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**SPECIFICATIONS FOR
HORSESHOE LAKE DAM
REHABILITATION**

Issued for Tender

WSP PROJECT No: 121-15275-52

PCA PROJECT No: 30025849

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Canada

Section	Title	Pages
<u>Division 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS</u>		
00 00 00	SPECIFICATION TITLE SHEET	1
00 00 01	LIST OF CONTENTS	2
00 00 07	SEALS PAGE	1
00 01 12	LIST OF DRAWINGS	2
<u>Division 01 - GENERAL REQUIREMENTS</u>		
01 11 00	SUMMARY OF WORK	5
01 14 00	WORK RESTRICTIONS	3
01 22 01	MEASUREMENT AND PAYMENTS	11
01 31 19	PROJECT MEETINGS	3
01 32 16.07	CONSTRUCTION PROGRESS SCHEDULE - BAR (GANTT) CHART	4
01 33 00	SUBMITTAL PROCEDURES	6
01 35 29.06	HEALTH AND SAFETY REQUIREMENTS	6
01 35 43	ENVIRONMENTAL PROCEDURES	9
01 41 00	REGULATORY REQUIREMENTS	2
01 42 13	ABBREVIATIONS AND ACRONYMS	8
01 45 00	QUALITY CONTROL	2
01 47 15	SUSTAINABLE REQUIREMENTS CONSTRUCTION	4
01 48 00	CONSTRUCTION CONTROL AND MONITORING	7
01 51 00	TEMPORARY UTILITIES	3
01 52 00	CONSTRUCTION FACILITIES	5
01 56 00	TEMPORARY BARRIERS AND ENCLOSURES	2
01 71 00	EXAMINATION AND PREPARATION	2
01 74 11	CLEANING	3
01 74 21	CONSTRUCTION/DEMOLITION WASTE MANAGEMENT AND DISPOSAL	7
01 77 00	CLOSEOUT PROCEDURES	2
01 78 00	CLOSEOUT SUBMITTALS	4
<u>Division 02 - EXISTING CONDITIONS</u>		
02 41 16	STRUCTURE DEMOLITION	6
02 41 21	REMOVALS	2
02 81 01	HAZARDOUS MATERIALS	5
<u>Division 03 - CONCRETE</u>		
03 10 00	CONCRETE FORMING AND ACCESSORIES	8
03 20 00	CONCRETE REINFORCING	4
03 30 00	CAST-IN-PLACE CONCRETE	10
03 35 00	CONCRETE FINISHING	4
<u>Division 05 - METALS</u>		
05 05 20	ANCHORS	3
05 50 00	METAL FABRICATIONS	7
<u>Division 31 - EARTHWORKS</u>		
31 05 16	AGGREGATE MATERIALS	5
31 11 00	CLEARING AND GRUBBING	5
31 23 16.26	ROCK REMOVAL	3
31 23 33.01	EXCAVATING, TRENCHING AND BACKFILLING	12
31 24 13	ROADWAY EMBANKMENTS	7

31 32 19.01	GEOTEXTILES	4
31 37 00	RIP RAP	2

Division 32 - EXTERIOR IMPROVEMENTS

32 91 19.13	TOPSOIL PLACEMENT AND GRADING	6
32 93 10	TREES, SHRUBS AND GROUND COVER PLANTING	10
32 94 00	GENERAL LANDSCAPING	3

Division 35 - WATERWAY AND MARINE CONSTRUCTION

35 20 22	DEWATERING	8
35 42 19	PRESERVATION OF WATERCOURSES	2
35 62 16	COFFERDAMS	4

APPENDICES

Appendix A	Geotechnical Report
Appendix B	USEPA Stormwater Best Management Practice Concrete Washout
Appendix C	Reptile and Amphibian Exclusion Fencing
Appendix D	Proposed Road Detour Plan
Appendix E	Recommended Contents of Environmental Management Plans
Appendix F	Temporary Sill Concrete Test Results

END OF SECTION

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END OF SECTION

LIST OF DRAWINGS

<u>DRAWING</u>	<u>TITLE</u>
100	COVER SHEET AND DRAWING LIST
101	EXISTING CONDITIONS - PLAN VIEW
102	EXISTING CONGDITIONS - ELEVATION AND SECTIONS
103	PROPOSED CONSTRUCTION STAGING PLAN STAGE 1 TO 4
104	PROPOSED CONSTRUCTION STAGING PLAN STAGE 5 TO 7
105	REMOVALS
106	CONSTRUCTION FINAL GENERAL ARRANGEMENT
107	CONSTRUCTION ELEVATION AND SECTIONS
108	REINFORCING DECK
109	REINFORCING PIER SECTION AND SILL SLAB
110	CONSTRUCTION - EAST ABUTMENT
111	JACKING BRACKET DETAILS
112	LOG PINNING SYSTEM - GENERAL ASSEMBLY AND DETAILS
113	GAIN COVER DETAILS
114	MISCELLANEOUS METAL
115	MISCELLANEOUS DETAILS
116	PUBLIC SAFETY PLAN
117	STANDARD DETAILS 1
118	STANDARD DETAILS 2
119	STANDARD DETAILS 3
120	STANDARD DETAILS 4

END OF SECTION

PART 1 - GENERAL

- 1.1 PRECEDENCE .1 For Federal Government Projects Division 1 sections take precedence over technical specifications in other Divisions.
- 1.2 RELATED SECTIONS .1 Section 01 14 00 - Work Restriction
- .2 Section 01 33 00 - Submittal Procedures
- .3 Section 01 35 43 - Environmental Procedures
- .4 Section 01 41 00 - Regulatory Requirements
- .5 Section 01 71 00 - Examination and Preparation
- 1.3 WORK COVERED BY CONTRACT DOCUMENTS .1 Work of this Contract is comprised of the demolition and reconstruction of the east portion of the Horseshoe Lake Dam, located in Minden Hills, Ontario on the Gull River; and further identified as Parks Canada Project Number 30025849.
- .2 Work includes demolition and removal of the east portion of the existing Horseshoe Lake Dam, including the temporary sluice 2 and sill, the concrete deck, the concrete piers, embedded metals, the abutments and the partial demolition and removal of the sill, as shown on the drawings.
- .3 Work includes the careful removal, in a manner to prevent damage, of all signage and railings at the site. These items are intended to be salvaged and reused and will remain the property of the Owner.
- .4 Work includes the careful removal, in a manner to prevent damage, of the existing crab winches and stoplogs during staged construction. Prior to cofferdam installation, crab winches are to be removed from the site and brought to PCA's shop for modification. Temporary winches are to be brought from PCA's shop to the site, and installed for temporary operation of Sluice 1 by the dam operators. Once the dam deck is fully constructed and the winch modifications are complete, the temporary winches are to be brought from the site to PCA's shop, and the modified winches are to be brought from PCA's shop to the site.
- .5 Work includes the delivery, assembly (if applicable) and installation of owner-supplied metals including log-pinning mechanisms, stoplog sills, main stoplog gain liners, aluminum stoplog gain covers, 60lb rails, jacking pins, steel pier nosing and service gain liners, half steel pier nosing and service gain liners, log rests, and
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fixed bollards.

- .6 Work includes backfilling of the pedestrian walkway as shown on the contract drawings.
 - .7 Work includes the restoration of the Whitewater property on the East side.
 - .8 Work includes off-site disposal of material.
 - .9 Work includes the construction of temporary cofferdams to enable dewatering of the site. The design and installation of the cofferdams is solely the responsibility of the Contractor. The cofferdam shall be designed for, at minimum, the water levels, flows, and velocities associated with the 20 year return flood for the period of construction. The Contractor is responsible for the control of water flow in the work area; disposal of excess water shall be in accordance with existing regulations and any required permits.
 - .10 Work includes the provision and installation of all additional dam appurtenances shown on the contract drawings including but not limited to:
 - .1 Additional signage and life rings/throw lines;
 - .2 Handrails and fencing;
 - .3 Vehicle guiderail extensions;
 - .4 Retractable bollards;
 - .5 Davit crane and recessed socket;
 - .6 Steel plate storage box
 - .7 Ramps and pathways;
 - .11 Work includes the installation and maintenance of all environmental protection measures as well as monitoring for the effectiveness of environmental protection measures.
 - .12 Work shall include provision of all machinery, tools, vehicles, or other equipment required to perform the work.
 - .13 Work shall include provision of all labour, skilled trades, supervision staff, divers, health and safety staff, sub-trades and other staff required to perform the work.
 - .14 Work shall include provisions to carry out all required permits applications and associated fees in order to complete the works.
 - .15 Work shall include the removal and/or replacement of components of the existing data collection, storage and transmission system as described on the drawings.
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.16 At the completion of the work, the site is to be restored to original site conditions unless indicated otherwise in drawings and specifications.

.17 Work shall include the provision of all surveying services required to ensure accurate lines and levels and shall also include the installation of new geodesic benchmarks on the completed dam.

