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PART 1 - GENERAL

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| <u>1.1 MINIMUM STANDARDS</u> | .1 | <p>Execute work to meet or exceed:</p> <p>.1 National Building Code of Canada 2010, National Fire Code of Canada 2010, Ontario Building Code 2012 and any other code of provincial or local application, including all amendments up to project date, provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.</p> <p>.2 Rules and regulations of authorities having jurisdiction.</p> <p>.3 Fire Commissioner of Canada, No. 301, Standard for Construction Operations, and No. 302, Standard for Welding and Cutting, June 1982 and Fire Protection Standard for Correctional Institutions - Treasury Board Personnel Management Manual, Occupational Safety and Health, Chapter 3-6, Feb. 1992.</p> <p>.4 Occupational Health and Safety Act and Regulations for Construction Projects, Revised Statutes of Ontario 1990, Chapter O.1 as amended, O. Reg. 213/91 as amended by O. Reg. 631/94, R.R.O. 1990, Reg. 834, Diving Operations, O. Reg. 629/94, as amended.</p> <p>.5 Environmental Protection Act, O. Reg. 102/94 and O. Reg. 103/94.</p> |
| <u>1.2 TAXES</u> | .1 | <p>Pay applicable Federal, Provincial and Municipal taxes.</p> |
| <u>1.3 EXAMINATION</u> | .1 | <p>Before submitting bid, examine existing conditions and determine conditions affecting work.</p> |
| | .2 | <p>Obtain all information which may be necessary for proper execution of Contract.</p> |
| <u>1.4 EXISTING CONDITIONS</u> | .1 | <p>The geotechnical investigation is bound in Appendix A - Geotechnical Investigations.</p> |
| | .2 | <p>Contractor shall be familiarized with all available data and scope, and price accordingly.</p> |

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| <u>1.5 SITE</u> | .1 | Confine work, including temporary structures, plants, equipment and materials to established limits of site. |
| | .2 | Locate temporary buildings, roads, walks, drainage facilities, services as directed and maintain in clean and orderly manner. |
| <u>1.6 CONSTRCUTION & STORAGE AREA</u> | .1 | The limits of the Construction and Storage Area will be designated by the Departmental Representative prior to commencement of work unless otherwise shown on the drawings. |
| <u>1.7 DOCUMENTS</u> | .1 | Keep on site one copy of contract documents, reviewed shop drawings and submissions. |
| | .2 | Specifications shall govern over Drawings. |
| <u>1.8 CONTRACT METHOD</u> | .1 | Construct Work under a combined price contract. All costs for work not specifically identified as a unit price item shall be included in the lump sum arrangement. |
| <u>1.9 MEASUREMENT PROCEDURES</u> | .1 | Within 48 hours of bid acceptance submit a list of subcontractors and a detailed breakdown of costs associated with the lump sum arrangement. |
| | .2 | Items measured for payment are in metric (SI) units. |
| | .3 | Submit requests for payment in metric units corresponding with items on the Unit Price Table. |
| | .4 | Submit supporting documents in metric units. Perform all necessary conversions required. |
| <u>1.10 LAYOUT OF WORK</u> | .1 | Immediately upon entering site for purpose of beginning work on this project, locate all general reference points and take proper action necessary to prevent their disturbance. |
| | .2 | Supply stakes and other survey markers required for |

this work. Employ competent personnel to lay out work in accordance with lines and grades provided.

- .3 Maintain all reference points and markers for duration of contract.

1.11 CO-OPERATION & PROTECTION

- .1 Execute work with minimum disturbance to occupants public and normal use of site work area. Make arrangements with Departmental Representative to facilitate execution of work.
- .2 Maintain access and exits.
- .3 Provide necessary barriers, warning lights and signs. Protect work from damage. Replace damaged existing work with material and finish to match original.

1.12 EXISTING UTILITIES

- .1 Establish location, protect and maintain existing utility lines.
- .2 Connect to existing utilities with minimum disturbance to pedestrian and vehicular traffic.

1.13 MATERIALS AND EQUIPMENT

- .1 Use new products unless otherwise specified.
- .2 Deliver and store material and equipment to manufacturer's instructions with manufacturer's labels and seals intact.
- .3 When material or equipment is specified by standard or performance specifications, upon request of Departmental Representative, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

1.14 INSPECTION AND TESTING

- .1 The Departmental Representative may employ an Inspection and Testing company to ensure work conforms with Contract Documents.
- .2 When initial tests and inspections reveal work not to contract requirements, pay for tests and inspections required by Departmental Representative on corrected work.
- .3 Submit timely inspection and test reports to Departmental Representative.

1.15 SCHEDULING OF WORK

- .1 On award of contract submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion.
- .2 When schedule has been reviewed by the Departmental Representative take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative.

1.16 AS-BUILT RECORD DRAWINGS

- .1 As work progresses, neatly record significant deviations from the Contract drawings using fine, red marker on full size white prints.
- .2 Neatly print lettering and numbers in size to match original. Lines may be drawn free-hand but shall be neat and accurate. Add at each title block note: "AS BUILT RECORD".
- .3 Record following significant deviations:
 - .1 Depths of various elements and foundations.
 - .2 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
 - .3 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
 - .4 Field changes of dimension.
 - .5 Other significant deviations which are concealed in construction and cannot be identified by visual inspection.
- .4 Turn one set of As-Built Record Drawings over to Departmental Representative upon completion of work.
- .5 If project is completed without significant deviations from contract drawings declare this in writing and submit to Departmental Representative in lieu of As-Built Record Drawings.

1.17 ADDITIONAL DRAWINGS

- .1 Departmental Representative may furnish additional drawings to clarify work.
- .2 Such drawings become part of Contract Documents.

1.18 FIRES AND TEMPORARY HEATERS

- .1 Burning of rubbish on site not permitted.
- .2 Only fires for temporary heaters are permitted on site.

- .3 Maintain temperature required to prevent frost damage to work.

1.19 DATUM

- .1 Elevations and soundings shown on Drawings are expressed in metres relative to chart datum.
- .2 Chart datum for Lake Huron is 176.0 metres I.G.L.D (1985) .

1.18 OPSS AND OPSD

- .1 Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) quoted in these specifications are available online at <http://www.raqsa.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage>.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.
- .11 Submit number of hard copies specified for each type and format of submittal and also submit in electronic format as pdf files. Forward pdf files

on CD or through email.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 5 days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.

- .2 Supplier.
- .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit 3 prints and 1 electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit 3 hard copies and 1 electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit 3 hard copies and 1 electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit 3 hard copies and 1 electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets

specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

- .14 Submit 3 hard copies and 1 electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit 3 hard copies and 1 electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit 3 hard copies and 1 electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .21 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Safety and Insurance Board Experience Report.
- .2 Submit transcription of insurance immediately after award of Contract.

1.4 FEES, PERMITS AND CERTIFICATES

- .1 Provide authorities having jurisdiction with information requested.
- .2 Pay fees and obtain certificates and permits required.
- .3 Furnish certificates and permits.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Ontario
 - .1 Occupational Health and Safety Act, R.S.O. [1990 Updated 2005].

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation.
- .3 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
- .4 Submit copies of reports or directions issued by safety inspectors of authority having jurisdiction.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce

the Contractor's overall responsibility for construction Health and Safety.

- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

1.4 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.

1.5 MEETINGS

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.6 REGULATORY REQUIREMENTS

- .1 Comply with the Acts and regulations of the Province of Ontario.
- .2 Comply with specified standards and regulations to ensure safe operation at site.

1.7 PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
 - .1 Work around water.

1.8 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project

specifications.

- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns either accepting or rejecting improvements.
- .3 Relief from or substitution for any portion or provision of minimum Health and Safety standards specified herein or reviewed site-specific Health and Safety Plan shall be submitted to Departmental Representative in writing.

1.9 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 The Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act for the Province of Ontario.

1.10 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Health and Safety Act, R.S.O.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.11 UNFORSEEN HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.
- .2 Follow procedures in place for Employee's Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.

1.12 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:
 - .1 Have working knowledge of occupational safety and health regulations.
 - .2 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .4 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.13 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province of Ontario, and in consultation with Departmental Representative. The following criteria is to be posted on site:
 - .1 Contractor's Safety Policy.
 - .2 Constructor's Name.
 - .3 Notice of Project.
 - .4 Name, trade, and employer of Health and Safety Representative or Joint Health and Safety Committee members (if applicable).
 - .5 Ministry of Labour Orders and reports.
 - .6 Occupational Health and Safety Act and Regulations for Construction Projects for the Province of Ontario.
 - .7 Address and phone number of nearest Ministry of Labour office.
 - .8 Material Safety Data Sheets.
 - .9 Written emergency Response Plan.
 - .10 Site Specific Safety Plan.
 - .11 Valid certificate of first aider on duty.
 - .12 WSIB "In Case of Injury At Work" poster.
 - .13 Location of toilet and cleanup facilities.

1.14 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of

health and safety issues identified.

- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.15 BLASTING

- .1 Blasting or other use of explosives is not permitted.

1.16 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
- .2 Assign responsibility and obligation to health and safety coordinator to stop or start Work when, at health and safety coordinator's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not used.

