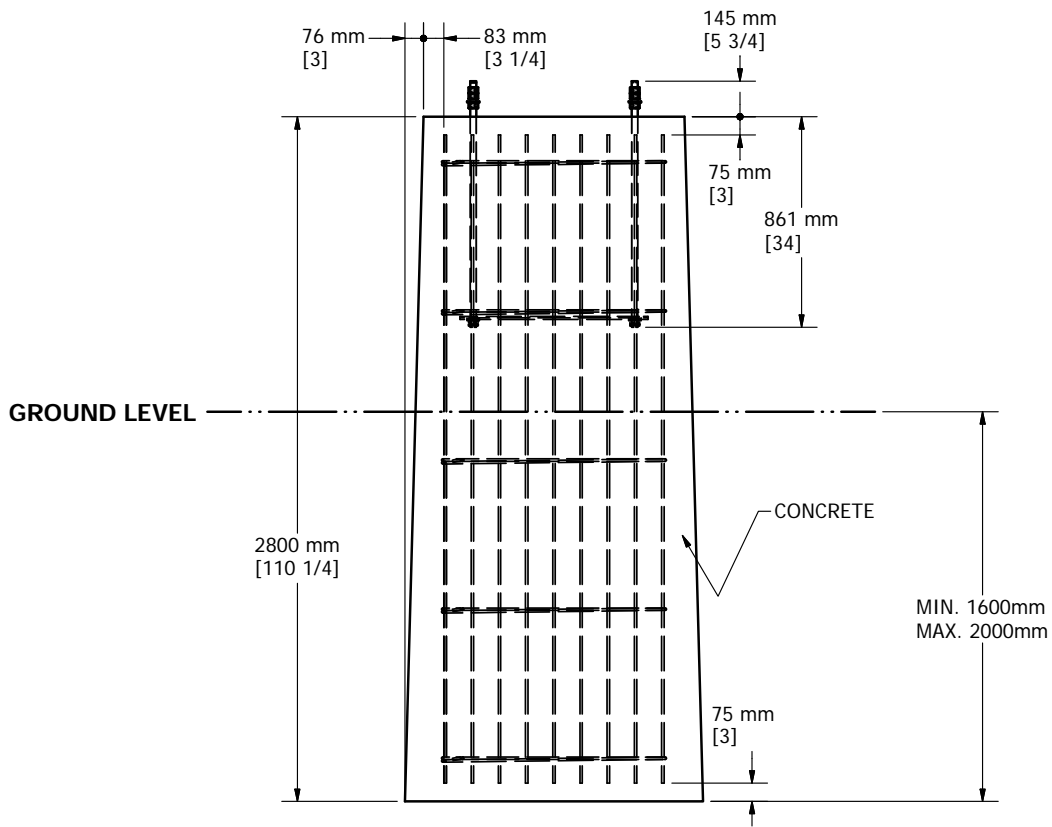


Freezing Index 3000 F° Deg. Days


Pier Geometry			Pier Reinforcing				Total Factored Ice & Wind Forces on Base of Pier (S6-06 Bridge Code)			
Water Depth 'A' (m)	Pier Height 'H' (m)	Round Pier Diameter 'D' (m)	Perimeter Vertical Bars Total	Interior Vertical Bars Total	Perimeter Stirrups Typical	Interior Stirrups Typical	Design Ice thickness (mm)	Vf (kN)	Mf (kN-m)	Tf (kN)
0.000	0.600	1.350	8-25M's	0	15M's @300	0	0	9	22	-48
0.305	0.905	1.350	12-25M's	0	15M's @300	0	305	620	113	137
0.610	1.210	1.350	12-30M's	4-30M's	15M's @300	15M's @300	610	1235	396	651
0.915	1.515	1.650	16-35M's	4-35M's	15M's @300	15M's @300	832	2055	1046	1232
1.220	1.820	1.800	20-35M's	4-35M's	15M's @300	15M's @300	832	2241	1824	1223
1.525	2.125	2.000	24-35M's	6-35M's	15M's @300	15M's @300	832	2490	2785	1207
1.830	2.430	2.000	24-35M's	8-35M's	15M's @300	15M's @300	832	2490	3546	1193