1.4 CONTRACT METHOD

.1 Lump sum and unit prices contract

.2 Submit list of subcontractors.

1.5 WORK SEQUENCE

.1 Construct Work in stages to accommodate the flow of water equivalent to at least two sluices over the construction period. At least one sluice (existing or new) must be open at all times. A temporary control structure must be installed in the north end of the upstream cofferdam structure such that if required, a flow equivalent to the flow of one sluice can be diverted through the work site to the downstream reach.

.2 Construct Work in stages to minimize the need for a road closure.

.3 Coordinate Work Schedule with Departmental Representatives.

.4 Perform Work in a manner to maintain access routes and other operational and safety requirements for the Owner and Departmental Representative.

.5 All sluices in the Horseshoe Lake Dam must be operational by no later than the date specified for such in Section 01 14 00 -Work Restrictions.

1.6 WORK BY OTHERS

.1 The Contractor shall for the purpose of the Ontario Occupational Health and Safety Act and Regulation for Construction Projects, and for the duration of the Work of the Contract:

.1 Assume the role of Constructor in accordance with the Authority Having Jurisdictions.

1.7 CONTRACTOR USE OF PREMISES

.1 Limit use of premises to the work of this project, including storage in designated areas and site access.

.2 Allow for Owner and Departmental Representatives access.

.3 Coordinate use of premises under direction of the Departmental Representative.

- .4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
 - .5 Prevent injury or damage to all existing items or property which is not part of the work.
 - .6 Repair or replace existing items or property which is not part of the work that are altered during construction operations to match existing or adjoining work.
 - .7 At completion of operations, the condition of existing items or property which are not part of the work to be equal to or better than before new work started.
- 1.8 OWNER OPERATION OF DAM
- .1 Owner will occupy premises during entire construction period for execution of normal dam operations.
 - .2 Provide access for Owner Representatives to operate the dam.
 - .3 Cooperate with Departmental Representative in scheduling operations to minimize conflict and to facilitate ongoing usage.
- 1.9 ALTERATIONS TO EXISTING SITE
- .1 Execute work with least possible interference or disturbance to property, operations and normal use of premises by the Owner and the Departmental Representative.
- 1.10 COMMUNICATION PROTOCOL
- .1 Due to the nature of the work of ongoing water management and control issues, a communication protocol will need to be established between the Departmental Representative, the Contractor and PCA, prior to the commencement of work (i.e. during the startup meeting).
 - .2 In general terms the Communication Protocol will address:
 - .1 Daily communication related to water management and control;
 - .2 Communication related to urgent safety concerns;
 - .3 Communication related to scheduled and unscheduled PCA operation activities;
 - .4 Communication related to construction and contract issues;
 - .5 Communication with the general public.
- 1.11 RECORD DRAWINGS
- .1 As work progresses, maintain accurate records to show deviations from contract drawings. Submit one (1) set of record drawings just prior to the

Departmental Representative's inspection of the work for issuance of the Final Certificate of Completion.

1.12 SIGNS

- .1 Provide common use signs related to traffic and navigation control, information, instruction, use of equipment, public safety devices, etc., in both official languages or by the use of commonly understood graphic symbols to the Departmental Representative's approval.
- .2 No Advertising will be permitted on this project.
- .3 PCA will provide a project sign which is to be installed by the contractor.

1.13 REGULATORY REQUIREMENTS

- .1 Fee Permits, Certificates: Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of authority having jurisdiction.
- .2 The submission of a tender will be construed as the Tenderer's declaration that they have discussed the approval requirements with the appropriate levels of government. The Contractor will not make any claim for additional compensation due to delays on commencing work due to compliance with the above.

1.14 DOCUMENTATION

- .1 Maintain on site, one copy of each document as follows:
 - .1 Work Permit,
 - .2 Contract Drawings (Full Size),
 - .3 Specifications,
 - .4 Addenda,
 - .5 Reviewed Shop Drawings,
 - .6 List of Outstanding Shop Drawings,
 - .7 Field Test Reports,
 - .8 Copy of Approved Work Schedule,
 - .9 Site Specific Health and Safety Plan,
 - .10 Environmental Protection Plan
- .2 Other related documents as specified herein.

END OF SECTION

PART 1 - GENERAL

1.1 ACCESS AND
EGRESS

- .1 Before bidding, the Contractor shall fully familiarize himself with access considerations of the site of the proposed work, and shall fully inform himself of the existing conditions and limitations.
- .2 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND
FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Where security is reduced by work provide temporary means to maintain security.
- .3 Contractor is responsible to provide sanitary facilities for use by Contractor's personnel and to keep facilities clean.
- .4 Closures: protect work temporarily until permanent enclosures are completed.

1.3 EXISTING
SERVICES

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions at minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for personnel, and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00.

1.4 SPECIAL
REQUIREMENTS

- .1 The restriction period for in-water work is May 1 to July 15. During the restriction period, the Contractor is not permitted to engage in any activity that may cause disturbance of the watercourse bottom and dispersion of sediment. Examples of prohibited activities include in-water

- excavation, in-filling, rock/armour stone placement, in-water concrete/tremie pours, and transfer/movement of granular material or aggregate. Transfer of cofferdam between phases (e.g. sheet piles) may be permitted during the restriction period, so long as the Contractor follows all required mitigations during the restriction period. Contractor to complete the installation and removal of cofferdam supporting elements (e.g. H-Piles, anchor plates etc.) outside of the restriction period.
- .2 Stoppage of flows during the construction work will not be permitted. Two sluiceways must be maintained operational at all times, this includes during the installation, transfer and removal of cofferdams. Contractor to include provisions for safe in-water work under continuous flows.
- .3 Maintain a dry work zone at all times. Take necessary measures to seal rock faults and fractures to ensure a dry work zone.
- .4 Refer to impact analysis for details of the restriction window and required mitigations.
- .5 Where possible, site clearing/commencement of construction should be planned to occur outside of sensitive bird nesting times - April 8th to August 28th. If this is not feasible, then the site must be inspected by a biologist prior to clearing, to identify any potential for nests.
- .6 Water levels can vary beyond the control of Parks Canada. The Navigation Season is typically from Victoria Day to Thanksgiving. However normal levels are as follows:
- .1 During the navigation season, the normal headwater level is 306.34 m.
- .2 During the non-navigation season, the normal headwater level is 306.17 m.
- .3 The normal tailwater level is 305.12 m.
- .4 Historical minimums, maximums, averages and daily levels for this year can be found at:
http://www.pc.gc.ca/lhn-nhs/on/trentsevern/visit/ne-wl/trent_e.asp
- .7 Carry out noise generating work Monday to Friday from 08:00 to 20:00 hours during the period of July 1 to September 15. Carry out noise generating work Monday to Friday from 07:00 to 20:00 hours during the rest of the year.
- .8 Submit schedule in accordance with Section 01 32 16.07.

- .9 Dam removal and related in-water works to be scheduled in accordance with the construction window outlined in Section 01 32 16.07.
- .10 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .11 Keep within limits of work and avenues of ingress and egress.
- .12 Subsurface utility protection (gas and water mains):
 - .1 The use of weighted and heavy equipment loads to be distributed and bridge over subsurface utilities to prevent load impact on subsurface utilities.
- .13 Hydro and Bell overhead wires to be protected.
- .14 Horseshoe Lake Road may need to be closed as part of the staged demolition and construction.
 - .1 Contractor to post advanced notice road sign boards within 2 weeks of contract award.
 - .2 Sign boards are to provide minimum 14 days of notice of road closure
 - .3 All plans for said traffic restrictions and detour routes must be submitted a minimum of 14 days in advance for approval.
- .15 All sluices in the Horseshoe Lake Dam must be operational by no later than May 31 2020.
- .16 Contractor shall not rely on any existing safety systems in place when he receives the site.

1.5 SECURITY

- .1 Contractor to provide means to maintain security as required by Departmental Representative.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 This section covers the measurement of work for payment purposes, and the scope of work included in the pay items in the Lump Sum and Unit Price Tables.

1.2 APPLICATIONS FOR PROGRESS PAYMENT

- .1 Make applications for payment on account as provided in Agreement as work progresses.
- .2 Date applications for payment last day of payment period and ensure amount claimed is for value, proportional to amount of Contract, of Work performed and products delivered to place of work at that date.
- .3 Submit to Departmental Representative, at least fourteen (14) days before first application for payment, schedule of values for parts of Work, aggregating total amount of Contract Amount, so as to facilitate evaluation of applications for payment.
- .4 Time and Materials work shall not take place without written approval from the Departmental Representative and PCA. The Contractor shall notify the Departmental Representative prior to starting work.

1.3 SCHEDULE OF VALUES

- .1 Make schedule of values out in such form and supported by such evidence as Departmental Representative may reasonably direct and when accepted by Departmental Representative, be used as basis for applications for payment.
- .2 Include statement based on schedule of values with each application for payment.
- .3 Support claims for products delivered to place of work but not yet incorporated into work by such evidence as Departmental Representative may reasonably require to establish value and delivery of products.