PART 1 - GENERAL

1.1 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to commencing construction activities or delivery of materials to site, provide Environmental Protection Plan for review and approval by Departmental Representative.
- .3 Ensure Environmental Protection Plan includes comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental Protection Plan:
 - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
 - .3 Names and qualifications of persons responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Erosion and sediment control plan identifying type and location of erosion and sediment controls

to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Ensure plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Ensure plan includes measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.

.12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste Water Management Plan identifying methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

.15 Pesticide treatment plan to be included and updated, as required.

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| <u>1.3 FIRES</u> | .1 | Fires and burning of rubbish on site not permitted. |
| <u>1.4 DRAINAGE</u> | .1 | Provide Erosion and Sediment Control Plan identifying type and location of erosion and sediment controls provided. Ensure plan includes monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations. |
| | .2 | Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan. |
| | .3 | Provide temporary drainage and pumping required to keep excavations and site free from water. |
| | .4 | Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials. |
| | .5 | Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements. |
| <u>1.5 SITE CLEARING AND PLANT PROTECTION</u> | .1 | Protect trees and plants on site and adjacent properties as indicated. |
| | .2 | Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum. |
| | .3 | Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones. |
| | .4 | Minimize stripping of topsoil and vegetation. |
| | .5 | Restrict tree removal to areas indicated or designated by Departmental Representative. |
| <u>1.6 WORK ADJACENT TO WATERWAYS</u> | .1 | Construction equipment to be operated on land only. |
| | .2 | Do not use waterway beds for borrow material |

without Departmental Representative's approval.

- .3 Waterways to be free of excavated fill, waste material and debris.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Blasting to be above water and 100 m minimum from indicated spawning beds.

1.7 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant to local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.
 - .1 Provide temporary enclosures where indicated or directed by Departmental Representative.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.8 HISTORICAL/ ARCHAEOLOGICAL CONTROL

- .1 Provide historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.
- .2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

1.9 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
 - .1 Do not take action until after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 CLEANING

- .1 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

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PART 1 - GENERAL

1.1 CONSTRUCTION AND DEMOLITION WASTE

- .1 Carefully remove, deconstruct, source separate materials and divert, from D&C waste destined for landfill to maximum extent possible. Reuse, recycle, compose, anaerobic digest or sell material for reuse except where indicated otherwise. On site sales are not permitted.
- .2 Source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 and Ontario Regulation 103/94.
 - .1 Provide facilities for collection, handling and storage of source separated wastes.
 - .2 Source separate the following waste:
 - .1 Portland cement concrete.
 - .2 Wood.
 - .3 Steel.
 - .4 Organic vegetation
- .3 Identify opportunities for reduction, reuse, and recycling of materials, where possible.
- .4 Accomplish maximum control of solid construction waste.
- .5 Preserve environment and prevent pollution and environment damage.

1.2 WASTE PROCESSING SITES

- .1 Province of: Ontario.
 - .1 Name: Ministry of Environment and Climate Change, 135 St. Clair Avenue West, Toronto, ON, M4V1P5.
 - .2 Telephone: 800-565-4923 or 416-325-4000.
 - .3 Fax: 416-325-3159.
- .2 Recycling Council of Ontario: 215 Spadina Avenue, Suite 225, Toronto, ON, M5T 2C7.
 - .1 Telephone: 416-657-2797
 - .2 Toll-free: 888-501-9637
 - .3 Email: rco@rco.on.ca.
 - .4 Internet: <http://www.rco.on.ca/>.

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1.3 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .2 Unless specified otherwise, materials for removal do become Contractor's property.
- .3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .4 Protect structural components not removed for demolition from movement or damage.
- .5 Support affected structures. If the safety of any component is endangered, cease operations and immediately notify Departmental Representative.
- .6 Protect surface drainage, mechanical and electrical from damage and blockage.

1.4 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil or paint thinner into waterways, storm, or sanitary sewers.
- .3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .4 All waste materials should be disposed of in a legal manner at a site approved by Local Authorities.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 APPLICATION

- .1 Do Work in compliance with WRW.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

3.3 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

- .1 Schedule E - Government Chief Responsibility for the Environment:

Province	Address	General Inquires	Toll-free
Ontario	Ministry of Environment And Climate Change 135 St. Clair Avenue West Toronto ON M4V 1P5	(416) 325-4000	(800) 565-5923
Federal	Environment Canada Inquiry Centre Gatineau PQ	(819) 997-2880	(800) 668-6767

PART 1 - GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

1.2 PROTECTION

- .1 Prevent movement, settlement or damage of adjacent parts of existing structure to remain.
- .2 The Contractor shall review the full extent of the work at the north and south piers for constraints to placement and movement of equipment.
- .3 The Contractor shall be held responsible for damage to existing facilities caused by demolition and removal.
- .4 When rig-mounted breakers, concrete crushers, cranes, any other heavy equipment are used for removals, limit the weight to:
 - .1 20 tonnes maximum weight (north pier)
 - .2 30 tonnes maximum weight (south pier)
 - .3 equipment shall not laterally to within 2 m of the pier edge

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit a waste reduction workplan indicating the materials and quantities of material that will be recycled and diverted from landfill.
 - .1 Indicate how material being removed from the site will be reused or recycled.
- .3 Submit a removals and operational plan to the Departmental Representative a minimum of 7 working days prior to the commencement of the concrete removals, including:
 - .1 Work drawings showing the extents of removals.
 - .2 Layout and description of concrete removal sequences and proposed equipment.
 - .3 Clearances at existing and proposed structures.

.4 The locations, loadings, and detailed descriptions of heavy equipment and vehicles to be supported on existing structure.

1.4 DEMOLITION,
REMOVAL AND DISPOSAL
MEASUREMENT PROCEDURES

- .1 Demolition, removal and disposal of all components identified on the drawing and as specified is considered part of the lump sum arrangement. Item/component to be demolished, removed and disposed, but not limited to, are as follows unless specified otherwise:
 - .1 Concrete related components including decking, cope walls and other miscellaneous hidden concrete sections (but not including coring).
 - .2 Removal of rock material from harbour bottom in areas of sheet piling installation.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- .1 Leave equipment and machinery running only while in use, except where extreme temperatures prohibit shutting down.
- .2 Demonstrate that tools and machinery are being used in manner which allows for salvage of materials in best condition possible.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Protection:
 - .1 Prevent movement, settlement, or damage to adjacent structures, utilities to remain in place. Provide bracing and shoring as required.
 - .2 Keep noise, dust, and inconvenience to occupants to minimum.

.3 Provide temporary dust screens, covers, railings, supports and other protection as required.

.3 Post warning signs on electrical lines and equipment which must remain energized to serve other products during period of demolition.

.4 Locate and protect utility lines. Do not disrupt active or energized utilities designated to remain undisturbed.

3.2 GENERAL DEMOLITION SALVAGE AND DISPOSAL

.1 Remove parts of existing structure to permit new construction. Sort materials into appropriate piles for reuse and recycling.

.2 Refer to removal drawings and specifications for items to be salvaged for reuse.

.3 Dispose legally off the site all demolished and removed materials.

.4 Undertaken demolition work in accordance with CSA S350.

.5 Chipping hammers will be permitted in all areas of concrete removal. Jackhammers and rig mounted equipment shall not be used for concrete removals:

.1 within 200 mm from concrete to remain in place.

.2 within 25 mm of any steel reinforcement to remain in place.

.6 Prior to carrying out concrete removal operations, the removal area shall be saw cut to a depth of 20 mm. The perimeter of the removal area shall have a face perpendicular to the original concrete surface of the removal area.

3.3 SUMMARY OF REMOVALS AND DISPOSAL

.1 Neatly demolish and remove all components within the limits of removal including, but not limited to, the following:

.1 Concrete and concrete coring

.2 Steel

.3 Fill

.4 Gabions (portion)

.5 Rock fill and other harbor bottom obstructions

.6 Existing bollards and ladders

.7 Fence (north pier)

.8 Rubble and other materials on South Pier not

clear under Section 31 11 00, Clearing and
Grubbing

.2 Dispose of all removed components.

3.4 CLEANING AND RESTORATION

.1 Keep site clean and organized throughout demolition
procedure.

.2 Upon completion of project, reinstate areas
affected by Work to condition which existed prior
to beginning of Work or better subject to the
approval of Departmental Representative.

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 03 41 00 - Precast Structural Concrete

1.2 MEASUREMENT PROCEDURES

- .1 Concrete in deck will be measured by volume in cubic metres of concrete placed, calculated from neat dimensions as indicated on drawing, and shall include all materials, labour and equipment to complete the work.
- .2 No deductions will be made for volume of concrete displaced by reinforcing steel, structural steel, or piles.
- .3 Reinforcing steel, splices, wire ties, bar supports, chairs, spacers, dowels, anchor bolts, nuts and washers and bolt grouting shall be considered included in the placing of concrete and will not be measured but considered separately for payment.
- .4 Hot and cold weather protection will be considered included in the placing of concrete and will not be measured separately for payment.