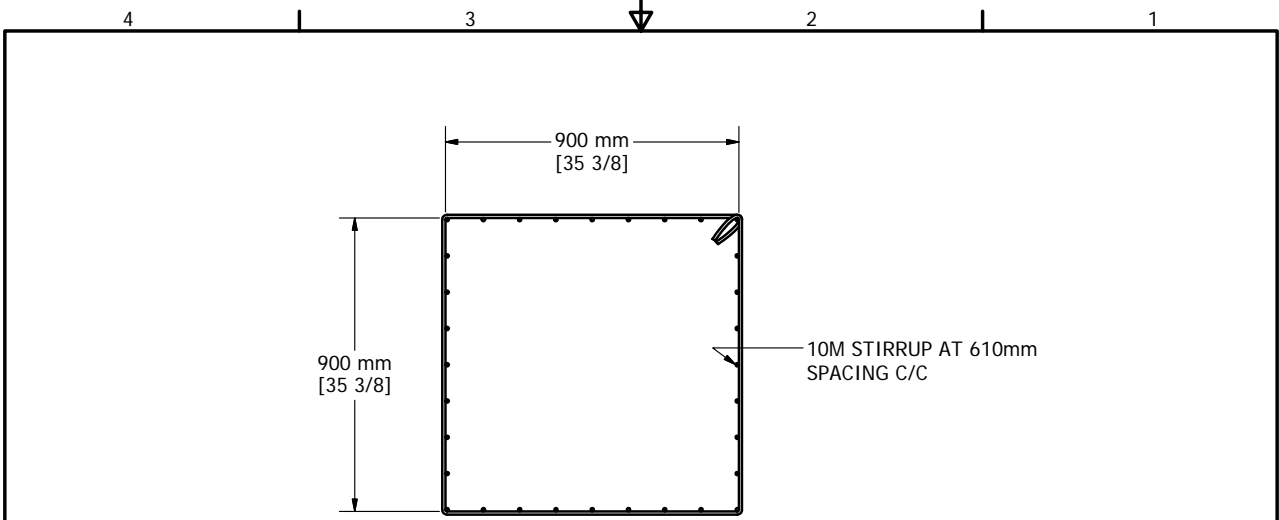
**PLAN**



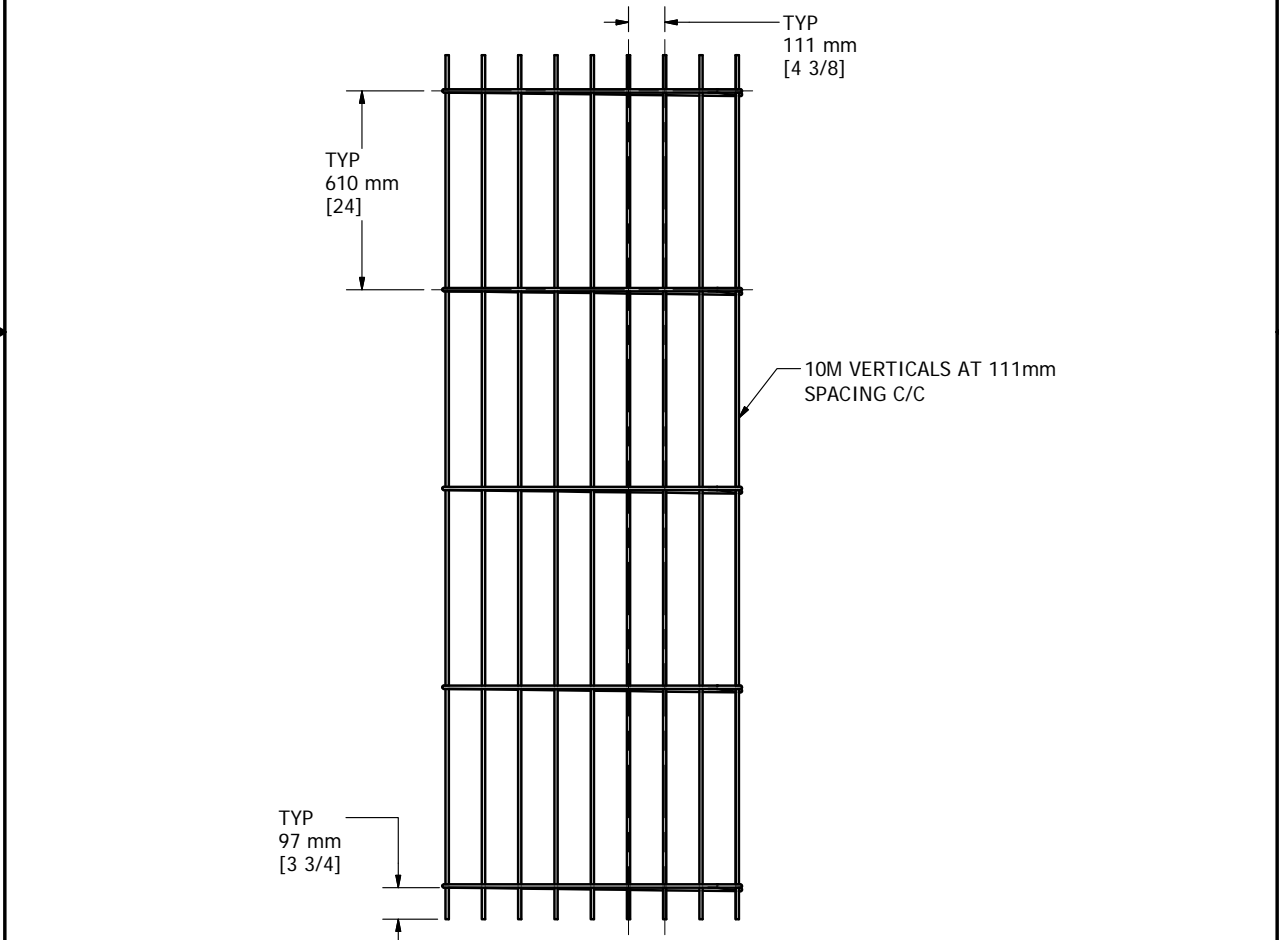
**SECTION**

 Fisheries and Oceans Canada <b>Canadian Coast Guard</b> Central & Arctic Region Maritime and Civil Infrastructure (MCI), Integrated Technical Services 520 Esplanade St., Sarnia, ON N7T 8B1		Pêches et Océans Canada <b>Garde côtière canadienne</b> Région du centre et de l'Arctique		
<b>SUCKER CREEK POINT FOUNDATION DRAWING, LL878</b>				
FILE No.	8010-20-0328 - LL878	SCALE:	N.T.S.	
DWG No.	1			
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
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1	22 FEB 12	PROJECT FOR TENDER	A.J.E.	A.W.W.





**REINFORCEMENT STEEL PLAN**

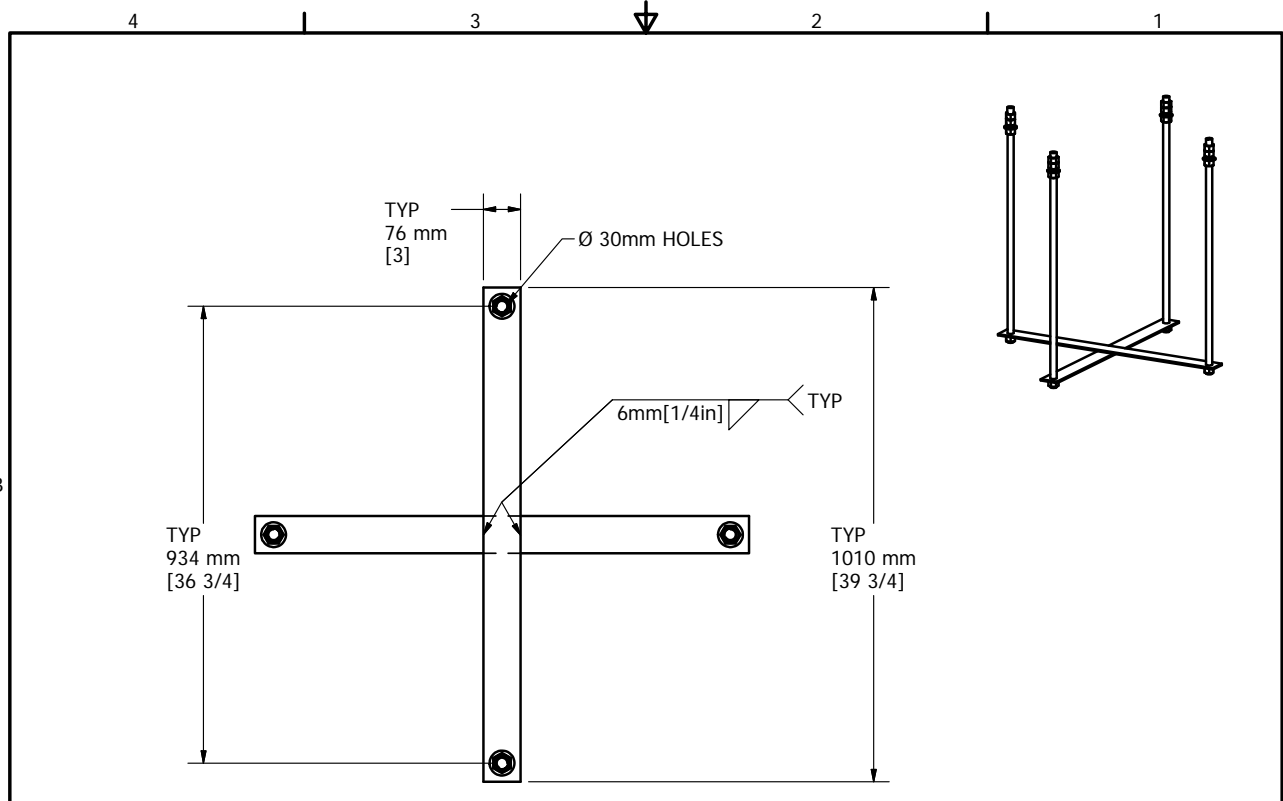


**REINFORCEMENT STEEL SECTION**

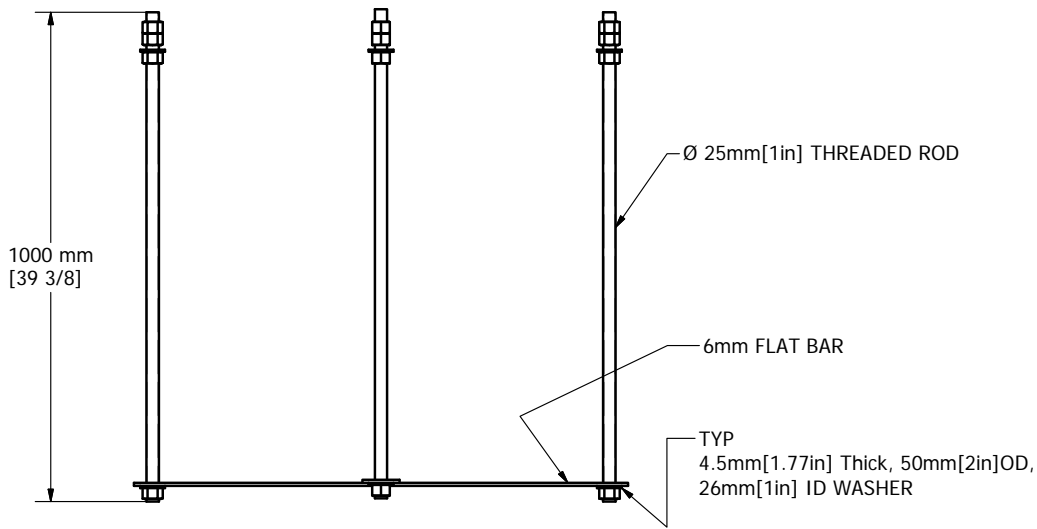
NOTE:

- ALL REINFORCING STEEL SHALL CONFORM TO CSA G30.18  
AND HAVE A YEILD STRENGTH OF 400 MPa

Fisheries and Oceans Canada Canadian Coast Guard Central & Arctic Region		Pêches et Océans Canada Garde côtière canadienne Région du centre et de l'Arctique		
Maritime and Civil Infrastructure (MCI), Integrated Technical Services 520 Exmouth St., Sarnia, ON N7T 8B1				
<b>SUCKER CREEK POINT FOUNDATION DRAWING, LL878</b>				
FILE No.	8010-20-0328 - LL878	SCALE:	N.T.S.	
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1	22 FEB 12	PROJECT FOR TENDER	A.J.E.	A.W.W.



**BOTTOM**



**ANCHOR ASSEMBLY**

**NOTE:**

- ANCHOR RODS SHALL CONFORM TO CSA - G40.21 AND HAVE A YIELD STRENGTH OF 300 MPa
- NUTS AND WASHERS SHALL BE SIZED TO SUIT ANCHOR CONNECTION.

Fisheries and Oceans Canada Canadian Coast Guard Central & Arctic Region		Pêches et Océans Canada Garde côtière canadienne Région du centre et de l'Arctique		
Maritime and Civil Infrastructure (MCI), Integrated Technical Services 520 Exmouth St., Sarnia, ON N7T 8B1				
<b>SUCKER CREEK POINT FOUNDATION DRAWING, LL878</b>				
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1	22 FEB 12	PROJECT FOR TENDER	A.J.E.	A.W.W.



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

Canadian  
Coast Guard

Garde côtière  
canadienne



## **APPENDIX E: GEOTECHNICAL INVESTIGATION**

## Canadian Coast Guard - Central & Arctic Regions

# RANGE LIGHT IMPROVEMENTS

### GEOTECHNICAL INVESTIGATION

April 2020

**Gibbons Point**

**Little Current, Ontario**

**P-0021664-0-00-100-01**

**FINAL VERSION**



Prepared by:

A handwritten signature in black ink, appearing to read "Ryan Grasser", written over a horizontal line.

Ryan Grasser  
Project Manager

Reviewed by:

A handwritten signature in black ink, appearing to read "J. Berghamer", written over a horizontal line.

J. Berghamer, P.Eng  
Service Director

Revision and Publication Register		
Revision N°	Date	Modification and/or Publication Details
00	April 2, 2020	Preliminary Report Issued
01	April 3, 2020	Final Report Issued

Distribution	
1 pdf	

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Formatting changes may have occurred during conversion to PDF version. The content however, remains the same.

# Table of Contents

<b>1</b>	<b>INTRODUCTION</b> .....	<b>1</b>
1.1	Site Conditions .....	1
<b>2</b>	<b>FIELDWORK</b> .....	<b>1</b>
<b>3</b>	<b>SUBSURFACE CONDITIONS</b> .....	<b>2</b>
3.1	Subsurface Summary Description.....	2
3.1.1	Borehole No. 1 (Rear Range Light Structure).....	2
3.1.2	Borehole No. 2 (Front Range Light Structure) .....	3
3.2	Groundwater Data .....	3
<b>4</b>	<b>DISCUSSION AND RECOMMENDATIONS</b> .....	<b>5</b>
4.1	Frost Protection .....	5
4.2	Foundation Recommendations .....	6
4.2.1	Rock Anchors.....	7
4.2.2	Lateral Earth Pressures .....	8
4.2.3	Earthquake Parameters .....	9
4.3	Excavation, Backfill, and Dewatering .....	9
<b>5</b>	<b>LIMITATIONS</b> .....	<b>11</b>

## Appendices

Appendix 1	Drawings
Appendix 2	Subsurface Data
Appendix 3	Lab Data
Appendix 4	Photo Essay
Appendix 5	Design Data

# 1 Introduction

As requested by the Canadian Coast Guard - Central and Arctic Region, the Client, Englobe Corp. (Englobe) has carried out the geotechnical investigation for the proposed replacement of the front and rear range light structures at Gibbons Point located near Little Current, Ontario. For the purposes of this investigation, the linear alignment of the two range lights is considered to be orientated in an East-West direction. We have completed the field and laboratory testing programs and submit the factual results in this report along with our comments and recommendations.

The purpose of the geotechnical investigation was to ascertain the subsurface and groundwater conditions at both range light locations to provide geotechnical recommendations for replacement.

## 1.1 Site Conditions

The existing range light structures are located south of the end of Loon Trail along the northeast shoreline of Manitoulin Island (See Drawing No. 1 and 2, Appendix 1). The site is undeveloped and primarily vegetated.

It is understood that the existing range lights, including foundations, will be replaced with similar structures, at or near their current locations.

There are no known underground services within the limits of the investigations. The range lighting is understood to be solar powered.

# 2 Fieldwork

The fieldwork for this geotechnical investigation was carried out on March 23<sup>rd</sup>, 2020. The fieldwork consisted of two (2) sampled boreholes (Boreholes (BH) Nos. 1 and 2), with one borehole being advanced at each range light location.

The locations of the boreholes are shown on the Borehole Location Plan, Drawing No. 2 in Appendix 1. The coordinates for each borehole obtained on site are provided on the record of Borehole Logs in Appendix 2.

The boreholes were advanced with a track mounted CME 850 drill rig equipped with continuous flight hollow stem augers and standard augers. The field work was under the full time direction of an experienced member of our engineering field staff who was responsible for underground service locates, logging individual borings, retrieving samples, field sample classification, plus overall field/drill supervision. At select boreholes, samples were obtained at frequent intervals of depth by using the Standard Penetration Test (SPT) method. The SPT method of sampling involves advancing a 50 mm outside diameter split spoon sampler with the force of a 63.5 kg hammer, freely dropping 760 mm, mounted in a trip (automatic) hammer. The number of blows per 300 mm penetration is recorded as the "N" value. When



cohesive deposits were encountered, the in-situ strength was measured using a MTO size field vane and calibrated torque meter. All samples taken during this investigation were stored in labeled airtight containers for transport to our North Bay laboratory for visual examination and select laboratory testing. The routine laboratory testing consisted of natural moisture content determination and particle size analysis on select samples. Samples remaining following testing will be stored for a period of three months following the date of this report and then discarded unless otherwise instructed.

In order to comply with the intent of Ontario Water Resources Act Regulation 903 amended to O. Reg. 128/03, the boreholes were sealed with reverse augering techniques for the full depth and, where appropriate, the surface was sealed with a bentonite plug.

The ground surface elevations at the borehole locations were established relative to the top of the existing base plate at each associated range light structure. Prior to carrying out any design with these values, the elevations must be established by the Owner or Designers. All measurements in this report are in Metric units (unless otherwise noted) report.