1.4 PREPARING SCHEDULE OF UNIT PRICE TABLE ITEMS

- .1 Make form of submittal parallel to Schedule of Values, with each line item identified same as line item in Schedule of Values. Include in unit prices only:
- .1 Cost of material.
 - .2 Delivery and unloading at site.
 - .3 Installation, overhead and profit.
- .2 Ensure unit prices multiplied by quantities given

equal material cost of that item in Schedule of Values.

1.5 MEASUREMENT AND PAYMENT .1
PROCEDURES

The following Item titles, units and their respective associated sections list work included in each item. Further description of the work can be found in the sections referenced.

- .2 Lump Sum Price Item No.1 "General Site Work" - All work that is not specifically designated in the Lump Sum or Unit Price Tables as individual items but is indicated in the tender package in order to complete the Work in full, shall be paid under the Lump Sum Price item "General Site Work". This item includes all costs associated to perform the work including but not limited to material, equipment, personnel, travel and accommodations, overhead, etc. Items included in the Lump Sum Price are:
- .1 Mobilization;
 - .2 Demobilization;
 - .3 Inventory of all metal items at the storage facility at the start of contract. Contractor is to notify the Departmental Representative immediately of any items required for installation and indicated as being provided by Owner which are not present or which are deficient.
**Storage area: 1452 Eagle Lake Rd
Haliburton ON (West Guilford Self-
Storage Units)**
 - .4 Designing, installing and maintaining all temporary access routes required to access the work areas;
 - .5 Excavation, trenching and backfilling;
 - .6 Clearing and grubbing;
 - .7 Providing construction fence and perimeter security measures around work and staging areas;
 - .8 Temporary utilities and construction facilities;
 - .9 Reptile exclusion fencing;
 - .10 Supplying, installing and maintaining luminated/non luminated signals;
 - .11 Maintaining the work/storage area for the duration of the work;
 - .12 Removal of the temporary access routes;
 - .13 Health and safety;
 - .14 Environmental Procedures, including control work to provide effective environmental, waterbody, and fish habitat protection;
 - .15 Progressive and final site cleaning including snow removal;
 - .16 Dewatering system;
 - .17 Roadway embankment;
 - .18 Parking area landscaping;
 - .19 Geodesic monuments;

1.5 MEASUREMENT AND PAYMENT
PROCEDURES
(Cont'd)

- .20 Surveying services.
- .3 Lump Sum Item No.2 - Traffic Control for Temporary Roadway Closure
 - .1 This item includes all costs related to the requirements of the Owner, municipality, county and MTO for the roadway closure.
 - .2 This item includes all costs related to the supply, delivery and installation of all required signage, barriers, and other temporary materials as described in the Traffic Control Plan and/or required by the Owner, municipality, county and MTO.
- .4 Lump Sum Item No.3 - Dewatering Works
 - .1 This item includes all costs related to:
 - .1 The installation and removal of upstream and downstream cofferdams, including moving the cofferdams as required to enable staged demolition, construction and operation of the dam.
 - .2 Installation, monitoring, operation, and removal of pumps, as required to maintain dewatered work area.
 - .3 Monitoring required to meet environmental requirements.
 - .4 Sediment control and water treatment measures
 - .5 All other works required to maintain dewatered work areas.
- 5 Lump Sum Item No.4 - Removal of All Existing Signage and Railings at the Site for Salvage and Reuse by PCA
 - .1 This item includes all costs related to the careful removal, in a manner to prevent damage and in accordance with the project plans, of all existing signage and railings.
- .6 Lump Sum Item No.5 - Careful Transferral of Crab Winches During Staged Construction
 - .1 This item includes all costs related to the careful transferral, in a manner to prevent damage, of the existing, temporary, and modified crab winches so as to enable continuous operation of the dam by the Owner.
- .7 Lump Sum Item No.6 - Removal and/or Replacement of Components of the Existing Data Collection, Storage and Transmission System, including all costs related to:
 - .1 The removal of existing level gauge G1 and hand over to PCA for disposal.
 - .2 The removal of existing flow gauge G2 and protection for reinstallation.
 - .3 The removal of the existing gauge G3 and hand

1.5 MEASUREMENT AND PAYMENT
PROCEDURES
(Cont'd)

- over to PCA for disposal.
- .4 The installation of a new data computer and level gauge combined unit G1. Unit will be provided by PCA. Include all required conduit
 - .5 The installation of new gauge G2. Install intake line extending to pool and anchor end to bedrock when dewatering. Include all required conduit.
 - .6 The installation of new telephone cable conduit to the utility pole near Bethel Rd Bridge.
- .8 Lump Sum Item No.7 - Site Restoration at the Completion of the Work
- .1 This item includes all costs related to the restoration of the site to original site conditions or as indicated otherwise in the project drawings and specifications.
 - .2 This item includes all costs related to topsoil placement, mulching, tree planting, and any other works required to restore the site to the original site conditions or as indicated otherwise in the project drawings and specifications.
- .9 Lump Sum Item No.8 - Manufacture, Deliver and Install Railings and Gates
- .1 This item includes all costs related to the manufacture in accordance to PCA standards, delivery and installation of all railings and gates shown on the project plans.
- .10 Lump Sum Item No.9 - Move PCA Safety Boom
- .1 The existing PCA standard safety boom is to be maintained at the site.
 - .2 This item includes all costs related to the detachment of the safety boom from the existing west anchor and the removal of the existing west anchor.
 - .3 This item includes all costs related to the construction of a new anchor on the west bank.
 - .4 This item includes all costs related to the attachment of the safety boom to the new west anchor.
- .11 Lump Sum Item No.10 - Supply and Install Dam Signage
- .1 This item includes all costs related to the supply and installation of additional PCA standard signage and lifesaving equipment including as detailed in the project plans and specifications.
 - .2 This item includes all costs related to the installation of previously removed signage designated for reuse including all new

1.5 MEASUREMENT AND PAYMENT
PROCEDURES
(Cont'd)

components required for installation as detailed in the project plans and specifications.

- .12 Lump Sum Item No.11 - Supply and Install Vehicle Guide Rail Extensions including OPS End Treatment
 - .1 This item includes all costs related to the supply and installation of vehicle guide rail extensions as shown on the contract drawings and in accordance to the referenced standard details.

- .13 Unit Price Item No.1 - Concrete Removal
 - .1 Item No.1 shall be paid at the contract unit price by the unit cubic meter. This item includes all costs related to removal of the existing concrete dam including concrete deck, east abutment structures, and concrete piers above the existing dam sill. This item also includes all costs related to removal of the sill to partial depth directed by Departmental Representative as described in Section 02 41 16 and 02 41 21. This item includes all costs related to transport and disposal of waste material off site.

- .14 Unit Price Item No.2 - Reinforcing Steel
 - .1 Item No.2 shall be paid at the contract unit price by the unit kilogram (kg). This item shall include all costs related to the work described in Section 03 20 00. Mass of reinforcing steel shall be computed from the theoretical unit mass specified in CAN/CSA-G30.18 for lengths and sizes of bars as indicated on drawings or authorized in writing by Departmental Representative.

- .15 Unit Price Item No.3 - Cast-in-Place Concrete.
 - .1 Item No.3 shall be paid at the contract unit price by the unit CUBIC meter calculated from neat dimensions indicated. This item shall include all costs related to the work described in Division 3; to supply, place and finish concrete in the construction of the:
 - .1 Sill extension.
 - .2 Sill slab,
 - .3 Piers,
 - .4 East abutment,
 - .5 East cut-off wall,
 - .6 Deck of the dam, and
 - .7 East approach slab
 - .2 No deductions will be made for volume of concrete displaced by reinforcing steel.
 - .3 Include in the price all mix designs and measures identified in Section 03 30 00.
 - .4 Include in the prices of concrete the bonding

1.5 MEASUREMENT AND PAYMENT
PROCEDURES
(Cont'd)

- agent.
- .5 Include in the prices of concrete the installation of all items embedded therein.
- .6 Include in the prices of concrete the work described in Section 03 10 00.
- .7 Include in the prices of concrete the heating, cooling, hot and cold weather protection, curing, and finishing.
- .8 Include in the prices of concrete the supply and installation of waterstops, joint filler, bond breaker and joint sealer.
- .9 Do not include in the prices of concrete any costs related to reinforcing steel which is to be measured separately for payment.
- .16 Unit Price Item No.4 - Non-Shrink Non-Metallic Grout.
- .1 Item No.4 shall be paid at the contract unit price by the unit CUBIC meter calculated from neat dimensions indicated. This item shall include all costs related to the work described in Section 03 30 00; to supply and place non-shrink non-metallic grout in the gain and sill embedment, drilled holed for rock anchors and under all metal plates.
- .17 Unit Price Item No.5 - U-Fill Concrete
- .1 Item No.6 shall be paid at the contract unit price by the unit CUBIC meter calculated from neat dimensions indicated. This item shall include all costs related to the work described in Section 03 30 00; to supply and place U-Fill concrete in the east abutment.
- .18 Unit Price Item No.6 - Rock Anchors
- .1 Item No.6 shall be paid at the contract unit price per linear meter of anchor installed for all anchors indicated on drawings and any additional anchors requested by Departmental Representative. This item shall include all costs related to the work described in Section 05 05 20 related to supplying and installation of rock anchors.
- .19 Unit Price Item No.7 - Silt Fencing
- .1 Shall be paid at the contract unit price per linear meter. This includes all costs related to any silt fencing included in the Contractor's environmental controls plan approved by the Departmental Representative and any additional silt fencing requested by the Departmental Representative as the work progresses.
-

1.5 MEASUREMENT AND PAYMENT .20
PROCEDURES
(Cont'd)

Unit Price Item No. 8 - Deliver, Assemble and
Install - Log-Pinning Mechanisms

- .1 Shall be paid at the contract unit price per log pinning mechanism. This item includes all costs related to delivery to site, assembly, and installation of log-pinning mechanisms as well as the installation of the supporting brackets.