1.3 REFERENCES

- .1 Reference Standards:
- .1 American Concrete Institute (ACI)
.1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International
.1 ASTM A 82/A 82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
.2 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
.3 ASTM C 260/C 260M-10, Standard Specification for Air-Entraining Admixtures for Concrete.
.4 ASTM C 494/C 494M-10, Standard Specification for Chemical Admixtures for Concrete.
.5 ASTM C 1017/C 1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
.6 ASTM D 1751-04(2008), Standard

Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.7 ASTM D 1752-04a(2008), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.3 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

.4 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.6 CSA-O86-09 (R2010), Engineering Design in Wood.

.7 CSA S269.1-[1975(R2003)], Falsework for Construction Purposes.

.8 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit shop drawings for formwork.

.3 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

.4 Indicate sequence of erection and removal of formwork.

.5 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.

.6 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

- .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and splices, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3.
 - .1 Provide type B tension lap splices unless otherwise indicated.
- .7 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .8 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
- .9 Provide WHMIS MSDS, Material Safety Data Sheets.

1.5 QUALITY ASSURANCE

- .1 Quality Assurance: as described in PART 2 - SOURCE QUALITY CONTROL.
 - .1 Mill Test Report: provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.
- .2 Provide Departmental Representative, minimum 3 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum 3 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following

items:

- .1 Falsework erection.
- .2 Hot weather concrete.
- .3 Cold weather concrete.
- .4 Curing.
- .5 Finishes.
- .6 Formwork removal.
- .7 Joints.

- .4 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Concrete Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by Departmental Representative.
 - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .4 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

- .1 Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

- .1 Concrete
 - .1 Cement to CAN/CSA-A3001, Type GU.
 - .2 Compressive strength: 30 MPa at 28 days.
 - .3 Exposure class: F-1 to CSA-A23.1/A23.2.
 - .4 Aggregate size: 20 mm.
 - .5 Slump: 80 mm at time of deposit, +/- 20 mm.
 - .6 Air content: 6%, Table 4, Category 1.
 - .7 Admixtures: air entraining to ASTM C233 Standard Test Methods for Air-Entraining Admixtures for Concrete. Calcium chloride or compounds containing calcium chloride not permitted.
 - .8 Water: to CSA-A23.1/A23.2.
- .2 Reinforcing steel bars: carbon steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to ASTM A 82/A 82M.
- .4 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .5 Formwork materials:
 - .1 Wood product formwork materials to CAN/CSA-O86.
- .6 Form ties:
 - .1 Form ties to be removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .7 Form release agent: non-toxic, biodegradable, and low VOC.
- .8 Bituminous impregnated fiber board: to ASTM D 1751.
 - .1 Joint sealant: Cold applied, single component, chemically curing silicone to ASTM D5893
 - .1 low modulus
 - .2 weather and UV resistant
 - .3 unprimed adhesion (primer not required for adhesive to concrete)
 - .2 Dowels into Concrete: epoxy type

2.4 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, ACI SP-66 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Unless otherwise approved by the Departmental Representative, do not weld reinforcement.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.5 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Upon request, inform Departmental Representative of proposed source of material to be supplied.

2.6 MIXES

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
 - .1 Verification of compliance as described in Part 1.5 Quality Assurance.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.
 - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .5 Protect previous Work from staining.
- .6 Clean and remove stains prior to application for concrete finishes.
- .7 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .8 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .9 Thoroughly clean joints to receive sealant. Place foam backer rod. Do not apply sealant to wet or damp concrete.
- .10 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 FORMWORK ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Do not place shores and mud sills on frozen ground.
- .5 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .6 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .7 Align form joints and make watertight.

.1 Keep form joints to minimum.

.8 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.10 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.11 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.3 FIELD BENDING OF REINFORCEMENT

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.4 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.

.2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.3 Ensure cover to reinforcement is maintained during concrete pour.

3.5 INSTALLATION/ APPLICATION

.1 Undertake cast-in-place concrete work to CSA A23.1/A23.2.

.2 Finishing and curing:

.1 Finish concrete to CSA A23.1/A23.2.

.2 In addition to cold weather requirements listed in CSA-A23.1, protect concrete in accordance with the following:

.1 Take special precautions to control and eliminate initial drying shrinkage and plastic shrinkage for slabs. Provide wind breaks, shelters or shades.

- .3 Keep concrete surfaces moist continuously while the concrete is protected.
- .4 For unformed surfaces, provide means to maintain concrete surface thoroughly wet for a period of 7 days after concrete is place.
- .5 Initial finishing: bull floats and darbies. Finish finishing for air entrained concrete: magnesium float for slabs or other means as approved by the Departmental Representative.
- .6 During curing period, uncover only such areas as are immediately needed for finish treatment. Recover and continue curing.
- .7 When concrete has hardened sufficiently, give surface a uniform broom finish free from porous spots, irregularities, depressions, small pockets or rough spots
- .8 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.

- .3 Joint fillers:
 - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.
 - .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .3 Locate and form isolation joints as indicated.
 - .4 Install joint filler.

3.6 SURFACE TOLERANCE

- .1 Finish unformed surfaces true to grade and free of surface irregularities exceeding 3 mm under a 3 metre straight edge in any direction.

3.7 FIELD QUALITY CONTROL

- .1 Site tests: conduct tests as follows and submit report as described in PART 1 - SUBMITTALS.
 - .1 Concrete pours.
 - .2 Slump.
 - .3 Air content.
 - .4 Compressive strength at 7 and 28 days.
 - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials may be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory is certified to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing

laboratory and Departmental Representative.

3.8 FORMWORK REMOVAL
AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 7 days for sides of slabs.
- .2 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Re-use formwork subject to requirements of CSA-A23.1/A23.2.

PART 1 - GENERAL

<u>1.1 RELATED REQUIREMENTS</u>	.1	Section 03 30 00 - Cast-in-Place Concrete.
<u>1.2 MEASUREMENT PROCEDURES</u>	.1	Measure precast elements (Deadmen for Scenario C) in units supplied, delivered, stored and erected including steel sleeve and plates, reinforcing steel and lifting devices.
<u>1.3 REFERENCES</u>	.1	Reference Standards: <ul style="list-style-type: none"> .1 ASTM International <ul style="list-style-type: none"> .1 ASTM C 260/C 260M-10, Standard Specification for Air-Entraining Admixtures for Concrete. .2 ASTM C 494/C 494M-10, Standard Specification for Chemical Admixtures for Concrete. .3 ASTM C 1017/C 1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete. .2 CSA International <ul style="list-style-type: none"> .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete. .2 CSA A23.3-04, Design of Concrete Structures. .3 CSA A23.4-05, Precast Concrete - Materials and Construction. .4 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005). .5 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement. .6 CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
<u>1.4 DESIGN REQUIREMENTS</u>	.1	Design precast elements to CSA-A23.3 and CSA-A23.4 and to carry handling stresses.

1.5 PERFORMANCE REQUIREMENTS

- .1 Tolerance of precast elements to CSA-A23.4.

1.6 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets.
- .3 Submit shop drawings in accordance with CSA-A23.3 and CSA-A23.4 and include following items:
 - .1 Design calculations for items designed by manufacturer.
 - .2 Details of reinforcement and their connections.
 - .3 Finishing schedules.
 - .4 Methods of handling and erection.
 - .5 Openings, sleeves, inserts and related reinforcement.
- .4 Submit detailed calculations and design drawings for typical precast elements and connections for review by Departmental Representative.
- .5 Shop Drawings: submit drawings stamped and signed by qualified professional engineer registered or licensed in Province of Ontario, Canada.

1.7 QUALITY ASSURANCE

- .1 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Departmental Representative verifying compliance that concrete provided meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.8 QUALIFICATIONS

- .1 Fabricate and erect precast concrete elements by manufacturing plant certified in appropriate categories according to CSA-A23.4
- .2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting bid and to specifically verify as part of tender that plant is currently certified in appropriate category, Structural.
- .3 Only precast elements fabricated in such certified plants to be acceptable to Departmental Representative and plant certification to be

maintained for duration of fabrication, erection until warranty expires.

.4 Welding companies certified to CSA-W47.1.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle and store precast units according to manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Concrete
 - .1 Cement to CAN/CSA-A3001, Type GU.
 - .2 Compressive strength: 30 MPa at 28 days.
 - .3 Exposure class: F-1 to CSA-A23.1/A23.2.
 - .4 Aggregate size: 20 mm.
 - .5 Slump: 80 mm at time of deposit, +/- 20 mm.
 - .6 Air content: 6%, Table 4, Category 1.
 - .7 Admixtures: air entraining to ASTM C233 Standard Test Methods for Air-Entraining Admixtures for Concrete. Calcium chloride or compounds containing calcium chloride not permitted.
 - .8 Water: to CSA-A23.1/A23.2.
- .2 Reinforcing steel: to CAN/CSA-G30.18, Grade 400.
- .3 Hardware and miscellaneous materials: to CSA-A23.1/A23.2.
- .4 Forms: to CSA-A23.4.
- .5 Anchors and supports: to CAN/CSA-G40.21 Type 300 W primed after fabrication.
- .6 Welding materials: to CSA W59.
- .7 Welding electrodes: to CSA W59 certified by Canadian Welding Bureau.

2.2 MIXES

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria in accordance with CAN/CSA-A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance

criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.

.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.