## 3 Subsurface Conditions

Soil conditions are confirmed at the boring locations only and may vary between borings. The boundaries between strata indicated on the borehole logs are inferred from non-continuous sampling, results of in-situ tests (i.e. SPT, etc.), observations during the drilling operations, and/or the response of the drilling equipment. These boundaries are approximations only and should not be regarded as exact planes of geological change as the actual transition may be gradual from one soil type to another. The description of compactness of the granular subsoils, in part, was based on the results of the SPT, DCPT, and/or the response of the drilling equipment. The consistency of very fine cohesive subsoils, if encountered, was based on in-situ vane tests. Refusal is defined as the point at which the augers can no longer be practically advanced with the equipment used in this investigation. Refusal to further advance of the augers, where encountered, DCPT and/or SPT may have been due to the presence of very dense soils, cobbles/boulders in the underlying soils, or possibly bedrock. Coring of the bedrock with diamond coring equipment was undertaken at one borehole location to confirm the presence and quality of the bedrock.

Detailed descriptions of the subsurface conditions revealed at the boreholes are shown on the enclosed Record of Borehole Logs in Appendix 2. The following is a brief description of revealed subsurface conditions at this site.

### 3.1 Subsurface Summary Description

#### 3.1.1 Borehole No. 1 (Rear Range Light Structure)

Borehole (BH) No. 1 was advanced 3.2 meters south of the center of existing rear range light structure. The ground surface elevation was measured as 99.2 m.

At surface at BH No. 1, a surficial layer of black silty organics some 50 mm in thickness was encountered. Underlying the surficial organic soils, a layer of tan silt, some fine sand, trace gravel was encountered. The natural moisture content measured on a sample of this layer was in the order of 15%. Based on an SPT “N” value recorded as 2 blows per 300 mm penetration, the compactness was described as very loose. The silt layer was encountered to a depth of 0.4 m (elevation  $\pm 98.8$ m), where auger refusal was encountered on bedrock.

Diamond coring operations with ‘N’ sized coring equipment was undertaken to a depth of 2.8 m below grade (elevation  $\pm 96.4$  m). The results of the coring indicated a grey limestone bedrock with dark grey shale layers (See Photo No. 6, Appendix 4). The Rock Quality Designation was measured at 17 to 43% indicating a very poor to poor quality rock.

Unsampled auger probes were advanced to the west and east of the existing range light structure to confirm shallow refusal depths in the area. Refusal was encountered at depths of 0.3 to 0.4 m (elevations 98.9 to 98.8 m).

### 3.1.2 Borehole No. 2 (Front Range Light Structure)

Borehole (BH) No. 2 was advanced 2.1 meters south of the center of existing front range light structure. The ground surface elevation was recorded as 99.5 m.

At surface at BH No. 2, a surficial  $\pm 100$  mm layer of black organic silt, some sand was encountered. Underlying the surficial organic soils, a layer of tan silt, some clay, sand, and gravel was encountered. The natural moisture content measured on a sample of this layer was in the order of 11%. Based on an SPT “N” value recorded as 3 blows per 300 mm penetration, the compactness was described as very loose. The silt layer was encountered to a depth of 0.6 m below existing grade (elevation  $\pm 98.9$ m).

Underlying the silt layer at BH No. 2, a till layer was penetrated. The till layer was described as tan to grey silty sand, some gravel and clay. The natural moisture content measured on a sample of this layer was in the order of 8%. A gradation (hydrometer) analysis was undertaken on a sample of this deposit, the results of which indicated 15% gravel sized particles, 41% sand sized particles, 33% silt sized particles, and 11% clay sized particles (See Figure No. L-1, Appendix 3). Based on the gradation analysis, this deposit is considered to have low susceptibility to frost heaving. Based on SPT “N” values recorded as 42 to 69 blows per 300 mm penetration, the compactness was described as dense to very dense, generally increasing with depth. Auger refusal was encountered in this layer at a depth of 2.1 m below grade (elevation  $\pm 97.4$  m).

## 3.2 Groundwater Data

Groundwater and cave-in levels in the open boreholes were measured, where possible, during the advance of the individual borings and upon completion. It is noted that there may have been insufficient time for the groundwater levels to stabilize in the boreholes prior to

measuring. These levels are recorded on the individual Record of Borehole Log Sheets (Appendix 2) and summarized in the table below.

Table 1 Groundwater Levels

BORING ID	SURFACE ELEVATIONS (m)	GROUNDWATER DEPTH (m)	GROUNDWATER ELEVATION (m)
BH 1	▪ 99.2	▪ 0.0 (at surface)	▪ 99.2 (Cave-in 98.8 m)
BH 2	▪ 99.5	▪ 1.2	▪ 98.3 (Cave-in 98.2 m)

Groundwater levels will fluctuate seasonally and/or yearly. As such, the groundwater level should be established in advance of the construction operations (i.e. at time of tender or following award, prior to starting site work) such that adequate groundwater control plans can be developed.

## 4 Discussion and Recommendations

As requested, Englobe, has carried out the geotechnical investigation for the replacement of the existing range light structures at Gibbons Point near Little Current, Ontario.

At the rear range light location (BH No. 1), the overburden consisted of surficial silty organics overlying a tan silt, some fine sand, trace gravel overlying limestone bedrock with shale layers. At the front range light location (BH No. 2), the overburden consisted of surficial organic silt overlying a tan silt, some clay, sand, and gravel, over silty sand till. The groundwater was encountered at elevations 99.2 and 98.3 m at BH Nos. 1 and 2, respectively.

### 4.1 Frost Protection

The estimated frost depth penetration for the area of the subject site, based on OPSD 3090.101 is:

- $\pm 1.7$  m below exposed asphalt surfaces or for isolated, unheated foundations

All exterior footings and isolated footings subject to frost penetration and stripped of the natural insulative value of snow cover must have frost protection (permanent and during construction) to the depths noted above.

If a sufficient depth of earth cover cannot be provided for frost protection, or shallow foundations are the preferred option, equivalent expanded extruded polystyrene (EEP) insulation may be used in conjunction with available soils cover to provide frost protection. If EEP is used for frost protection, precautions must be taken to protect the insulation from accidental spillage of hydrocarbons, solvents or other destructive products.

Assuming sufficient earth cover can be provided to prevent overturning, foundations can be founded at a higher elevation (minimum 1.0 m) provided they are supported on approved subgrades and insulated. See Appendix 5 for examples of typical insulation placement. The following general insulation design can be used. The following insulation design was based on the generalized design curves (Robinsky and Bespflug, 1973) for minimum insulation requirements for unheated structures founded on sandy soil. Synthetic insulation (i.e. Styrofoam SM, HI-40, HI-60, HI-100, depending on loading, or equivalent), minimum 80 mm thick, should be placed below the foundation and then extend outwards horizontally beyond the foundation edge a minimum of 2.4 m. Beyond the foundation footprint, the horizontal insulation should be sloped downwards slightly (i.e. 2 to 3%) to promote drainage away from the structure. The insulation should be overlapped (or step jointed) and pegged or spot glued together. The insulation must be unbroken and any damaged pieces must be replaced. The insulation should have a minimum of 300 mm of permanent soil cover. To reduce the risk of damage to the polystyrene insulation from an accidental hydrocarbon spill, it is recommended

that the insulation be covered, where appropriate, with a layer of 6 mil polyethylene (i.e. maintenance areas, garage entrances, below parking lots, etc.).

Footings founded directly on sound, unweathered bedrock do not require the full frost protection noted above provided the geometry of the bedrock is such that groundwater flows away from the footings (i.e. groundwater will not pool adjacent to, or underneath, the footings).

The founding soil subgrade must be protected from frost at all times during foundation excavation and construction operations. Concrete cannot be placed against materials with subzero temperatures. Should freezing temperatures occur during construction, the founding subgrade must be insulated (straw, insulated traps, etc.) against frost until such a time that footings are adequately protected (soil cover, insulation etc.).