.21 Unit Price Item No. 9 - Backfill Material

- .1 Shall be paid at the contract unit price per cubic meter. This item includes all costs related to the supply and installation of backfill material (Type 3).

.22 Unit Price Item No. 10 - Granular A Fill Material

- .1 Shall be paid at the contract unit price per cubic meter. This item includes all costs related to the supply and installation of Granular A.

.23 Unit Price Item No. 11 - Granular B Fill Material

- .1 Shall be paid at the contract unit price per cubic meter. This item includes all costs related to the supply and installation of Granular B.

.24 Unit Price Item No. 12 - Clean Stone

- .1 Shall be paid at the contract unit price per cubic meter. This item includes all costs related to the supply and installation of Clean Stone.

.25 Unit Price Item No. 13 - Drains

- .1 Shall be paid at the contract unit price per linear meter. This item includes all costs related to the supply and installation of drains as detailed in the project drawings and specifications, including the geotextile.

.26 Unit Price Item No. 14 - Deliver and Install -
Stoplog Sills

- .1 Shall be paid at the contract unit price per embedded sill. This item includes all costs related to the delivery to site and installation of the embedded stoplog sill plates as detailed in the project drawings and specifications.

- 1.5 MEASUREMENT AND PAYMENT .27 Unit Price Item No. 15 - Deliver and Install - Main
PROCEDURES Stoplog Gain Liners, complete with Jacking Pins and
(Cont'd) Rests
- .1 Shall be paid at the contract unit price per embedded sill. This item includes all costs related to the delivery to site and installation of the embedded stoplog gains, including the gain liners and the angles and sheer studs edging the stoplog gains, as detailed in the project drawings and specifications.
- .28 Unit Price Item No. 16 - Deliver and Install - Aluminium Stoplog Gain Covers
- .1 Shall be paid at the contract unit price per complete gain cover. This item includes all costs related to the delivery to site and installation of the stoplog gain covers and any adjustments required to achieve the specified spacings.
- .29 Unit Price Item No. 17 - Davit and Post
- .1 Shall be paid at the contract unit price per davit. This item includes all costs related to the supply, assembly and delivery of the davit and post.
- .30 Unit Price Item No. 18 - Embedded Davit Socket
- .1 Shall be paid at the contract unit price per davit socket. This item includes all costs related to the supply and installation of the davit sockets, including all embedded parts.
- .31 Unit Price Item No. 19 - Stainless Steel Plate Storage Box
- .1 Shall be paid at the contract unit price per storage box. This item includes all costs related to the supply and installation of the stainless steel plate storage box.
- .32 Unit Price Item No. 20 - Deliver and Install - ASCE 60 lb Rails
- .1 Shall be paid at the contract unit price per linear meter. This item includes all costs related to the delivery to site and installation of the rails and all associated accessories provided by Owner.
- .33 Unit Price Item No. 21 - Coir Mat

1.5 MEASUREMENT AND PAYMENT
PROCEDURES
(Cont'd)

- .1 Shall be paid at the contract unit price per square meter. This item includes all costs related to the supply and installation of the coir mat.

- .34 Unit Price Item No. 22 - Deliver and Install - Steel Pier Nosing and Service Gain Liners, complete with Jacking Pins and Rests
 - .1 Shall be paid at the contract unit price per pier. This item includes all costs related to the delivery to site and installation of the steel pier nosing as described in the project drawings and specifications, including the embedded plate and the Nelson studs, as well as the service gain liners.

- .35 Unit Price Item No. 23 - Deliver and Install - Half Steel Pier Nosing and Service Gain Liners, complete with Jacking Pins and Rests
 - .1 Shall be paid at the contract unit price per pier. This item includes all costs related to the delivery to site and installation of the half steel pier nosing as described in the project drawings and specifications, including the embedded plate and the Nelson studs, as well as the service gain liners.

- .36 Unit Price Item No. 24 - Rip Rap
 - .1 Shall be paid at the contract unit price per cubic meter, measured on site. This item includes all costs related to the supply and installation of rip rap.

- .37 Unit Price Item No. 25 - Geotextile
 - .1 Shall be paid at the contract unit price per square meter. This item includes all costs related to the supply and installation of geotextile.

- .38 Unit Price Item No. 26 - Log Rests
 - .1 Shall be paid at the contract unit price per linear metre. This item includes all costs related to the manufacturing, delivery and installation of the log rests.

- .39 Unit Price Item No. 27 - Deliver and Install - Fixed Bollards
 - .1 Shall be paid at the contract unit price per bollard. This item includes all costs related to the delivery to site and installation of

the fixed bollards.

.40 Unit Price Item No. 28 - Removable Bollards

.1 Shall be paid at the contract unit price per removable bollard. This item includes all costs related to the manufacturing, delivery and installation of the removable bollard.

.41 Unit Price Item No. 29 - Rock Excavation

.1 Shall be paid at the contract unit price per cubic meter, measured on site. This item includes all costs related to the labour and equipment required to remove and dispose of rock.

1.6 SUBSTANTIAL PERFORMANCE OF WORK

- .1 Prepare and submit to Departmental Representative a comprehensive list of items to be completed or corrected and apply for a review by Departmental Representative to establish Substantial Performance of Work or Substantial Performance of designated portion of Work when Work is substantially performed if permitted by lien legislation applicable to Place of Work designated portion thereof which Departmental Representative agrees to accept separately is substantially performed. Failure to include an item on list does not alter responsibility to complete the Contract.
- .2 Submit an application for final payment when work is completed.
- .3 Departmental Representative will, no later than ten (10) days after receipt of an application for final payment, review work to verify validity of application. Departmental Representative will give notification that application is valid or give reasons why it is not valid, no later than seven (7) days after reviewing work.
- .4 Departmental Representative will issue a Certificate of Completion and a Certificate of Measurement when application for final payment is found valid.

END OF SECTION

PART 1 - GENERAL

1.1 ADMINISTRATIVE

- .1 Schedule and administer project meetings throughout the progress of the work at the call of the Departmental Representative.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants, affected parties not in attendance and Departmental Representative.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION
MEETING

- .1 Within ten (10) days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Consultant, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum ten days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Health and Safety Plan
 - .3 Environmental Issues and Mitigation Measures
 - .4 Schedule of Work: in accordance with Section 01 32 16.07.

- .5 Submittal Schedule: Submit submittals in accordance with Section 01 33 00.
- .6 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00.
- .7 Site security in accordance with Departmental Representative requirements.
- .8 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .9 Monthly progress claims, administrative procedures, photographs, hold backs.
- .10 Appointment of inspection and testing agencies or firms.
- .11 Insurances, transcript of policies.

1.3 PROGRESS
MEETINGS

- .1 During course of Work and two weeks prior to project completion, schedule progress meetings bi-weekly.
- .2 Contractor, major Subcontractors involved in Work, and the Departmental Representative are to be in attendance.
- .3 Notify parties minimum five days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three days after meeting.
- .5 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Corrective measures and procedures to regain projected schedule.
 - .6 Revision to construction schedule.
 - .7 Progress schedule, during succeeding work period.
 - .8 Review submittal schedules: expedite as required.
 - .9 Maintenance of quality standards.
 - .10 Review proposed changes which affect construction schedule and completion date.
 - .11 Other business.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 DEFINITIONS

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
 - .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
 - .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
 - .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
 - .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
 - .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
 - .7 Milestone: significant event in project, usually completion of major deliverable.
 - .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
 - .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.
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1.2 REQUIREMENTS

- .1 Specified Contract completion date is May 31, 2020.
- .2 The construction window for dam demolition and removal is dependent on fish migration and spawning periods. Refer to Section 01 14 00 -Work Restrictions, for the restriction window to in-water works. The Contractor is responsible for implementing required mitigations.
- .3 Where possible, site clearing/commencement of construction should be planned to occur outside of sensitive bird nesting times; see Section 01 14 00 -Work Restrictions. If this is not feasible, then the site must be inspected by a biologist prior to clearing, to identify any potential for nests.
- .4 The contractor shall make every effort to minimize time working in the streams or water body. Accordingly all necessary materials and equipment should be on site before proceeding with removal such that delays waiting for materials or equipment do not occur once in-stream activities have commenced.
- .5 Ensure Project Schedule is practical and remains within specified Contract duration.
- .6 Detail Project Schedule to include a breakdown of work activity.
- .7 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Certificate of Substantial Performance and Certificate of Completion as defined times of completion are of essence of this contract.
- .8 Submit Project Schedule to Departmental Representative for comment and update accordingly.