2.3 MANUFACTURED UNITS

- .1 Manufacture units in accordance with CSA-A23.4.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not be exposed.
- .3 Provide hardware suitable for handling elements.
- .4 Shop prime lifting anchors after fabrication and touch up primer on anchors after welding. Do not apply primer to embedded portion of anchor or inserts.

2.4 FINISHES

- .1 Finish units to standard grade to CSA-A23.4.

2.5 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CSA-A23.4.
- .2 Provide records from in-house quality control programme based upon plant certification requirements to Departmental Representative for inspection and review.
- .3 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.
- .4 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to Departmental Representative for review upon request.

PART 3 - EXECUTION

3.1 ERECTION

- .1 Do precast concrete work in accordance with CSA-A23.4 and CSA-A23.3.
- .2 Do welding in accordance with CSA-W59.
- .3 Non-cumulative erection tolerances in accordance with CSA-A23-4.
- .4 Fasten precast units in place as indicated on reviewed shop drawings.
- .5 Secure with bolts using locknuts.

3.2 VERIFICATION

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in Part 2 - Products, by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

PART 1 - GENERAL

- | | | |
|--|----|--|
| <u>1.1 RELATED REQUIREMENTS</u> | .1 | Section 31 23 33.01 - Excavating, Trenching and Backfilling. |
| <u>1.2 REFERENCES</u> | .1 | American Society for Testing and Materials (ASTM)
.1 ASTM D 4791-[99], Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate. |
| | .2 | Ontario Provincial Standard Specifications (OPSS) /Ontario Ministry of Transportation
.1 OPSS 1004 November 2012, Ontario Provincial Standard Specification, Material Specification for Aggregate - Miscellaneous.
.2 OPSS 1010 April 2013, Ontario Provincial Standard Specification, Material Specification for Aggregate - Base, Subbase, Select Subgrade, and Backfill Material. |
| <u>1.3 SAMPLES</u> | .1 | Allow sampling by Departmental Representative as required. |
| | .2 | Provide Departmental Representative with access to source and processed material for sampling. |
| | .3 | Pay cost of sampling and testing of aggregates which fail to meet specified requirements. |
| <u>1.4 WASTE MANAGEMENT AND DISPOSAL</u> | .1 | Divert unused granular materials from landfill to local facility as approved by Departmental Representative. |

PART 2 - PRODUCTS

- | | | |
|----------------------|----|--|
| <u>2.1 MATERIALS</u> | .1 | Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or |
|----------------------|----|--|

minerals, or other substances that would act in deleterious manner for use intended.

- .2 Flat and elongated particles of coarse aggregate: to ASTM D 4791.
 - .1 Greatest dimension to exceed five times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Natural sand.
 - .2 Manufactured sand.
 - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock.
 - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
 - .3 Light weight aggregate, including slag and expanded shale.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.
- .2 If, in opinion of Departmental Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise Departmental Representative 4 weeks in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Processing
 - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
 - .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Departmental Representative.
 - .3 Wash aggregates, if required to meet specifications. Use only equipment approved by Departmental Representative.
 - .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.
- .2 Handling
 - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .3 Stockpiling
 - .1 Do not stockpile aggregates on site approved otherwise by Departmental Representative.

3.2 CLEANING

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.

PART 1 - GENERAL

- | | | |
|--|----|---|
| <u>1.1 DEFINITIONS</u> | .1 | Clearing consists of the removal of trees and brush vegetative growth along the south and north sides of the South Pier. |
| | .2 | Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments of specified size, to a depth below existing ground surface required to suit new work. |
| <u>1.2 MEASUREMENT PROCEDURES</u> | .1 | Clearing and grubbing as identified on the drawings and as specified is considered part of the lump sum arrangement. |
| <u>1.3 STORAGE AND PROTECTION</u> | .1 | Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses and root systems of trees which are to remain.
.1 Repair damaged items to approval of Departmental Representative. |
| <u>1.4 WASTE MANAGEMENT AND DISPOSAL</u> | .1 | Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber. |

PART 2 - PRODUCTS

- | | | |
|----------------------|----|---|
| <u>2.1 MATERIALS</u> | .1 | Soil Material for Fill:
.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
.2 Remove and store soil material for reused. |
|----------------------|----|---|

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Inspect site and verify with Departmental Representative, items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
 - .1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.
 - .2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

3.2 CLEARING

- .1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.
- .2 Remove cleared materials and dispose off site.

3.3 GRUBBING

- .1 Remove and dispose off site stumps and roots larger than 2.5 cm in diameter, in the designated working areas north and south of the South Pier.
- .2 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.4 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for excavation work and other operations to approval of Departmental Representative.

3.5 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

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PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 31 11 00 - Clearing and Grubbing.
- .2 Section 31 05 16 - Aggregate Materials.

1.2 REFERENCES

- .1 Ontario Provincial Standard Specifications (OPSS) /Ontario Ministry of Transportation
 - .1 OPSS 1004 November 2012, Ontario Provincial Standard Specification, Material Specification for Aggregate - Miscellaneous.
 - .2 OPSS 1010 April 2013, Ontario Provincial Standard Specification, Material Specification for Aggregate - Base, Subbase, Select Subgrade, and Backfill Material.

1.3 MEASUREMENT PROCEDURES

- .1 New clear stone fill will be measured in tonnes of material placed to limits indicated and shall include all labour, equipment and materials necessary to complete the work.
- .2 New granular A will be measured in tonnes of material placed to limits indicated and shall include all labour, equipment and materials necessary to complete the work.
- .3 New rock protection will be measured in cubic metres of material placed to limits indicated and shall include all labour, equipment and materials necessary to complete the work.
- .4 Native fill will be measured as part of the lump sum arrangement and shall include all labour, equipment and materials necessary to complete the excavating, stockpiling and backfilling of native backfill. Supply and installation of silt fence barrier is considered incidental to excavating and backfilling of native fill and will not be measured separately for payment.
- .5 Compaction shall be considered incidental and not measured separately for payment.
- .6 Disposal of surplus native fill legally off site is

considered included in the excavation and backfilling of native fill.

- .7 Excavation is considered part of the lump sum arrangement and shall include all labour, equipment and materials necessary to complete the work.

1.4 UTILITIES

- .1 Before commencing work, establish location and extent of underground utility lines in area of excavation. Notify Departmental Representative of findings.
- .2 Arrange for and de-energize existing street lighting lines. Retain, protect and support, as required, existing conduit and lines.
- .3 Record and submit the locations of all lines.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Clear stone: to Ontario Provincial Standard Specification OPSS.MUNI.1004.
- .1 Size 19mm, uniformly graded.
- .2 Size 75mm, with gradation:
- | Sieve Designation | % Passing |
|-------------------|-----------|
| 75.0 mm | 100 |
| 40.0 mm | 20 |
| 19.0 mm | 0 |
- .2 Granular A: to Ontario Provincial Standard Specification OPSS.MUNI.1010.
- .3 Rock Protection: to Ontario Provincial Standard Specification OPSS.MUNI.1010.
- .4 Native fill: excavated soil, free from roots and debris. Departmental Representative to approve excavated materials before use as backfill.

PART 3 - EXECUTION

3.1 EXCAVATION

- .1 Excavate and stockpile native material as required.
- .2 Excavate to lines, grades, elevations and dimensions.
- .3 Remove concrete, masonry, paving, walks, demolished foundations, rubble and other obstructions encountered during excavation in accordance with Section 02 41 16 - Structure Demolition.
- .4 Keep excavated and stockpiled materials safe distance away from edge of excavations.
- .5 Dispose of surplus and unsuitable excavated material off site.
- .6 Do not obstruct flow of surface drainage or natural watercourses.
- .7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .8 Correct unauthorized over-excavation in accordance with Section 31 05 16 - Aggregate Materials and as directed by the Departmental Representative. Fill and compact the excavation to the correct grade with an approved material without compensation to specified densities.
- .9 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.2 DEWATERING

- .1 Keep excavations free of water while Work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.

3.3 BACKFILLING

- .1 Do not proceed with backfilling until tie rod and waler installation has been inspected and approved by Departmental Representatives.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Backfill all spaces not occupied by parts of the structure, or other permanent works, with specified material, placed as shown on the drawings
- .5 Place Granular A materials in areas as indicated.
- .6 Place clear stone in areas as indicated.
- .7 Place non-woven geotextile as indicated.
- .7 Place backfill material in uniform layers not exceeding 200 mm compacted thickness up to grades indicated and be uniformly compacted. Compact each layer before placing succeeding layers. Compact Granular A uniformly to at least 98% SPMDD, respectively.

3.4 ROCK PROTECTION

- .1 Install rock protection in areas as indicated at the North Pier.