All granular backfill must be free of frost, ice, and snow, and at an appropriate moisture content and temperature to allow compaction. If the surface of a granular fill lift is frozen, the Contractor shall, in conjunction with an Englobe representative, confirm depth of frost prior to backfilling. It is noted that frost penetration can be reduced through the use of insulated tarps, with or without heat source (depending upon ambient temperatures), and by ensuring backfilling operations are continuous.

## 4.2 Foundation Recommendations

Based upon the geotechnical data, the proposed range light foundations can be founded on conventional reinforced concrete spread footings.

At the rear range light location, it is recommended that the overburden be removed down to bedrock at  $\pm 0.3$  to 0.4 m depth, and the footing founded directly on the bedrock. It is noted the exposed bedrock surfaces can be erratic in nature, however exposed bedrock in the area appears to be generally flat (See Photo No. 5 in Appendix 4).

At the front range light location, the overburden consists of silt overlying a dense till structure. It is recommended that the overburden be removed down to  $\pm 1.7$  m depth (or to a  $\pm 1.0$  m depth, if insulated as detailed above), and the footing founded on the natural till subgrade.

All founding subgrades must be inspected and approved by a qualified member of this firm prior to forming footings.

The design is based upon the assumption that the footings will be properly formed (i.e. earth forms are not acceptable) and any required rebar is placed in accordance with standard accepted practices (i.e. RSIC). Backfill around the foundations should consist of a well graded and free draining OPSS.MUNI 1010 Granular B Type I (see below).

For the rear range light foundation bearing directly on sound, unweathered bedrock:

- Factored Geotechnical Resistance at ULS: 500 kPa;

- Since bedrock is essentially an unyielding subgrade, a geotechnical reaction at SLS does not apply.

If any bedrock surface supporting foundations slopes greater than 10° off the horizontal, dowels may be required to resist sliding and a staff member from our office must review the conditions in the field. Alternatively, the contractor could level the footing bearing surface with a hydraulic hammer (hoe-ram), if logistically possible. The contractor must be prepared to adjust his operations to address the anticipated variable conditions.

Based on the above noted design bearing pressure and assuming proper subgrade preparation, settlements of the foundation units on bedrock should be negligible.

For the front range light foundation bearing directly on approved natural till subgrade at 1.0 m depth below finished grade:

- Factored Geotechnical Resistance at ULS: 350 kPa;
- Geotechnical Reaction at SLS of 25 mm total settlement: 200 kPa net bearing pressure increase.

For the front range light foundation bearing directly on approved natural till subgrade at 1.7 m depth below finished grade:

- Factored Geotechnical Resistance at ULS: 450 kPa;
- Geotechnical Reaction at SLS of 25 mm total settlement: 250 kPa net bearing pressure increase.

Based on the above noted design bearing pressure and assuming proper subgrade preparation, settlements of the foundation units on soil for the structure will be well within the generally accepted tolerance range for this type of structure (i.e. 25 mm total and 19 mm differential).

#### 4.2.1 Rock Anchors

It is understood that the lateral load and overturning moments may be design factors. The resistance to the lateral and overturning forces can be from the backfill material above the footing and the bearing below the footing. In consideration of the anticipated shallow bedrock at the rear range light location, if there is insufficient earth cover to provide lateral/uplift resistance, rock anchors can be used to provide the required lateral and uplift resistance. Grout bonded rock anchors are the recommended anchor system at this site.

Two methods of failure are possible for anchors installed in bedrock: rock-grout failure and rock mass conical failure.

For the rock-grout failure method, the capacity of grout bonded rock anchors is dependent on the bond between the rock and grout. The recommended ultimate bond strength between the grout and the unweathered limestone bedrock is 750 kPa for both tensile and compressive

loading. Considering the potential for fracture planes in the upper bedrock near surface, the upper 1.5 m of the bedrock should be ignored in the calculation of anchor capacities. The bond length should be a minimum 1.5 m, however can be increased to provide increased resistance, if required. The method of installation will also affect the capacity of the bond between rock and grout. For estimating purposes, a 25M rebar dowel installed into a 37.5 mm diameter percussion drilled hole 3.0 m deep into the bedrock (i.e. 1.5 m bond length) will provide a factored pull out resistance of 55 kN. The spacing of the anchors however will have an effect on this pullout capacity. If necessary, greater capacities can be achieved by installing the anchors to deeper depths in the bedrock or by increasing the bond diameter.

For the rock mass conical failure, the weight of the rock mass provides resistance against rock mass failure. An inverted cone angle of 90°, from the midpoint of the bonded zone, may be used in the design of the anchors. Depending on anchor spacing, the resistance of the rock mass should be reduced due to anchor overlap.

Rock anchors required to resist uplift resistance should be field tested to confirm design requirements and verify installation.

Mechanical rock anchors are generally not recommended under these conditions (heavily fractured rock) unless installed to sufficient depth with representative proof testing. The grouted anchors noted above have the advantage of locally filling fractures within the anchor column with grout, thereby solidifying localized areas of the bedrock. However, as mechanical anchors are proprietary system, Suppliers may suggest mechanical anchors. In this case, the Supplier should be provided with the factual information so that an appropriate anchor system can be designed, following which, a sufficient number of the anchors must be proof tested to confirm their design.

#### 4.2.2 Lateral Earth Pressures

It is understood that the lateral load and overturning moments may be design factors. The resistance to the overturning will be from the backfill material above the footing and the bearing below the footing.

As noted, backfill above the foundation should consist of a well graded Granular B Type I, and must be compacted to a minimum of 98% SPDD below. The existing native soils do not meet OPSS specifications for Granular B Type I, as such can only be reused for landscaped areas.

The following parameters may be used for design. The parameters are based on general representative values for the various soil types, obtained through laboratory testing and tactile analysis.

Table 2 Lateral Earth Pressures

PARAMETER	GRANULAR B TYPE I AND GRANULAR B TYPE III
Angle of Internal Friction (degrees)	32



PARAMETER	GRANULAR B TYPE I AND GRANULAR B TYPE III
Unit Weight, $\gamma$ (kN/m <sup>3</sup> )	19.5
Active earth pressure, $K_a$	0.31
At rest earth pressure, $K_o$	0.47
Passive earth pressure, $K_p$	3.25

### 4.2.3 Earthquake Parameters

Considering the overburden conditions and the known geotechnical values, soil liquefaction is not considered an issue, and based on NBCC 2015, Site Classification for Seismic Site Response, the subject site would have Site Class C.

### 4.3 Excavation, Backfill, and Dewatering

Based on the Occupational Health and Safety Act Regulations for Construction Projects, the soil at this site is classified as Type 3. All excavations greater than 1.2 m in depth must be sloped or shored in accordance with the Occupational Health and Safety Act Regulations for Construction Projects. Short-term (i.e. day) open excavations will be stable above the groundwater table at a temporary angle of 1H:1V, however excavations established at this slope must not be left unattended at any time. Below the prevailing groundwater table, the slopes of open excavations will have to be flattened to 2H:1V or possibly shallower depending upon the method of dewatering employed.

The groundwater level was encountered at ground surface at BH No. 1 and at a depth of 1.2 m at BH No. 2. Groundwater levels will fluctuate both seasonally and yearly. The Contractor must establish the groundwater level in advance of the construction operations such that adequate groundwater control plans can be developed.

It must be emphasized that, when wet, soils can be easily disturbed through excavation operations, foot traffic, etc. and such disturbed soils can lose a significant amount of the native bearing. To minimize the potential for disturbance, the groundwater must be drawn down a sufficient depth below the anticipated base of the excavation (i.e. 600 mm to 1 m).