1.3 ACTION AND
INFORMATIONAL
SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Submit to Departmental Representative within 5 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within five working days of receipt of acceptance of Master Plan.

1.4 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart

organizing and execution of Work as Bar Chart (GANTT).

- .2 Departmental Representative will review and return revised schedules within five working days.
- .3 Revise impractical schedule and resubmit within five working days. Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.5 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan and specified contract duration.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Permits.
 - .3 Mobilization
 - .4 Roadway closure.
 - .5 Roadway reopening.
 - .6 Installation of environmental controls.
 - .7 Dewatering sequence.
 - .8 Construction staging sequence.
 - .9 Demolish temporary sluice 2.
 - .10 Construction sluice 2.
 - .11 Demolish east side of dam.
 - .12 Construct east side of dam.
 - .13 Installation of operating and safety equipment.
 - .14 Installation of railings and signage.
 - .15 Site remediation and landscaping.
 - .16 Demobilization.
 - .17 Contract Closeout.

1.6 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation. Contractor to resubmit updated Project Schedule to Departmental Representative for review in case of delays due to severe weather conditions.
- .3 Updated Project Schedule is to be submitted with every request for Progress Payment.

1.7 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities

considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

Not used.

1.2 REFERENCES

Not used.

1.3 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 Summary of submittal requirements as a minimum:
 - .1 Project Schedule, 01 32 16.07 Section 1.3
 - .2 Monthly Photographic Documentation, 01 33 00 Section 1.7
 - .3 Site Specific Health and Safety Plan, 01 35 29.06 Section 1.2
 - .4 Site Health and Safety Reports, 01 35 29.06 Section 1.2
 - .5 MOL Reports, 01 35 29.06 Section 1.2
 - .6 Incident and Accident Reports, 01 35 29.06 Section 1.2
 - .7 Notice of project, 01 35 29.06 Section 1.3
 - .8 Environmental Protection Plan, 01 35 43 Section 1.3
 - .9 WHMIS Material Safety Data Sheets, 01 47 15 Section 1.4
 - .10 Construction Control and Monitoring Plan, 01 48 00 Section 1.6
 - .11 Pre-construction Condition Survey, 01 48 00 Section 1.9 and 31 23 33.01 Section 1.5
 - .12 Waste Reduction Workplan (WRW), 01 74 21 Section 1.1, 1.6
 - .13 Monthly WRW Reports, 01 74 21 Section 1.4
 - .14 Waste Source Separation Program (WSSP), 01 74 21 Section 1.7
 - .15 Operation Manuals, 01 78 00 Section 1.3
 - .16 Final Documents, 01 78 00 Section 1.3
 - .17 Final Survey, 01 78 00 Section 1.8
 - .18 Survey Reference Points, 02 41 16 Section 1.5
 - .19 Master Plan of Concrete Placement, 03 10 00 Section 1.4
 - .20 Joint Type Shop Drawing, 03 10 00 Section 1.4
 - .21 Formwork, 03 10 00 Section 1.4
 - .22 Reinforcing Steel Shop Drawing, 03 20 00 Section 1.5
 - .23 Mill Test, 03 20 00 Section 1.6
 - .24 Concrete Warranty Performance and Data Sheets, 03 30 00 Section 1.5
 - .25 Concrete Mix Design, 03 30 00 Section 1.5
 - .26 RMCAO Certificate, 03 30 00 Section 1.6
 - .27 Concrete QC Procedures, 03 30 00 Section 1.6
 - .28 Alkali Aggregate Testing, 03 30 00 Section 1.6
 - .29 Shrinkage Testing, 03 30 00 Section 1.6
 - .30 Cold Weather Protection Plan, 03 30 00 Section 3.5
 - .31 Hot Weather Protection Plan, 03 30 00 Section 3.6
 - .32 Metal Fabrication Shop Drawings, 05 50 00 Section 1.4
 - .33 Aggregates Product Data, 31 05 16 Section 1.4, 2.2
 - .34 Utilities Locate, 31 23 33.01 Section 1.8
 - .35 Geotextile Data Sheet, 31 32 19.01 Section 1.4 and 35 49 25 Section 1.5
 - .36 Topsoil Test Report, 32 91 19.13 Section 1.6
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- .37 Material Sourcing, 32 94 00 Section 1.5
- .38 Dewatering System Shop Drawing, 35 20 22
Section 1.5
- .39 Sediment Control Plan, 35 49 25 Section 1.5.3
- .40 Final Cofferdam Drawings, 35 62 16 Section
1.6
- .41 Cofferdam Certification Letter, 35 62 16
Section 1.6
- .42 Cofferdam QC Plan, 35 62 16 Section 1.7

1.4 SHOP DRAWINGS AND
PRODUCT DATA

- .1 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.
- .2 After Departmental Representative's review, distribute copies.
- .3 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .4 Submit electronic copies 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.

- .5 Submit electronic copies 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.
 - .6 Submit electronic copies 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.
 - .7 Submit electronic copies 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.
 - .8 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .9 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
 - .10 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
 - .11 Delete information not applicable to project.
 - .12 Supplement standard information to provide details applicable to project.
 - .13 If upon review by Departmental Representative no
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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.

.14 The review of shop drawings by Parks Canada Agency and its representatives (PCA) is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that PCA 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.

1.5 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's site office.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples 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 samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.6 MOCK-UPS

Not used.

1.7 PHOTOGRAPHIC
DOCUMENTATION

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution monthly with progress statement.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 4 locations.
 - .1 Viewpoints and their location as determined by Departmental Representative.
- .4 Frequency of photographic documentation: monthly or as directed by Departmental Representative,
 - .1 Upon completion of: excavation, foundation, framing and services before concealment, of Work.

1.8 CERTIFICATES AND
TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

PART 2- PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
- .2 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .3 Canadian Standards Association (CSA).
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .4 National Building Code (NBC) 2015.
 - .1 NBC 2010, Division B, Part 8 Safety Measures at Construction and Demolition Sites.
- .5 National Fire Code (NFC) 2015.
 - .1 NFC 2010, Division B, Part 2, Emergency Planning, subsection 2.8.2 Fire Safety Plan.
- .6 Province of Ontario
 - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990, c.0.1, as amended and O. Reg. 213/91 as amended - Updated 2005.
 - .2 Forest Fires Prevention Act of Ontario 1990, Chapter 24.
 - .3 Workplace Safety and Insurance Act, 1997.
 - .4 Municipal Statutes and authorities.
- .7 Treasury Board of Canada Secretariat (TBS):
 - .1 Treasury Board, Fire Protection Standard April 1, 2010. www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316§ion=text.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit 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. Use Parks Canada Safety Template.
- .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 Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.

- .6 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 81 01 - Hazardous Materials.
- .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 Consultant 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 Consultant.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.
- .11 Complete and Submit Parks Canada Attestation and Proof of Compliance with Occupational Health and Safety. Form attached as appendix item.

1.3 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location. Contractor shall provide a written acknowledgement of this responsibility with 1 week of contract award, or prior to beginning work, whichever is sooner.
- .3 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.4 SAFETY ASSESSMENT

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

1.5 WORK PERMIT

- .1 Obtain road permits related to project prior to commencement of Work.
 - .2 Obtain all other permits related to the project, as required, such as well decommissioning, prior to
-

commencement of the work.

1.6 MEETINGS

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

1.7 REGULATORY REQUIREMENTS

.1 Do Work in accordance with Section 01 41 00.

.2 Comply with the Acts and Regulations of the Province of Ontario and Canada.

.3 Comply with specified standards and regulations to ensure safe operations at site.

1.8 PROJECT/SITE CONDITIONS

.1 The following are known or potential project related health, environmental and safety hazards at site which must be properly managed if encountered during course of work:

- .1 Work adjacent to streams and water.
- .2 Working within and adjacent to roadway.
- .3 Working in a remote location.
- .4 Upstream leakage between stoplogs creating strong drawing force.
- .5 Rapidly changing flows and water levels below a dam.
- .6 Steep embankments and retaining walls may impede quick egress from dangers.
- .7 Slippery conditions due to ice formation during winter months in and around dams.
- .8 Unprotected gain openings on the dam present a fall hazard.
- .9 Hazards related to working in a remote and natural area including insect, vegetation and wildlife related hazards.
- .10 Possible tripping hazards include tracks, anchor points, and gain covers.
- .11 Slipping hazard on upstream and downstream side of earth embankments due to steep slopes, uneven or loose soil and rocks.
- .12 Above list shall not be construed as being complete and inclusive of potential health, and safety hazards encountered during work. Include above items into hazard assessment process.