PART 1 - GENERAL

- | | | |
|---|----|--|
| <u>1.1 MEASUREMENT AND PAYMENT</u> | .1 | Measure geotextiles in square metres of surface covered by material. No allowance will be made for seams and overlaps. |
| <u>1.2 REFERENCES</u> | .1 | Canadian General Standards Board (CGSB)
.1 CAN/CGSB-4.2 No. 11.2-M89, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
.2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes |
| | .2 | Ontario Provincial Standard Specifications (OPSS)
.1 OPSS 1860-November 2010, Material Specification for Geotextiles. |
| <u>1.3 SUBMITTALS</u> | .1 | Submit in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations. |
| <u>1.4 DELIVERY, STORAGE AND HANDLING</u> | .1 | Deliver, store and handle materials in accordance with manufacturer's written instructions. |
| | .2 | Storage and Handling Requirements:
.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect geotextiles from direct sunlight and UV rays.
.3 Replace defective or damaged materials with new. |

PART 2 - PRODUCTS

2.1 MATERIAL

- .1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.
 - .1 Class II, OPSS 1860
- .2 Physical properties:
 - .1 Table 1 (Class II) of OPSS 1860
- .3 Hydraulic properties:
 - .1 Filtration opening size (FOS): 75 to 150 um.
- .4 Factory seams: sewn in accordance with manufacturer's recommendations.
- .5 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Place geotextile material as indicated on drawings.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .4 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .5 After installation, cover with overlying layer within 4 hours of placement.
- .6 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .7 Place and compact soil layers.

<u>3.2 CLEANING</u>	.1	Upon completion remove surplus materials, rubbish, tools and equipment.
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<u>3.4 PROTECTION</u>	.1	Vehicular traffic not permitted directly on geotextile.
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PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A 6/A 6M-[02b], Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
 - .2 ASTM A 325M-13, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - .3 ASTM A 1011/A 1011M-13, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- .2 Canadian Standards Association (CSA International).
 - .1 CAN/CSA G40.20/G40.21-04(R 2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
 - .3 CSA W59-M1991(R2008)], Welded Steel Construction (Metal Arc Welding) (Metric Version).

1.2 MEASUREMENT PROCEDURES

- .1 Measure Steel Sheet Piling in square metres of steel sheet piling installed, including steel sheet piling corners and closure plates.
- .2 Steel Waler including splice plates, bolts, nuts and other associated hardware will be measured by the length, in metres, of Steel Waler installed.
- .3 Steel Tie Rods including nuts, washers, couplers andnock nuts will be measured by the number of tie rod installed.
- .4 Steel Sheet Pile Deadmen Anchors (Scenario B) will be measured by the numbers of complete units supplied, delivered, stored and erected including plates, walers, sheets, bolts and welding.
- .5 Mobilization and de-mobilization of equipment will not be measured separately for payment.

1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Submit shop drawings for following items:
 - .1 A plan layout of steel sheet piling sections indicating all dimensions.
 - .2 Details of sheet piling sections.
 - .3 Layout and details of the steel double channel waler indicating location of splices, splice details, tie bolt details and steel washer plate details.
 - .4 Details of steel tie rods, steel plate washers, nuts, lock nuts and couplers.

1.4 STEELMAKER CERTIFICATES

- .1 At least four weeks prior to start of pile installation operation, furnish Departmental Representative with two copies of steelmaker and mill test data and certification that all steel piling, delivered to job site, meets requirements of this section.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Use slings for lifting piling so that mass is evenly distributed and piling is not subjected to excessive bending stresses.
- .2 Store sheet piling on level ground or provide supports so that sheet piling is level when stored.
 - .1 Provide blocking at spacing not exceeding 5 m so that there is no excessive sagging in piling.
 - .2 Overhang at ends not to exceed 0.5 m.
 - .3 Block between lifts directly above blocking in lower lift.
- .3 If material is stock-piled on structure, ensure that structure is not overloaded.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Divert unused metal materials from landfill to metal recycling facility for disposal approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Steel sheet piles: to CAN/CSA-G40.21, grade 350W, and following:
- .2 Continuous interlocking Z section:
 - .1 North Pier Sheet Piling
 - .1 Minimum effective section modulus of $1710 \times 10^3 \text{ mm}^3$ per metre of wall.
 - .2 Minimum thickness of 9.0 mm.
 - .2 South Pier Sheet Piling
 - .1 Minimum effective section modulus of $839 \times 10^3 \text{ mm}^3$ per metre of wall.
 - .2 Minimum thickness of 7.5 mm.
- .3 Structural steel for rolled sections including walers and waler splices: to CAN/CSA-G40.21, Grade 350W.
- .4 Structural steel for plates and miscellaneous steel: to CAN/CSA-G40.21, Grade 300W.
- .5 Tie rods:
 - .1 Material properties: ASTM A 615, Grade 517, continuous threaded bar.
 - .2 Bars to be 32 mm diameter continuous threaded bar, with lengths to suit the drawing details.
 - .3 Sleeve nuts, couplers, connector sleeves to have 100% of the tie rod load capacity
 - .4 Preassemble, mark and test tie rod assemblies in shop to ensure quality.
- .6 Nuts and bolts: hexagon nuts, bolts, and washers: to ASTM A325M.
- .7 Backfill material: to Section 31 23 33.01 - Excavating, Trenching and Backfilling.

2.2 SOURCE QUALITY CONTROL: COLD FORMED STEEL SHEET PILING

- .1 Provide results of tension tests of sheet piling material to be used on project as follows:
 - .1 One tension test from each heat for quantities of finished material less than 50 tonnes.
 - .2 Two tension tests from each heat for quantities of finished material exceeding 50 tonnes.
- .2 Tension tests in accordance with CAN/CSA-G40.20/G40.21.

- .3 Provide results of bend tests of sheet piling material to be used on project as follows:
 - .1 Bend tests in accordance with ASTM A6/A6M, with following amendments:
 - .1 S14.1 Bend tests to be performed with material in condition as used in cold forming operation. Three tests to be made from each heat and each thickness of material produced. Bend test specimens to be taken from edge of each coil. Longitudinal axis of specimen to be transverse to coil rolling direction.
 - .2 S14.1.1 - Except as provided below, bend test specimens to have minimum width to thickness ratio of 8, with both edges parallel throughout section in which bending occurs, and is maintained.
 - .3 S14.2 - Minor surface separations less than 0.8 mm in depth related to superficial steel surface or subsurface discontinuities to not cause rejection. Surface separations in excess of 0.8 mm depth and/or cracks normal to metal surface to cause rejection.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Do welding in accordance with CSA W59 except where specified otherwise.
- .2 Do not begin pile installation until required quality control tests have been completed and test results approved by Departmental Representative.
- .3 Submit full details of method and sequence of installation of piling to Departmental Representative for approval prior to start of pile installation work. Details must include templates, bracing, setting and driving sequence and number of piles in panels for driving.
- .4 Steel sheet piling walls:
 - .1 Clear rock and other obstructions on the harbor bed prior to sheet piling operations.
 - .2 Provide temporary templates or bracing to hold piles in alignment during setting and driving.
 - .3 Place panel of four to eight sheet piles in templates to prevent spreading of piles in panel.
- .5 When installation is complete, face of wall at top of sheet piles to be within 75 mm of location as indicated and deviation from vertical not to exceed 1 in 100.

3.2 OBSTRUCTIONS

- .1 If obstruction encountered during driving, leave obstructed pile and proceed to drive remaining piles. Return and attempt to complete driving of obstructed pile later.
- .2 Advise Departmental Representative immediately if impossible to drive pile to full penetration, and obtain direction from Departmental Representative on further steps required to complete Work.

3.3 HOLES

- .1 Patch holes in sheet pile wall, except where permanent holes are indicated.
 - .1 Use 10 mm thick plate of material equal to that of piling to patch holes and overlap not less than hole diameter.
 - .2 Weld to develop full strength of plate.
- .2 Drill any required holes in piling. Do not use flame cutting without permission of Departmental Representative.

3.4 CUTTING

- .1 When flame cutting tops of piles, and flame cutting holes in piles approved by Departmental Representative, use following procedure:
 - .1 When air temperature is above 0 degrees C, no pre-heat is necessary.
 - .2 When air temperature is below 0 degrees C, pre-heat until steel 25 mm on each side of line of cut has reached a temperature very warm to hand (approximately 35 degrees C). Temperature indicating crayon marks may be used to measure temperature.
 - .3 Use torch guiding device to ensure smooth round holes or straight edges.
 - .4 Make cut smooth and free from notches throughout thickness. If grinding is employed to remove notch or crack, finished radius to be minimum 5 mm.

3.5 SPLICING

- .1 Use full length piles with no splicing.

3.6 TIE ROD ANCHORAGE SYSTEM

- .1 Do not place backfill behind anchored bulkhead until piles have been completely driven, adjusted

and secured in final position by anchorage system.

- .2 Support tie rods at intervals along their length as indicated.
- .3 Fit and adjust tie rod systems so that connections at waling and anchor end of tie rods are tight before backfilling.
- .4 Saw cut tie-rods to required lengths. Do not flame cut.
- .5 At splices, butt the two ends of the tie-rods together. Locate the couplers such that they are centred over the joint. Tighten the locking nuts onto the couplers to create a rigid assembly.
- .6 Place granular sub-base material around tie-rods as indicated. Pack granular sub-base material below tie-rods to provide continuous supports. Compact to 100% Standard Proctor Density where the granular sub base materials are placed above the water level.
- .7 Ensure that the tie-rods are not disturbed when backfill is placed.

3.7 DEADMEN

- .1 Carefully align and place deadmen anchors as indicated.
- .2 Provide temporary support for the blocks in order to prevent movement and/or displacement.
- .3 After plate washers, nuts, and locking nuts are installed, place granular sub-base material evenly around the deadmen anchor as indicated.