A Permit to take Water (PTTW) and registration on the Environmental Activity and Sector Registry (EASR) is required by the MOECC when more than 50,000 litres/per day will be removed for dewatering a construction site. It is not expected that this condition will apply for this replacement operation.

Ultimately, the method of dewatering will be the choice of the contractor. The importance and benefits of maintaining a dry stable subgrade during excavation and foundation construction cannot be stressed enough. Failure by the contractor to adequately control the groundwater, and/or rainwater, surficial runoff, etc., can result in disturbance to the founding subgrades, which can result in having to carry out corrective measures (i.e. additional excavation, time



delays, etc.) to improve the subgrade. Corrective measures required to improve subgrades where groundwater is not adequately controlled will be at the Contractors cost. As part of the Contractors proposed methodology of construction, the Contractor should be requested to submit a dewatering plan prior to commencement of the project that details how they will control groundwater. The plan should be based on an up to date groundwater level and include all aspects from methodology (i.e. sump holes and pumps, drainage ditches, vacuum well points), to construction of system (sump hole details, placement, etc.), to operation of system, etc.

## 5 Limitations

The design recommendations given in this geotechnical report are applicable only to the project described in the text and only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known, in our analysis certain assumptions had to be made. The actual conditions may however, vary from those assumed, in which case changes and modifications may be required to our geotechnical recommendations. We recommend, therefore, that we be retained and provided the opportunity during the design stage to review the design drawings, site survey information, proposed elevations, etc. to verify that they are consistent with our recommendations or the assumptions made in our analysis. It is further recommended that we be retained to review the final design drawings and specifications relative to the geotechnical recommendations. If, during construction, conditions in the field vary from those assumed at the design stage, an engineer from this office must be notified immediately.

Proper subgrade preparation, groundwater control, compaction, etc. are all critical aspects of the bearing capacity of native soils. It must be noted that different aspects of the geotechnical design are based on the assumption that Englobe will be retained during site preparation and construction of the proposed works to ensure that both the geotechnical site characteristics and the construction operations/techniques are consistent with our recommendations. Should Englobe not be involved during the full construction phase, our liability is strictly limited to the factual information contained herein only.

The comments in this report are intended solely for the guidance of the design team and address the geotechnical conditions only. The number of boreholes required to determine the localized conditions between boreholes directly affecting construction costs, equipment, scheduling, etc. would in fact be greater than what has been carried out for design purposes. Inclusion of the factual information (Sections 1 to 3 inclusive) in the tender documents is furnished merely for the general information of bidders and is not in any way warranted or guaranteed by or on behalf of the owner or the owner's consultants and its subconsultants or the consultants' or subconsultants' employees, and neither the owner nor its consultants or its employees shall be liable for any representations negligent or otherwise contained in the documents. Therefore, contractors bidding on this project or undertaking this work should make their own interpretations of the factual borehole results and carry out further work as they deem necessary to assess the scope of the project.

Section 4 of this report is intended solely for the use of the client and the design team. If this section is provided to the Contractor, it is solely to provide an understanding of the geotechnical aspects of the site, and alternatives presented are not to be considered potential substitutes of the final design. If there is a discrepancy between this report and the tender documents and/or construction drawings, the latter shall govern and the discrepancy must be immediately brought to the attention of the design team.

## Appendix 1 Drawings

Drawing No. 1a and 1b	Key Plan
Drawing No. 2	Borehole Location Plan

G:\152IP-0021664 - GI, Gibbons Point, Little Current, ON (DFO)\4\_CAD - Drawings & Specs\IP-0021664 - GI, Gibbons point - BH Plan.dwg



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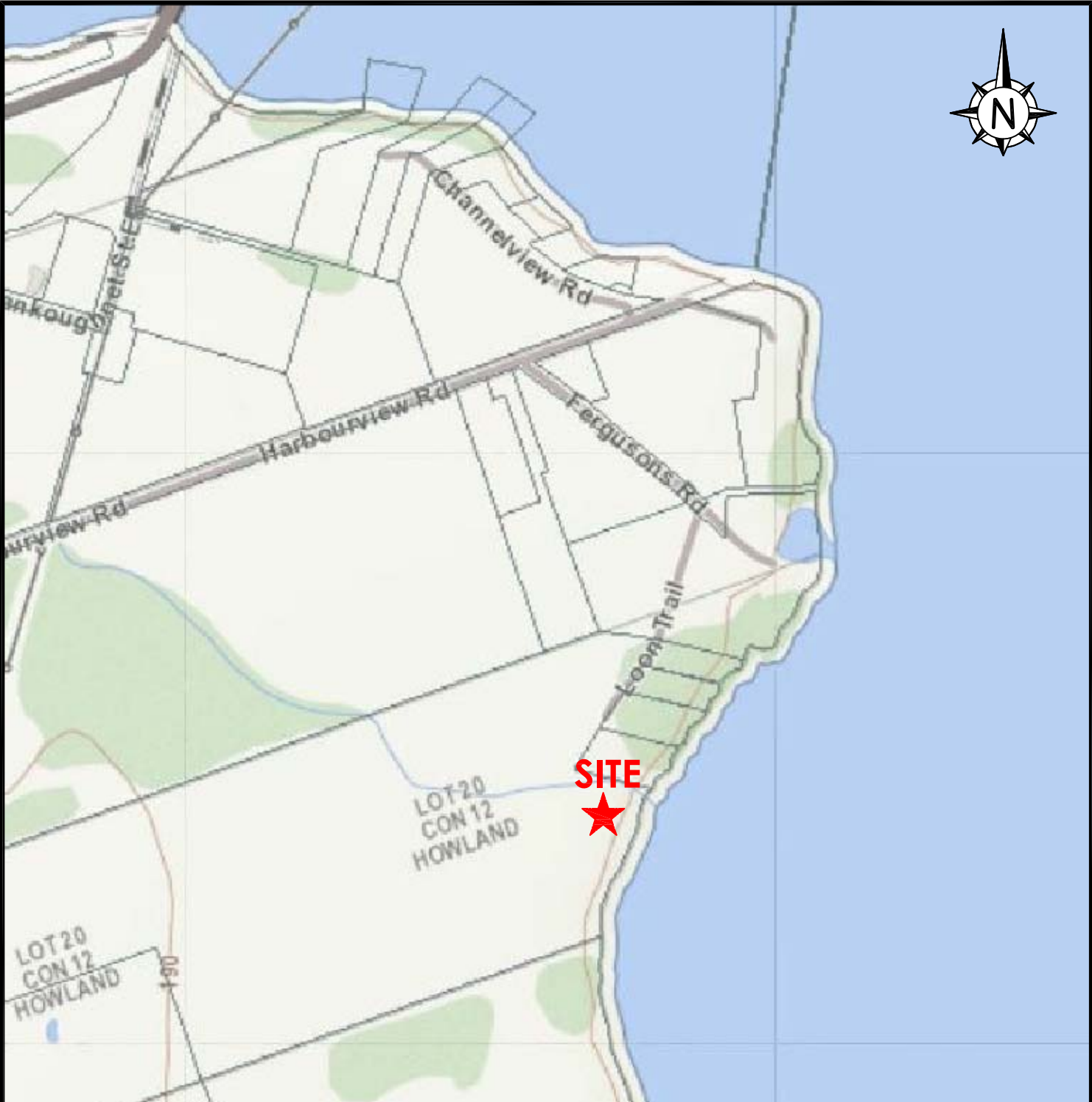
Canadian Coast Guard
Gibbons Point Front and Rear Range Light Improvements Little Current, Ontario
Key Plan (Macro)