.2 For work in isolated locations Contractor to comply with Occupational Health and Safety Act, S.25 (2)(h)-Duties of employers and other applicable regulations.

.3 For working near, on or above a body of water Contractor to comply with Safe Boating Guide issued by Transport Canada, OHS Regulation 213/91 - Section 27, CAN/CGSB-65.7 for use of life jackets and CAN/CGSB-65.11 for use of Personal Flotation Devices (PFDs)

.4 Provide traffic control measures when working on, or adjacent to, roadways in accordance with the "Traffic Control Manual for Roadwork Operations", Department of Transportation and Works.

.5 Erect safety barricades, lights and signage on site to effectively delineate work areas, protect pedestrian and vehicular traffic around and adjacent to work and to create a safe working environment.

.6 Contractor to comply with Municipal Bylaws and Owner's bylaws for the use of ATV's and side-by-side off-road vehicle on site.

.7 For Forest Safety Worker's to show valid certificates on training in First Aid, Forest Safety, Forest Survival, Heat/Cold Stress and use of an auto-injector (EpiPen) and to comply with Occupational Health and Safety Act (OHSA).

.8 For helicopter use, contractor to comply with applicable regulations.

.9 For Thermal Exposure - Heat/Cold stress Contractor to comply with OHS Regulation 213/91 and other applicable regulations.

.10 Work of this nature may involve:

.1 Contact with silica in concrete, concrete block and ceramic tile.

.2 Contact with mercury in switches, lights and thermostats.

.3 Contact with asbestos in pipe covering, wall shingles, gypsum board, joint compound, asphalt shingles, roof and wall felt paper.

.4 Contact with lead in paint, solder.

.5 Contact with coal, cinders, ash, nylon debris, copper, beryllium, nickel, molybdenum and PAH impacted soils.

.6 Contact with PCBs in ballasts.

.7 Contact with benzene, arsenic and acrylonitrile in paints, and adhesives.

1.9 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 requesting 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.

1.10 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 Contractor will be responsible and shall be designated "Constructor" as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.

.3 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.

1.11 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.

.2 Follow procedures in accordance with Acts and Regulations of Province of Ontario and advise Departmental Representative verbally and in writing.

1.12 HEALTH AND SAFETY COORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:

- .1 Have site-related working experience specific to activities associated with abatement of lead and asbestos containing material and contaminated soil.
- .2 Have working knowledge of occupational safety and health regulations.
- .3 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.
- .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .5 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.

- .1 Contractor's Safety Policy.
- .2 Contractor's name.
- .3 Notice of project.
- .4 Name, trade and employer of Health and Safety Representative or Joint Health and Safety committee member.
- .5 Ministry of Labour orders and reports.
- .6 Occupational Health and Safety Act and Regulations for Construction Projects for 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 on-duty First Aider.
- .12 WSIB "In Case of Injury at Work" poster.
- .13 Location of toilet and clean-up facility.

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 and/or competent supervisor to stop or start Work when, at Health and Safety Coordinator and/or competent supervisor's discretion, it is necessary or advisable for reasons of health and 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.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED SECTIONS
- .1 Section 01 74 11 - Cleaning.
 - .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal
 - .3 Basic Impact Analysis and Environmental Standards and Guidelines will be provided to the Contractor upon contract award
- 1.2 DEFINITIONS
- .1 Environmental Pollution and Damage:
 - .1 Presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
 - .2 Environmental Protection:
 - .1 Prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, 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.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit in accordance with Section 01 33 00.
 - .2 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan (EPP) for review and approval by Departmental Representative.
 - .1 Include a list of key project activities and identify the actual and potential environmental impacts associated with each activity.
 - .3 It is recommended that the qualified environmental professional(s) prepare the EPP or its component plans. EPP will detail frequency of monitoring and list high-risk construction activities where a qualified environmental professional must be onsite.
 - .4 EPP must include comprehensive overview of known or potential environmental issues to be addressed

during construction. EPP must show consideration of spring freshet conditions in the event that project timing slips into this period. EPP must demonstrate that this condition is planned for and work activities will be halted or revised accordingly. The potential environmental issues associated with the construction activities include, but are not limited to, the following:

- .1 Introduction of fines or silt to waterways - during placement of rock fill; rock excavation; cofferdam construction; dewatering; construction of new dam; demolition of existing dam; coffer dam removals; commissioning of new dam
- .2 Contamination of waterways due to spills - during refueling; a hydraulic line rupture; an accidental spill of lubricants
- .5 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .6 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. The plan will describe water quality standards to be adhered to and frequency of monitoring on-site.
 - .6 Drawings indicating 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 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
 - .1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved

within authorized work areas.

- .8 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .9 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .10 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
- .11 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.
- .12 Waste Water Management Plan identifying methods and procedures for management and/or discharge of waste waters which are directly derived from 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. Note that if wastewater has a pH greater than or equal to 12. it is considered a hazardous waste under Ontario Regulation 347. The contractor would be responsible for proper disposal.
- .13 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
- .14 Plan to include provisions for protecting species at risk (SAR), including procedures for reporting if SAR found in the project area and measures for keeping at risk turtles out of the project site (including, but not necessarily limited to, installation of reptile exclusion fencing around disturbed soils and stockpiles). Should any suspected SAR be encountered, or if there is potential to negatively impact SAR (or wildlife generally), contact Departmental Representative.

1.4 DISPOSAL AND
WASTES

- .1 Do not bury rubbish and waste materials on site.
 - .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.
-

1.5 DRAINAGE

- .1 Develop and submit Erosion and Sediment Control Plan (ESC) as part of the EPP identifying type and location of erosion and sediment controls provided. Plan to include 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 Provide temporary drainage and pumping required to keep excavations and site free from water.
 - .1 Water with harmful substances to be disposed in accordance with local authority, provincial and federal regulatory requirements.
- .3 Ensure pumped water into waterways or drainage systems is free of suspended materials.
- .4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority, provincial, and federal requirements.
- .5 The following factors must be considered in determining the suitability of specific erosion control practices:
 - .1 Run-off Quantity and Velocity: Dictates the suitability of products;
 - .2 Soil Characteristics: Soil texture and chemistry can affect the performance of many erosion control practices. Grain size characteristics of concrete sediment must be considered when selecting filter fabric material. Filter fabric material shall be designed around the principles of maintaining sufficient hydraulic flow and preventing particle movement through the material;
 - .3 Topography: The selection and success of erosion control practices is dependent on slope length and gradient. The ease or difficulty of diverting clean run-off around the site is dependent on the terrain and drainage patterns;
 - .4 Climate and Season
Contingency measures for extreme water events including rainfall and flooding need to be considered in the Plan.
 - .5 Temporary vs. Permanent Controls: Some erosion control practices are intended as permanent measures;
 - .6 Accessibility: Some practices require access for specialized equipment (i.e. hydro-

seeding);

- .7 Erosion and sediment control requirements by construction phase

1.6 SITE CLEARING
AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties as indicated on approved site/work plans.
- .2 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
 - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .3 Minimize stripping of topsoil and vegetation. Restrict grubbing and clearing to locations previously identified in construction site plans.
- .4 Restrict tree removal in areas of work and as designated by Departmental Representative. Tree removal to be restricted to locations previously identified in construction site plans.
- .5 Do not cut new trails to complete work.

1.7 WORK ADJACENT
TO WATERWAYS

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material and debris in waterways.
- .4 Do not skid logs or construction materials across waterways.
- .5 Any stockpiled materials shall be removed from site, or stored and stabilized a safe distance away from any watercourse, drainage course, or swales to prevent erosion and subsequent entry into the water body.

1.8 IN WATER WORK

- .1 In-water work includes in-water excavation, in-filling, rock/armour stone placement, in-water concrete/tremie pours, transfer/movement of granular material or aggregate, and the removal of existing structures. Site locations and demolition details are provided in contract drawings.
- .2 All in water work must occur within the construction timing windows outlined in Section 01 32 16.07.
- .3 All work must comply with the Fisheries Act.