3.8 BACKFILLING

- .1 Do not commence backfilling until tie-rods and anchor blocks have been installed.
- .2 Carefully place backfill materials between the new steel sheet piling and the existing structure.
- .3 Ensure that the steel sheet piling, tie-rods and anchoring systems, are not damaged when backfill material is placed.

PART 1 - GENERAL

1.1 MEASUREMENT PROCEDURES

- .1 Safety ladders will be measured by the number of units installed, including all labour, materials and equipment to fabricate and install.
- .2 Pile caps will be measured by the length, in metres, installed, including all labour, materials and equipment to fabricate and install.
- .3 Pipe railings will be measured by the length, in metres, installed, including all labour, materials and equipment to fabricate and install.
- .4 Cleaning, shop painting and field painting of steel pipe railings and associated hardware will not be measured separately for payment, but shall be considered included in the measurement for payment of pipe railings.

1.2 REFERENCES

- .1 Canadian Standards Association
 - .1 CSA G40.20/G40.21-04(R 2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-13, Welded Steel Construction (Metal Arc Welding)
- .2 ASTM
 - .1 ASTM A307-12 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod, 60 000 PSI Tensile Strength
- .3 The Society for Protective Coatings (SSPC)
 - .1 SSPC-SP 2-82(R2004), Hand Tool Cleaning.
 - .2 SSPC-SP 6/NACE No. 3-07, Commercial Blast Cleaning.
 - .3 SSPC-Vis-1-89, Visual Standard for Abrasive Blast Cleaned Steel (Standard Reference Photographs) Editorial Changes September 1, 2000 (Steel Structures Painting Manual, Chapter 2 - Surface Preparation Spec.).
 - .4 SSPC-PA 2-04, Measurement of Dry Coat Thickness with Magnetic Gauges.
 - .5 SSPC Good Painting Practices, Volume 1, 4th Edition.

1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Shop Drawings:
 - .1 Prior to fabrication, submit fabrication shop drawings with general layout, detailed dimensions, welding details, fastener details and all other relevant information necessary for fabrication.
 - .2 Submit manufacturer's instructions, printed product literature and data sheets for paint, MSDS sheets, surface preparation requirements, application temperature/conditions, finish and limitations.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Structural steel for rolled sections: to CAN/CSA-G40.21, Grade 350W.
- .2 Structural steel for plates and miscellaneous steel: to CAN/CSA-G40.21, Grade 300W.
- .3 Pipe railing hardware: Anchor bolts, anchor coil bolts, nuts and washers to ASTM A307.
- .4 Paint for Steel Pipe Railing and pile caps: high performance, multi-purpose, surface tolerant, epoxy coating.
 - .1 Volume Solid: 68%
 - .2 Minimum Dry Film Thickness: 100 microns.
 - .3 Grey (subject to final approval of the Departmental Representative)
- .5 Sand for sandblasting: to SSPC.

PART 3 - EXECUTION

3.1 STEEL FABRICATION

- .1 Fabricate steel components as detailed on drawings and weld according to CSA W59.
- .2 All flame cut edges shall be as smooth and regular as those produced by edge planing and shall be free of slag.
- .3 Surfaces to be welded shall be smooth, uniform and free from birs, fins and other defects which would adversely affect the quality and uniformity of the weld.

3.2 SAFETY LADDERS

- .1 Fabricate as detailed on drawings.
- .2 Provide access and install ladders.

- .3 Field weld ladder to the sheet pile and grind all field welds smooth.

3.3 PILE CAPS

- .1 Fabricate as detailed on drawings and shop apply coatings.
- .2 Install steel pile caps and field weld to sheet piling as indicated on the drawings. Where the cap is not fully supported on the sheet piles due low cutoff elevations, weld angles for support and connection to sheeting.
- .3 Touch up coating on pile caps damaged by handling and installation.

3.4 PIPE RAILINGS

- .1 Fabricate as detailed on drawings and shop apply coatings.
- .2 Install steel pipe railings as specified and indicated on the drawings.
- .3 Pipe railing shall typically be placed on new pile caps. Install railing on existing concrete deck where applicable. Dowels into concrete shall be as specified in Section 03 30 00.
- .4 Touch up coating on pipe railing damaged by handling, installation and field welding.

3.4 PAINTING PREPARATION

- .1 Clean surfaces of metal to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and foreign substances in accordance with SSPC-SP6 Commercial Blast Cleaning.
- .2 Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, by blowing with clean dry compressed air, or by vacuum cleaning.
- .3 Prior to starting paint application ensure degree of cleanliness of surfaces is to SSPC-Vis 1.
 - .1 Apply primer, paint, or pretreatment after surface has been cleaned and before deterioration of surface occurs.
 - .2 Clean surfaces again if rusting occurs after completion of surface preparation.
- .4 Mixing paint:
 - .1 Do not dilute or thin paint for brush application.
 - .2 Mix ingredients in container before and

during use and ensure breaking up of lumps, complete dispersion of settled pigment, and uniform composition.

.3 Do not mix or keep paint in suspension by means of air bubbling through paint.

.4 Thin paint for spraying according to manufacturer's written instructions.

3.4 PAINTING APPLICATION

- .1 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Paint shall be applied by spray, brush, or roller.
- .3 Where surface to be painted is not under cover, do not apply paint when:
 - .1 Air temperature is below 5 degrees C or when temperature is expected to drop to 0 degrees C before paint has dried.
 - .2 Temperature of surface is over 50 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Fog or mist occur at site; it is raining or snowing; there is danger of rain or snow; relative humidity is above 85%.
 - .4 Surface to be painted is wet, damp or frosted.
 - .5 Previous coat is not dry.
- .4 Supply cover when paint must be applied in damp or cold weather. Supply, shelter, or heat surface and surrounding air to comply with temperature and humidity conditions specified. Protect until paint is dry or until weather conditions are suitable.
- .5 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.
- .6 Apply each coat of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .7 Shop painting:
 - .1 Do shop painting after fabrication and surface preparation and before damage to surface occurs from weather or other exposure.
 - .2 Do not paint metal within 50 mm of edge to be welded. Give unprotected steel one coat of approved protective coating after shop fabrication is completed.
 - .3 Remove weld spatter before painting.
- .8 Field painting:
 - .1 Touch up metal which has been shop coated

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with same type of paint and to same thickness as shop coat.

- .9 Handling painted metal:
 - .1 Handle painted metal after paint has dried, or when necessary for handling for painting or stacking for drying.
 - .2 Scrape off and touch up paint which is damaged in handling, with same number of coats and kinds of paint as were previously applied to metal.

Appendix A

Geotechnical Investigations



• Fisheries and Oceans Canada

Geotechnical Investigation

Type of Document
FINAL

Project Name

Project Number
KCH-00215059-GE

Prepared By:
exp Services Inc.
15701 Robin's Hill Road, Unit 2
London, ON N5V 0A5
Canada

Date Submitted
October 25, 2013

Fisheries and Oceans Canada

Geotechnical Investigation

Project Name:

Bayfield Harbour, Ontario

Project Number:

KCH-00215059-GE

Prepared By:

exp

15701 Robin's Hill Road, Unit 2

London, ON N5V 0A5

Canada

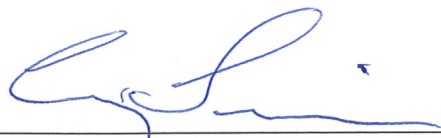
T: 519-963-3000

F: 519-963-1152

www.exp.com



Geordy Fournier, P. Eng.
Geotechnical Services

for 
Rebecca Walker, P. Eng.
Discipline Manager, Earth and Environment

Date Submitted:

October 25, 2013

Legal Notification

This report was prepared by exp Services Inc. for the account of **Fisheries and Oceans Canada**.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. **Exp** Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

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1 Introduction and Background

Exp Services Inc. (**exp**) was retained by Fisheries and Oceans Canada to conduct a Geotechnical Investigation at Bayfield Harbour in Bayfield, Ontario, hereinafter referred to as the 'site'. Authorization for **exp** to proceed with the Geotechnical Investigation was given by Mr. Mike Macdiarmid, P. Eng., of Fisheries and Oceans Canada.

Based on an interpretation of the factual test hole data and a review of subsurface information from test holes advanced at the site, **exp** has provided geotechnical engineering comments.

1.1 Terms of Reference

The geotechnical investigation was generally done in accordance with Terms of Reference.

The purpose of the investigation was to determine subsurface conditions at specific locations of the harbour. Based on an interpretation of the factual test hole data, and a review of soil and groundwater information from test holes advanced at the site, **exp** has provided geotechnical engineering comments.

This report is provided on the basis of the terms of reference presented above and on the assumption that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning geotechnical aspects of the codes and standards, this office should be contacted to review the design.

The information in this report in no way reflects on the environmental aspects of the soil. Should specific information in this regard be needed, additional testing may be required.

2 Methodology

The fieldwork for this investigation was carried out on October 17 and 22, 2013. During this time, two (2) sampled boreholes were advanced at the approximate locations shown on the attached Borehole Location Plan (Drawing. 1). Borehole 1 was located on the North Pier adjacent to the beach area. Borehole 2 was drilled at the mouth of Bayfield River, next to the South Pier.