00	Final	2020-04-03	RG	JRB	JRB
No.	Version	Date	By	Verif	Appr.

	2-120 Progress Court North Bay, Ontario, P1A 0C2 705-476-2550	
	Discipline: Geotechnical Scale: Not To Scale Date: 2020-03-31 Page setup: 1a - Macro Paper size: 8.50 X 11.00 in.	Prepare by: RG Draw by: RG Drawing no: 1a Register no.:

Man.	Project	Otp	Project	Phase	Electronic ref.	Rev.
JRB	P-0021664	152	GE	-	--	00


G:\152IP-0021664 - GI, Gibbons Point, Little Current, ON (DFO)\4\_CAD - Drawings & Specs\IP-0021664 - GI, Gibbons point - BH Plan.dwg



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**Canadian Coast Guard**  
**Gibbons Point**  
**Front and Rear Range Light Improvements**  
 Little Current, Ontario  
  
**Key Plan (Micro)**

00	Final	2020-04-03	RG	JRB	JRB
No.	Version	Date	By	Verif	Appr.



2-120 Progress Court  
 North Bay, Ontario,  
 P1A 0C2  
 705-476-2550

Discipline: Geotechnical		Prepare by: RG	Verify by: JRB
Scale: Not To Scale		Draw by: RG	Approval by: JRB
Date: 2020-03-31		Drawing no: 1b	
Page setup: 1b - Micro		Register no.:	
Paper size: 8.50 X 11.00 in.			

Man.	Project	Otp	Project	Phase	Electronic ref.	Rev.
JRB	P-0021664	152	GE	-	-- --	00





G:\152IP-0021664 - GI, Gibbons Point, Little Current, ON (DFO)\4\_CAD - Drawings & Specs\IP-0021664 - GI, Gibbons point - BH Plan.dwg

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00	Final	2020-04-03	RG	JRB	JRB
No.	Version	Date	By	Verif	Appr.

**Canadian Coast Guard**

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**Gibbons Point**  
**Front and Rear Range Light Improvements**  
 Little Current, Ontario

2-120 Progress Court  
 North Bay, Ontario,  
 P1A 0C2  
 705-476-2550



Discipline:	Geotechnical	Prepare by:	RG	Verify by:	JRB
Scale:	Not To Scale	Draw by:	RG	Approval by:	JRB
Date:	2020-03-31	Drawing no.:	2		
Page setup:	Paper size:	Register no.:			
2 - BH Plan	8.50 X 11.00 in.				

**Borehole Location Plan**

Man.	Project	Otp	Project	Phase	Electronic ref.	Rev.
JRB	P-0021664	152	GE	-	-- --	00

## **Appendix 2    Subsurface Data**

Enclosure No. 1	List of Abbreviations and Symbols
Enclosure Nos. 2 to 3	Record of Borehole Sheets

## LIST OF ABBREVIATIONS & DESCRIPTION OF TERMS

The abbreviations and terms, used to describe retrieved samples and commonly employed on the borehole logs, on the figures and in the report are as follows:

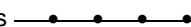
### 1. ABBREVIATIONS

AS	Auger Sample
CS	Chunk Sample
DS	Denison type sample
FS	Foil Sample
NFP	No Further Progress
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
RC	Rock core with size & percentage of recovery
SS	Split Spoon
ST	Slotted Tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash Sample

### 2. PENETRATION RESISTANCE/"N"

*Dynamic Cone Penetration Test (DCPT):*

A continuous profile showing the number of blows for each 300 mm of penetration of a 50 mm diameter 60° cone attached to AW rod driven by a 63 kg hammer falling 760 mm.

Plotted as 

*Standard Penetration Test (SPT) or "N" Values*

The number of blows of a 63 kg hammer falling 760 mm required to advance a 50 mm O.D. drive open sampler 300 mm.

### 3. SOIL DESCRIPTION

a) *Cohesionless Soils:*

"N" (blows/0.3 m)	Compactness Condition
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

### 3. SOIL DESCRIPTION (Cont'd)

b) *Cohesive Soils:*

Undrained Shear Strength (kPa)	Consistency
Less than 12	very soft
12 to 25	soft
25 to 50	firm
50 to 100	stiff
100 to 200	very stiff
over 200	hard

c) *Method of Determination of Undrained Shear Strength of Cohesive Soils:*

- + 3.2 - Field Vane test in borehole.  
The number denotes the sensitivity to remoulding.
- D - Laboratory Vane Test
- .. - Compression test in laboratory

For a saturated cohesive soil the undrained shear strength is taken as one-half of the undrained compressive strength.

### 4. TERMINOLOGY

Terminology used for describing soil strata is based on the proportion of individual particle sizes present in the samples (please note that, with the exception of those samples subject to a grain-size analysis, all samples were classified visually and the accuracy of visual examination is not sufficient to determine exact grain sizing):

Trace, or occasional	Less than 10%
Some	10 to 20%
With	20 to 30%
Adjective (i.e. silty or sandy)	30 to 40%
And (i.e. sand and gravel)	40 to 60%

### 5. LABORATORY TESTS

P	Standard Proctor Test
A	Atterberg Limit Test
GS	Grain Size Analysis
H	Hydrometer Analysis
C	Consolidation



**SAMPLE DESCRIPTION NOTES:**

1. **FILL:** The term fill is used to designate all man-made deposits of natural soil and/or waste materials. The reader is cautioned that fill materials can be very heterogeneous in nature and variable in depth, density and degree of compaction. Fill materials can be expected to contain organics, waste materials, construction materials, shot rock, rip-rap, and/or larger obstructions such as boulders, concrete foundations, slabs, abandoned tanks, etc.; none of which may have been encountered in the borehole. The description of the material penetrated in the borehole therefore may not be applicable as a general description of the fill material on the site as boreholes cannot accurately define the nature of fill material. During the boring and sampling process, retrieved samples may have certain characteristics that identify them as 'fill'. Fill materials (or possible fill materials) will be designated on the Borehole Logs. If fill material is identified on the site, it is highly recommended that testpits be put down to delineate the nature of the fill material. However, even through the use of testpits defining the true nature and composition of the fill material cannot be guaranteed. Fill deposits often contain pockets or seams of organics, organically contaminated soils or other deleterious material that can cause settlement or result in the production of methane gas. It should be noted that the origins and history of fill material is frequently very vague or non-existent. Often fill material may be contaminated beyond environmental guidelines and the material will have to be disposed of at a designated site (i.e. registered landfill). Unless requested or stated otherwise in this report, fill material on this site has not been tested for contaminants however, environmental testing of the fill material can be carried out at your request. Detection of underground storage tanks cannot be determined with conventional geotechnical procedures.
2. **TILL:** The term till indicates a material that is an unstratified, glacial deposit, heterogeneous in nature and, as such, may consist of mixtures and pockets of clay, silt, sand, gravel, cobbles and/or boulders. These heterogeneous deposits originate from a geological process associated with glaciation. It must be noted that due to the highly heterogeneous nature of till deposits, the description of the deposit on the borehole log may only be applicable to a very limited area and therefore, caution must be exercised when dealing with a till deposit. When excavating in till, contractors may encounter cobbles/boulders or possibly bedrock even if they are not indicated on the borehole logs. It must be appreciated that conventional geotechnical sampling equipment does not identify the nature or size of any obstruction.
3. **BEDROCK:** Auger refusal may be due to the presence of bedrock, but possibly could also be due to the presence of very dense underlying deposits, boulders or other large obstructions. Auger refusal is defined as the point at which an auger can no longer be practically advanced. It must be appreciated that conventional geotechnical sampling equipment does not differentiate between nature and size of obstructions that prevent further penetration of the boring below grade. Bedrock indicated on the borehole logs will be labeled 'possibly' or 'probable' etc. based on the response of the boring and sampling equipment, surrounding topography, etc. Bedrock can be proven at individual borehole locations, at your request, by diamond core drilling operations or, possibly, by testpits. It must also be appreciated that bedrock surfaces can be, and most times are, very erratic in nature (i.e. sheer drops, isolated rock knobs, etc.) and caution must be used when interpreting subsurface conditions between boreholes. A bedrock profile can be more accurately estimated, at the clients' request, through a series of closely positioned unsampled auger probes combined with core drilling.
4. **GROUNDWATER:** Although the groundwater table may have been encountered during this investigation and the elevation noted in the report and/or on the record of boreholes, it must be appreciated that the elevation of the groundwater table will fluctuate based upon seasonal conditions, localized changes, erratic changes in the underlying soil profile between boreholes, underlying soil layers with highly variable permeabilities, etc. These conditions may affect the design and type and nature of dewatering procedures. Cave-in levels recorded in borings give a general indication of the groundwater level in cohesionless soils however, it must be noted that cave-in levels may also be due to the relative density of the deposit, drilling operations etc.