- .4 The contractor shall make every effort to minimize time working in the streams or water body. Accordingly, all necessary materials and equipment should be on site before proceeding with removal such that delays waiting for materials or equipment do not occur once in-stream activities have commenced.
- .5 In water work shall be performed in a manner that minimizes the disturbance of the watercourse bottom and dispersion of sediment.
- .1 At the discharge point into the watercourse - i.e. the interface between the work site and the natural waterbody - a maximum increase of 8 NTU caused by suspended sediment from background levels for a short-term exposure (< 24-h period). Maximum average increase of 2 NTU from background levels for a longer term exposure. If elevated turbidity is observed Parks Canada will stop work and assess potential impact to the aquatic environment. Additional mitigation measures may be required;
- .2 At the discharge point into the watercourse, pH will be maintained between 6.5 and 9.0. Water with pH > 9 cannot be released directly back into the watercourse, but must be treated prior to release. Water with a pH ≥ 12.5 is considered toxic and treated as a hazardous waste under Ontario Regulation 347 of the Environmental Protection Act and wastewater in this condition must be removed from the site;
- .3 Additional Environmental Mitigation Measures For Placement of Concrete:
- .1 Ensure concrete forms are tight and no flow is occurring.
- .2 Isolate area with curtain or impermeable material specified for concrete particulates; Ensure fish exclusion is followed.
- .3 Isolated area should be the minimum size required to complete task.
- .4 CO₂ system must be installed and operating along the entire length of the isolated area; The tank shall be used to release carbon dioxide gas into an affected area to neutralize pH levels. Ensure sufficiently sized tanks for the concrete volumes used.
- .5 Workers shall be trained in the use of the system.
- .6 Use of neutralizing acids is not permitted in the river.

- .7 pH monitoring conducted inside and outside the containment area (i.e. at the outside of the form and outside of the CO2 line that is treating the water)
- .6 Work should occur in the dry using appropriate dewatering procedures for the site. Dewatering procedures to be set out in EMP/EPP as applicable and approved by Parks Canada.
- .7 Fish and wildlife stranded within the work area, particularly de-watered areas, shall be captured and released live in suitable habitat on the same side of the work area from which they were captured, and under the supervision of a qualified aquatic biologist.
- .8 It is recommended that the qualified environmental professional(s) that prepared the EPP or its component plans be available on-site for the inspection, testing and maintenance of structures, facilities, equipment and systems critical to environmental protection in order to ensure compliance with the EPP. EPP will detail frequency of monitoring and list high-risk construction activities where a qualified environmental professional must be onsite.

1.9 POLLUTION CONTROL

- .1 No acid-bearing (containing sulphides) rock shall be used for in water works. Limestone-based aggregates shall not be used for in water works.
- .2 Maintain temporary erosion and pollution control features installed under this Contract.
- .3 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .4 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area by providing temporary enclosures.
- .5 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- .6 Spills of deleterious substances (includes pH readings of 9 or over):
 - .1 Immediately contain, limit spread and clean up in accordance with provincial regulatory requirements and to the satisfaction of the Departmental Representative. Documentation of remediation, testing and results must be

- provided to the Departmental Representative.
- .2 Report immediately to Ontario Spills Action Centre: 1-800-268-6060 in accordance with MOECC rules for reporting. Note there are no exemptions under MOE Class VIII spills as the criteria do not apply at this site.
 - .3 Notify PCA and the Departmental Representative of all spills for the record.
 - .4 Further information on dangerous goods emergency clean-up and precautions including a list of companies performing this work can be obtained from Transport Canada 24 hr. collect number 613-996-666.

1.10 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 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.
- .3 Known resources at this site include the remnants of the old timber dam foundation upstream of the dam.

1.11 NOTIFICATION

- .1 The Contractor shall monitor compliance with the Contractor's environmental plan, logging compliance and non-compliance issues. The log shall be presented to the Departmental Representative for review upon request. The log shall be forwarded on a regular basis and after a high risk in-water activity.
- .2 Departmental Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .3 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
 - .1 Take action only after receipt of written approval by Departmental Representative.

- .4 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .5 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 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

PART 1 - GENERAL

1.1 REFERENCES AND
CODES

- .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
- .2 Perform Work in accordance with National Building Code of Canada (NBC), 2010, National Fire Code of Canada (NFC), 2010 and Ontario Building Code (OBC), 2012 including amendments up to bid closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .3 Perform work in adherence to Fisheries Act, federal and provincial Species at Risk Acts, federal and provincial Environmental Protection Acts, Ontario Water Resources Act, and Migratory Bird Act.
- .4 Perform work in adherence with the restrictions listed in Section 01 14 00 -Work Restrictions.
- .5 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS
MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

1.3 BUILDING
SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions.

1.4 RELICS AND
ANTIQUITIES

- .1 Relics and antiquities, and items of historical or scientific interest, such as cornerstones and contents, commemorative plaques, inscribed tables,

and similar objects found on site shall remain the property of the Departmental Representative. Protect such articles and request directives from Departmental Representative.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

<u>1.1 ABBREVIATIONS AND ACRONYMS</u>	.1	The abbreviations and acronyms are commonly found in the Project Manual and represent the associated organizations or terms.
<u>1.2 MATERIALS, EQUIPMENT AND METHODS</u>	.1	A: .1 AL: aluminum. .2 AB: anchor bolt. .3 ANOD: anodized. .4 ARCH: architecture.
	.2	B: .1 B: base. .2 BEAST: benthic assessment of sediment. .3 BH: bore hole. .4 BL: bottom layer. .5 BLK: block. .6 BLKD: bulkhead. .7 BM: beam. .8 BOT: bottom. .9 BMP: best management practice. .10 B PL: base plate. .11 BRG: bearing. .12 BTEX: benzene, toluene, ethylbenzene .13 BUR: built-up roof.
	.3	C: .1 CAL: caliper. .2 CANTIL: cantilever. .3 CB: catch basin. .4 CC: centre to centre. .5 CCN: contemplated change notice. .6 CDF: controlled density fill. .7 CEC: Canadian electrical code. .8 CHAN: channel. .9 CHS: Canadian hydrographic service. .10 CJ: construction joint. .11 CL: centreline. .12 CLG: ceiling. .13 CLR: clear. .14 COL: column. .15 CONC: concrete. .16 CONC BLK: concrete block. .17 CONC BRK: concrete brick. .18 CONT: continuous. .19 CONT J: control joint. .20 COMPL: complete. .21 CM: centimetre. .22 CPM: critical path method. .23 CT: ceramic tile. .24 C/W: complete with.

- .4 D:
- .1 D: deep.
 - .2 DEG: degree.
 - .3 DIA: diameter.
 - .4 DIM: dimension.
 - .5 DL: dead load.
 - .6 DP: dampproofing.
 - .7 DR: door.
 - .8 DWL: dowel.
- .5 E:
- .1 EA: each.
 - .2 ECF: engineered containment facility.
 - .3 EE: each end.
 - .4 EF: each face.
 - .5 EL: elevation.
 - .6 ELEC: electric.
 - .7 EM: expanded metal.
 - .8 ENCL: enclosure.
 - .9 EQ: equal.
 - .10 EXH: exhaust.
 - .11 EXIST: existing.
 - .12 EXPJ: expansion joint.
 - .13 EXP STRUCT: exposed structure.
 - .14 EXT: exterior.
 - .15 EW: each way.
- .6 F:
- .1 FC: fuel contributed.
 - .2 FDN: foundation.
 - .3 FIN: finish.
 - .4 FL: floor.
 - .5 FLD: field.
 - .6 FR: frame.
 - .7 FTG: footing.
- .7 G:
- .1 GALV: galvanized steel.
 - .2 GC: General Conditions.
 - .3 GF: ground floor.
- .8 H:
- .1 HDW: hardware.
 - .2 HDWD: hardwood.
 - .3 HOR: horizontal.
 - .4 HOR EF: horizontal each face.
 - .5 HP: hydro pole.
 - .6 HT: height.
- .9 I:
- .1 ID: inside diameter.
 - .2 INS: insulation.
- .10 J:
- .1 JT: joint.
-

- .11 L:
 - .1 LG: long.
 - .2 LL: live load.

 - .12 M:
 - .1 MAS: masonry.
 - .2 MAS FL: masonry flashing.
 - .3 MAX: maximum.
 - .4 MECH: mechanical.
 - .5 MET: metal.
 - .6 MET DK: metal deck.
 - .7 MET FL: metal flashing.
 - .8 MET GRTG: metal grating.
 - .9 MH: maintenance hole.
 - .10 MIN: minimum.
 - .11 MO: masonry opening.
 - .12 MWP: membrane waterproofing.

 - .13 N:
 - .1 NBC: National Building Code.
 - .2 NF: near face.
 - .3 NFC: National Fire Code.
 - .4 NIC: not in contract.
 - .5 NRC: noise reduction coefficient.
 - .6 NRP: non removable pin.
 - .7 NTS: not to scale.

 - .14 O:
 - .1 OBC: Ontario Building Code
 - .2 OC: on centre.
 - .3 OD: outside diameter.
 - .4 OPNG: opening.
 - .5 OPR: operator.
 - .6 OVHD: overhead.
 - .7 OWSJ: open web steel joist.