The boreholes were advanced to depths of about 9.3 to 10.0 m below ground surface/harbour bottom using a locally sub-contracted, portable rig that was truck-mounted and barge-mounted. The boreholes were advanced by tri-coning and casing installation and sample were recovered using split spoon sampling techniques.

Within the boreholes, Standard Penetration Tests (SPTs) were performed to assess the compactness of the underlying soils and to obtain representative samples. In cohesive soils, pocket penetrometer readings were taken to assess the undrained shear strength. During the drilling, the stratigraphy in the boreholes was examined and logged in the field by exp geotechnical personnel. Short-term groundwater level observations within the open boreholes and the natural moisture contents of recovered soil samples were recorded on the borehole logs.

The fieldwork was supervised by a member of the **exp** technical staff who directed the drilling and sampling operations, and logged the samples. All samples recovered were transported to **exp**'s London laboratory for detailed examination and selective testing. Laboratory testing for this investigation consisted of routine moisture content determinations, with results presented on the attached Borehole Logs. Unit weight determinations and a grain size analysis were also conducted on selected soil samples.

Samples remaining after the classification testing will be stored for a period of three months following the date of sampling (i.e., until January, 2014). After this time, they will be discarded unless prior arrangements have been made for longer storage.

The locations of the boreholes were established in the field by exp. The ground surface elevations of the boreholes were referenced to geodetic survey data provided by the Canadian Hydrographic Service on the Fisheries and Oceans website.

3 Site and Subsurface Conditions

3.1 Site Description

A review of available surficial geology maps indicates that beneath any fill, the predominant native deposits in the vicinity of the harbour consist of lacustrine shoreline deposits of sand and gravel, overlain by a clayey silt till known as the St. Joseph Till. The overburden is underlain by grey, fossiliferous, medium to thick-bedded limestones with minor dolomite (reference Preliminary Map 1232, Quaternary Geology of Goderich Area, Southern, Ontario Geological Survey, 1977).

3.2 Soil Stratigraphy

The detailed stratigraphy encountered in the boreholes is detailed in the borehole logs found in Appendix B. The stratigraphy is summarized in the following paragraphs. It must be noted that boundaries of soil indicated in the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect transition zones for the purposes of geotechnical design and should not be interpreted as exact planes of geological change.

3.2.1 Sand

At Borehole 1, sand was encountered at surface, to a depth of about 1.5 m, Elevation 172.54 m. The sand was noted to be greyish-brown, fine-grained, with traces of silt and gravel. The compactness condition of the sand is dense, based on a Standard Penetration Test (SPT) N-value of 36 blows per 300 mm penetration of the spoon. The *in situ* moisture content of the sand is in the order of 19 percent, indicating wet/saturated conditions.

For design purposes, the soil parameters of the sand are:

$$\phi = 35^\circ$$

$$K_a = 0.27$$

$$K_p = 3.7$$

3.2.2 Sand and Gravel

At Borehole 2, sand and gravel was encountered at harbour bottom, to a depth of about 3 m, Elevation 170.71 m. In general, the sand and gravel was noted to be grey with traces of silt and have some organic odours. The compactness condition of the sand and gravel is compact, based on SPT N-values of 10 to 11 blows per 300 mm penetration of the spoon. The *in situ* moisture content of the sand and gravel is greater than 23 percent, indicating wet/saturated conditions.

For design purposes, the soil parameters of the sand and gravel are:

$$\phi = 35^\circ$$

$$K_a = 0.27$$

$$K_p = 3.7$$

3.2.3 Gravel

Beneath the sand and gravel, at Borehole 2, a layer of gravel was encountered to a depth of about 4.5 m, Elevation 169.21 m. The gravel layer was noted to consist of fine gravel and coarse-grained sand with traces of cobbles. The compactness condition of the sand and gravel is dense based on a SPT N-value of 40 blows per 300 mm penetration of the spoon. The *in situ* moisture content of the gravel is in the order of 12 percent, indicating wet/saturated conditions.

For design purposes, the soil parameters of the gravel are:

$$\phi = 40^\circ$$

$$K_a = 0.22$$

$$K_p = 4.6$$

3.2.4 Clayey Silt Till

Beneath the granular layers at both borehole locations, a clayey silt till was encountered to depths from 9.1 to 10.0 m below existing grade, Elevation 164.01 to 164.61 m. In general, the clayey silt till was noted to be grey and contains traces of fine rounded gravel. Based on pocket penetrometer readings of undrained shear strength, the consistency of the clayey silt till is generally very stiff to hard. Below a depth of 7.6 m in Borehole 2, the clayey silt till was noted to be stiff.

The *in situ* moisture content of the clayey silt ranges from about 10 to 15 percent, indicating moist conditions. The unit weight of the clayey silt is 22.8 to 23.3 kN/m³, as determined by laboratory testing. A grain size analysis was conducted on a sample from BH2 at a depth of about 6.1 to 6.5 m. The result of the grain size analysis indicates that the till typically consists of 20% Gravel, 6% Sand, 50% Silt, and 24% Clay. A copy of the grain size analysis is included as Drawing 2.

For design purposes, the soil parameters of the clayey silt till are:

$$\phi = 40^\circ$$

$$K_a = 0.22$$

$$K_p = 4.6$$

$$\gamma = 23 \text{ kN/m}^3$$

$$c = 10 \text{ kPa}$$

3.2.5 Bedrock

The clayey silt till at Borehole 2 is underlain by limestone bedrock at depth of about 9.1 m depth, Elevation 164.61 m. Auger refusal and/or sampler refusal on bedrock was met at about 9.34 m. Bedrock at the site was confirmed to be limestone of the Dundee Formation. In general, the bedrock was noted to be grey with black zones and the rock fragments were hard.

3.3 Groundwater Conditions

Details of the groundwater conditions observed within the boreholes are provided on the attached Borehole Logs. Moisture contents of all retained samples are also recorded on the attached Borehole Logs. Upon completion of drilling and removing the augers and casing, free water was at surface, consistent with underwater drilling.

4 General Limitations

The information presented in this report is based on a limited investigation designed to provide information regarding the current conditions within the subject property. The conclusions and recommendations presented in this report reflect site conditions existing at the time of the investigation. Consequently, during the future development of the property, conditions not observed during this investigation may become apparent. Should this occur, exp Services Inc. should be contacted to assess the situation, and the need for additional testing and reporting. **Exp** has qualified personnel to provide assistance in regards to any future geotechnical and environmental issues related to this property.

Our undertaking at exp, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the engineering profession. It is intended that the outcome of this investigation assist in reducing the client's risk associated with environmental impairment. Our work should not be considered 'risk mitigation'. No other warranty or representation, either expressed or implied, is included or intended in this report.

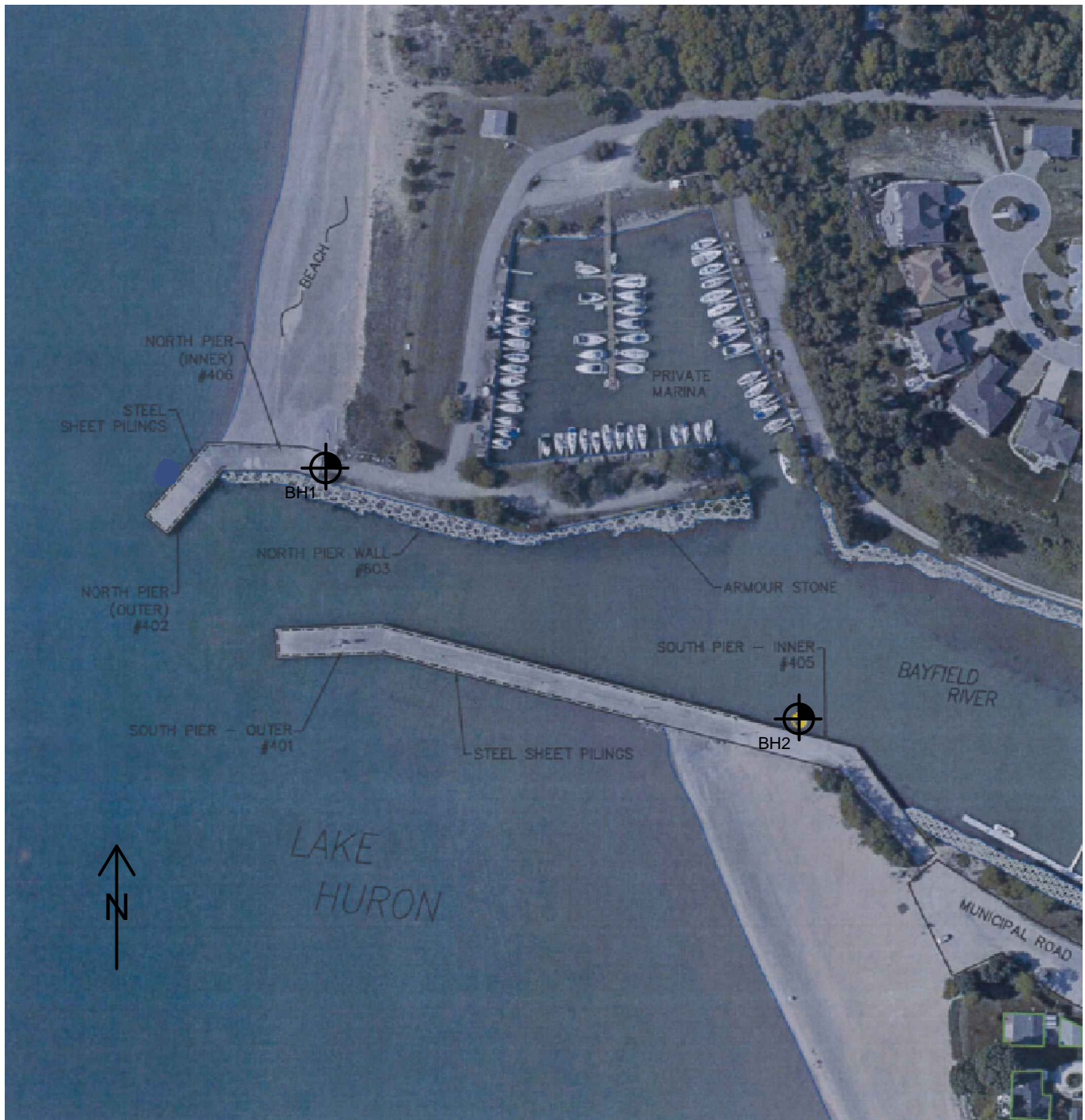
The comments given in this report are intended only for the guidance of design engineers. The number of test holes required to determine the localized underground conditions between test holes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