**METRIC**

**RECORD OF BOREHOLE NO. 02**



REFERENCE P-0021664 DATUM TBM LOCATION 17 N 5090871 E 429749 - See Borehole Location Plan; Appendix No. 1, 02/04/20 ORIGINATED BY ELS  
 PROJECT Gibbons Point - Front and Rear Range Lights BOREHOLE TYPE Track Mounted CME 850 - Hollow Stem Augers COMPILED BY RG  
 CLIENT Canadian Coast Guard DATE (Started) 23 March 2020 TIME   
 DATE (Completed) 23 March 2020 (Completed) 3:45:00 PM CHECKED BY JRB

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION (see Enclosure No. 1)	STRATA PLOT	NUMBER	TYPE			"N" VALUES	20	40	60	80					
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					WATER CONTENT (%)					
99.5	Ground Surface															
0.0	±100 mm black organic silt, some sand SILT - some clay, sand & gravel tan (very loose)		1A													
			1B	SS	3											
98.9																
0.6	TILL - silty sand and gavel tan (dense to very dense)															
			2	SS	42											
	grey															
			3	SS	69											15 41 33 11
97.4																
2.1	Auger Refusal End of Borehole															

COMMENTS  
 Borehole elevation was established relative to the top of the base plate at front light tower.

+ 3, × 3 : Numbers on right refer to Sensitivity  
 Numbers on left refer to values greater than 100 kPa  
 ○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 23/03/20 3:42:00 PM	1.2	1.3
2)	-	-
3)	-	-

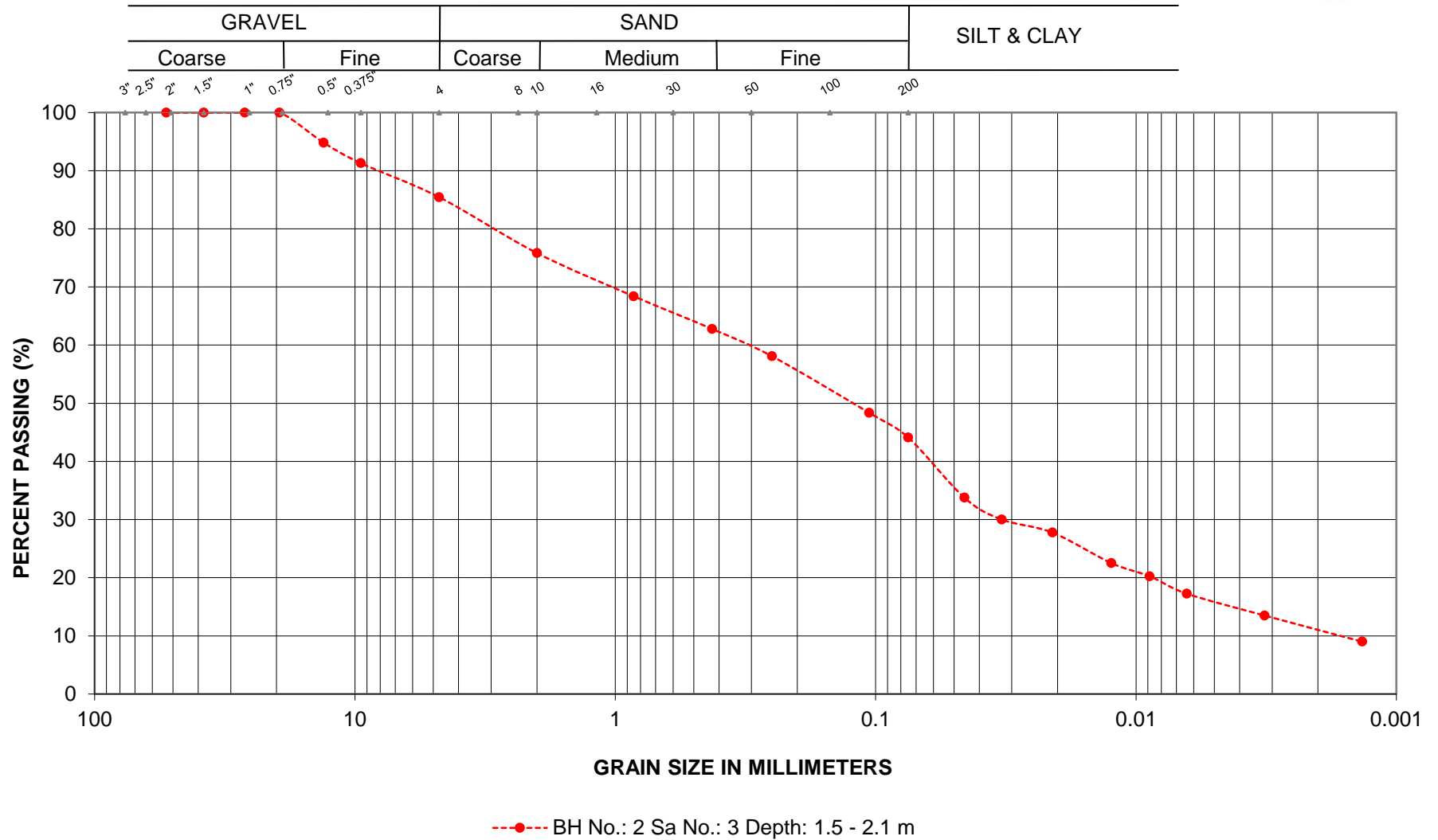
The stratification lines represent approximate boundaries. The transition may be gradual.

MEL-GEO P-0021664 - BOREHOLE LOGS, GIBBONS POINT.GPJ MEL-GEO.GDT 02/04/20

## Appendix 3 Lab Data



### GRAIN SIZE ANALYSIS



TILL

## Appendix 4 Photo Essay

Site – Rear Range Light Location, Looking East

Photo: 1



Rear Range Light Foundation

Photo: 2



Project: Range Light Improvements - Gibbons Point

Photos By: Englobe

Date: March 2020



Site – Front Range Light Location, Looking East

Photo: 3



Front Range Light Foundation

Photo: 4



Project: Range Light Improvements - Gibbons Point

Photos By: Englobe

Date: March 2020



Exposed Bedrock in the Vicinity of the Site

Photo: 5



Bedrock Core Extracted From BH No. 1

Photo: 6



Project: Range Light Improvements - Gibbons Point

Photos By: Englobe

Date: March 2020

## Appendix 5 Design Data

TYPICAL DETAIL  
UNHEATED FOOTING



FIGURE No. 3  
Not to Scale