Exp Services Inc. should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not afforded the privilege of making this review, **exp** Services Inc. will assume no responsibility for interpretation of the recommendations in this report

This report was prepared for the exclusive use of the Fisheries and Oceans Canada and may not be reproduced in whole or in part, without the prior written consent of exp, or used or relied upon in whole or in part by other parties for any purposes whatsoever. Any use which a third party makes of this report, or any part thereof, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. **Exp** Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We trust this report is satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

Appendix A – Drawings



BOREHOLE LOCATION PLAN

LEGEND

1:2000

NOTES



APPROXIMATE BOREHOLE LOCATION

1. THE BOUNDARIES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT TEST HOLE LOCATIONS. BETWEEN TEST HOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR.
2. SOIL SAMPLES WILL BE RETAINED IN STORAGE FOR 3 MONTHS AND THEN DESTROYED UNLESS CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. TOPSOIL QUANTITIES SHOULD NOT BE ESTABLISHED FROM THE INFORMATION PROVIDED AT THE TEST HOLE LOCATIONS.



exp Services Inc.

T: +1.519.745.5146 | F: +1.519.745.5145
405 Maple Grove Rd.
Cambridge, ON N3E 1B6
Canada
www.exp.com

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• INFRASTRUCTURE • SUSTAINABILITY •

DRAWING TITLE:

BOREHOLE LOCATION PLAN,
GEOTECHNICAL INVESTIGATION
BAYFIELD HARBOUR, ONTARIO

JOB #: KCH-00215059-GE

DWN.: MD

SCALE: 1:2000

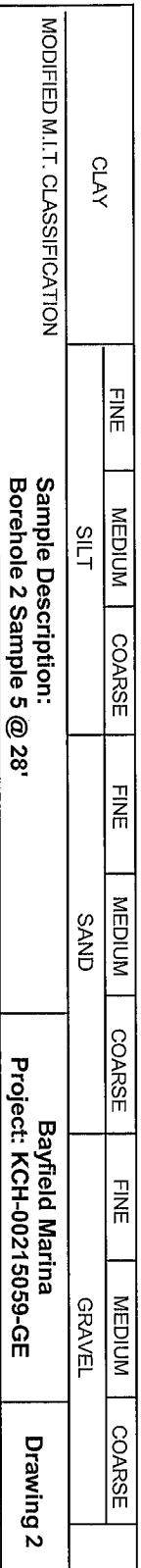
CHKD.: GF

DATE: OCTOBER, 2013

DWG. No.: 1



Q Z - S S A U H Z M O R M U



Appendix B – Borehole Logs

NOTES ON SAMPLE DESCRIPTIONS

1. All descriptions included in this report follow the 'modified' Massachusetts Institute of Technology (M.I.T.) soil classification system. The laboratory grain-size analysis also follows this classification system. Others may designate the Unified Classification System as their source; a comparison of the two is shown for your information. Please note that, with the exception of those samples where the grain size analysis has been carried out, all samples are classified visually and the accuracy of the visual examination is not sufficient to differentiate between the classification systems or exact grain sizing. The M.I.T. system has been modified and the **exp** classification includes a designation for cobbles above the 75 mm size and boulders above the 200 mm size.

UNIFIED SOIL CLASSIFICATION	Fines (silt and clay)		Sand			Gravel		Cobbles	
			Fine	Medium	Coarse	Fine	Coarse		
M.I.T. SOIL CLASSIFICATION	Clay	Silt	Sand			Gravel			
			Fine	Medium	Coarse				
	Sieve Sizes								
Particle Size (mm)	0.002	0.06	0.075	0.2	0.6	2.0	5.0	20	80

2. **Fill:** Where fill is designated on the borehole log, it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description therefore, may not be applicable as a general description of the site fill material. All fills should be expected to contain obstructions such as large concrete pieces or subsurface basements, floors, tanks, even though none of these obstructions may have been encountered in the borehole. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact and correct composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. The fill at this site has been monitored for the presence of methane gas and the results are recorded on the borehole logs. The monitoring process neither indicates the volume of gas that can be potentially generated or pinpoints the source of the gas. These readings are to advise of a potential or existing problem (if they exist) and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic waste that renders the material unacceptable for deposition in any but designated land fill sites; unless specifically stated, the fill on the site has not been tested for contaminants that may be considered hazardous. This testing and a potential hazard study can be carried out if you so request. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common, but not detectable using conventional geotechnical procedures.
3. **Glacial Till:** The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process, the till must be considered heterogeneous in composition and as such, may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (75 to 200 mm in diameter) or boulders (greater than 200 mm diameter) and therefore, contractors may encounter them during excavation, even if they are not indicated on the borehole logs. It should be appreciated that normal sampling equipment can not differentiate the size or type of obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited area; therefore, caution is essential when dealing with sensitive excavations or dewatering programs in till material.



BOREHOLE LOG

BH1

Sheet 1 of 1

PROJECT **Bayfield Harbour**PROJECT NO. **KCH-00215059-GE**CLIENT **Fisheries and Oceans Canada**DATUM **Geodetic**DRILL TYPE/METHOD **Tri-Cone & Casing**DATES: Boring **October 22, 2013**Water Level **October 22, 2013**

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES			PENETROMETER (kPa)	SHEAR STRENGTH	
					TYPE	NUMBER	RECOVERY (mm or %)		N VALUE (blows) or RQD (%)	Field Vane Test (#=Sensitivity)
										▲ Penetrometer ■ Torvane
										100 200 kPa
										Atterberg Limits and Moisture
										W _p W _L
										● SPT N Value X Dynamic Cone
										10 20 30 40
0	174.04	SAND: Greyish-brown, fine-grained, traces of silt and gravel, wet, dense				S1	370	36		
1										
2	172.54	CLAYEY SILT TILL: Grey, traces of fine rounded gravel, very stiff to hard				S2	370	57	192	
3										
4		Unit Weight= 22.8 kN/m ³				S3	370	56	215	
5										
6						S4	370	57	215	
7										
8		Unit Weight= 23.3 kN/m ³				S5	410	54	215	
9										
10						S6	410	53	215	
11										
12						S7	370	34	120	
13						S8	400			
	164.04	End of Borehole at 10.0 m depth.								

NOTES

- Borehole interpretation requires assistance by exp before use by others.
Borehole Log must be read in conjunction with exp report KCH-00215059-GE.
For definition of terms used on log, see sheets prior to log.
- After removing augers, borehole open to 9.1 m.

SAMPLE LEGEND

☒ AS Auger Sample ☒ SS Split Spoon ■ ST Shelby Tube
☐ Rock Core (eg. BQ, NQ, etc.) ☐ VN Vane Sample

OTHER TESTS

G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
Y Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS

▽ Apparent ▼ Measured ▲ Artesian (see Notes)



BOREHOLE LOG

BH2

Sheet 1 of 1

PROJECT **Bayfield Harbour**PROJECT NO. **KCH-00215059-GE**CLIENT **Fisheries and Oceans Canada**DATUM **Geodetic**DRILL TYPE/METHOD **Tri-Cone & Casing**DATES: Boring **October 17, 2013**Water Level **October 17, 2013**

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES				PULVUL-ROSE-IL-IR (kPa)	SHEAR STRENGTH																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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For definition of terms used on log, see sheets prior to log.
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SAMPLE LEGEND

- ☒ AS Auger Sample ☒ SS Split Spoon ■ ST Shelby Tube
☐ Rock Core (eg. BQ, NQ, etc.) ☐ VN Vane Sample

OTHER TESTS

- G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
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K Lab Permeability DS Direct Shear

WATER LEVELS

- ▽ Apparent ▼ Measured ▲ Artesian (see Notes)