 - .15 P:
 - .1 P: prefinished.
 - .2 PAH: polynuclear aromatic hydrocarbons.
 - .3 PARG: parging.
 - .4 PCC: precast concrete.
 - .5 PL: plate.
 - .6 PLYWD: plywood.
 - .7 PR: pair.
 - .8 PREFAB: prefabricated.
 - .9 PRFL: profile.
 - .10 PT: preservative treated (wood).
 - .11 PVC: polyvinyl chloride.

 - .16 R:
 - .1 R: radius.
 - .2 RC: reinforced concrete.
 - .3 REINF: reinforced/reinforcing.
 - .4 REQD: required.
 - .5 REQT: requirement.
-

- .6 RM: room.
 - .7 RO: rough opening.
 - .8 RWL: rain water leader.

 - .17 S:
 - .1 SAN SEW: sanitary sewer.
 - .2 SCHED: schedule.
 - .3 SCRIN: screen.
 - .4 SECT: section.
 - .5 SL: sliding.
 - .6 SPEC: specification.
 - .7 SS: stainless steel.
 - .8 STD: standard.
 - .9 STL: steel.
 - .10 STL BM: steel beam.
 - .11 STC: sound transmission class.
 - .12 STL FL DK: steel floor deck.
 - .13 STL PL: steel plate.
 - .14 STN: stone.
 - .15 STR: structure or structural.
 - .16 ST SEW: storm sewer.
 - .17 S&U: stain and urethane.
 - .18 S&V: stain and varnish.

 - .18 T:
 - .1 T: top.
 - .2 T&B: top and bottom.
 - .3 TCB: turbidity control plan.
 - .4 TEL: telephone.
 - .5 THKNS: thickness.
 - .6 THR: threshold.
 - .7 TOPG: topping.
 - .8 TRANSV: transverse.
 - .9 TYP: typical.

 - .19 U:
 - .1 U: urethane.
 - .2 UCUT: undercut.
 - .3 UGRD: underground.
 - .4 UNO: unless noted otherwise.
 - .5 UOS: unless otherwise specified.
 - .6 U/S: underside.
 - .7 UR: urinal.
 - .8 UTM: universal transverse mercator

 - .20 V:
 - .1 VERT: vertical.
 - .2 VERT EF: vertical each face.

 - .21 W:
 - .1 WD: wood.
 - .2 WHMIS: workplace hazardous materials information system.
 - .3 WP: waterproofing.
 - .4 WSIB: workplace safety and insurance board.
 - .5 WT: weight.
-

1.3 STANDARDS
ORGANIZATIONS

- .1 Standards writing organizations:
- .1 AA - Aluminum Association.
 - .2 ACPA - American Concrete Pipe Association.
 - .3 ANSI - American National Standards Institute.
 - .4 ASHRAE - American Society of Heating and Refrigerating and Air-Conditioning Engineers.
 - .5 ASTM - American Society for Testing and Materials.
 - .6 AWI/AWMAC - Architectural Woodwork Institute/Architectural Woodwork Manufacturers Association of Canada.
 - .7 AWPA - American Wood Preservers' Association.
 - .8 AWWA - American Water Works Association.
 - .9 BHMA - Builders Hardware Manufacturers Association.
 - .10 CCA - Canadian Construction Association.
 - .11 CCDC - Canadian Construction Documents Committee.
 - .12 CCMPA - Canadian Concrete Masonry Producers Association.
 - .13 CGSB - Canadian General Standards Board.
 - .14 CNTA - Canadian Nursery Trades Association.
 - .15 CPCA - Canadian Painting Contractors Association.
 - .16 CRCA - Canadian Roofing Contractors Association.
 - .17 CSA - Canadian Standards Association.
 - .18 CSC - Construction Specifications Canada.
 - .19 CSDMA - Canadian Steel Door Manufacturers Association.
 - .20 CSI - Construction Specifications Institute.
 - .21 CSSBI - Canadian Sheet Steel Building Institute.
 - .22 CRCA - Canadian Roofing Contractors Association.
 - .23 DHI - Door and Hardware Institute.
 - .24 EEMAC - Electrical and Electronic Manufacturer's Association of Canada.
 - .25 ESA - Electrical Safety Authority.
 - .26 FCC - Fire Commissioner of Canada.
 - .27 FSC - Forest Stewardship Council.
 - .28 GANA - Glass Association of North America.
 - .29 HMMA - Hollow Metal Manufacturers Association.
 - .30 IEEE - Institute of Electrical and Electronics Engineers Inc.
 - .31 ISO - International Organization for Standardization.
 - .32 IWFA - International Window Film Association.
 - .33 LEED - LEED Canada, Leadership in Energy and Environmental Design.
 - .34 MPI - Master Painters Institute.
 - .35 NAAMM - National Association of Architectural Metal Manufacturers.
 - .36 NCPI - National Clay Pipe Institute.
-

- .37 NEMA - National Electrical Manufacturers Association.
- .38 NFPA - National Fire Protection Association.
- .39 OPSD - Ontario Provincial Standard Drawings.
- .40 OPSS - Ontario Provincial Standard Specifications.
- .41 PPI - Plastics Pipe Institute.
- .42 SDI - Steel Door Institute.
- .43 SCAQMD - South Coast Air Quality Management District.
- .44 TIA - Telecommunications Industry Association.
- .45 TIAC - Thermal Insulation Association of Canada.
- .46 TTMAC - Terrazzo Tile and Marble Association of Canada.
- .47 UL - Underwriters Laboratories.
- .48 ULC - Underwriters Laboratories of Canada.
- .49 US EPA - United States Environmental Protection Agency.
- .50 WH - Warnock Hersey.

1.4 FEDERAL
GOVERNMENT DEPARTMENTS
AND AGENCIES

- .1 Departments, agencies and crown corporations.
 - .1 CEAA - Canadian Environmental Assessment agency.
 - .2 CSC - Correctional Service Canada.
 - .3 CRA - Canada Revenue Agency.
 - .4 DND - Department of National Defence.
 - .5 EC - Environment Canada.
 - .6 FHBRO - Federal Heritage Buildings Review Office.
 - .7 HC - Health Canada.
 - .8 HCD - Heritage Conservation Directorate.
 - .9 LC - Labour Canada.
 - .10 PC - Parks Canada.
 - .11 PWGSC - Public Works and Government Services Canada.
 - .12 RCMP - Royal Canadian Mounted Police.
 - .13 TBS - Treasury Board Secretariat.
 - .14 TC - Transport Canada

1.5 PROVINCIAL
GOVERNMENT DEPARTMENTS
AND AGENCIES

- .1 MOEE - Ontario Ministry of Environment and Energy.
- .2 MOL - Ontario Ministry of Labour.
- .3 MTO and MOT - Ontario Ministry of Transportation.
- .4 MNRF - Ontario Ministry of Natural Resources and Forestry.

1.6 INTERNATIONAL
GOVERNMENT DEPARTMENTS
AND AGENCIES

- .1 DOHMH - New York City Department of Health and Mental Hygiene, USA.
- .2 GSA - Government Services Administration, USA.

1.7 UNITS OF
MEASURE (METRIC)

- .1 The following abbreviations of units of measure commonly found in the Project Manual:
 - .1 cm: centimetre.
 - .2 kg: kilogram.
 - .3 kg/m³: kilogram per cubic metre.
 - .4 kN: kilonewton.
 - .5 kPa: kilopascals.
 - .6 kW: kilowatts.
 - .7 l/s: litre per second.
 - .8 m: metre.
 - .9 m³: cubic metre.
 - .10 mg/kg: milligrams per kilogram.
 - .11 mg/L: milligrams per litre.
 - .12 mm: millimetres.
 - .13 MPa: megapascal.
 - .14 NTU: nephelometric turbidity unit.
 - .15 ppm: parts per million.
 - .16 ug/L: micrograms per litre.
 - .17 ug/m³: micrograms per cubic metre.

1.8 UNITS OF
MEASURE (IMPERIAL)

- .1 The following abbreviations of units of measure commonly found in the Project:
 - .1 F: Fahrenheit.
 - .2 ft: foot/feet.
 - .3 ga: guage.
 - .4 gpm: gallons per minute.
 - .5 in: inches.
 - .6 lbs: pounds.
 - .7 NTU: nephelometric turbidity unit.
 - .8 psi: pounds-force per square inch.
 - .9 ppm: parts per million.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not used.

END OF SECTION

PART 1 - GENERAL

- 1.1 SECTION INCLUDES
- .1 Inspection and testing, administrative and enforcement requirements.
 - .2 Tests.
- 1.2 INSPECTION
- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
 - .2 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.
- 1.3 INDEPENDENT INSPECTION AGENCIES
- .1 Independent Inspection/Testing Agencies may be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
 - .2 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.
- 1.4 ACCESS TO WORK
- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
 - .2 Co-operate to provide reasonable facilities for such access.
- 1.5 REJECTED WORK
- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
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.2 Make good other Contractor's work damaged by such
removals or replacements promptly.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

- 1.1 PRECEDENCE .1 For Federal Government Projects, Division 01 Sections take precedence over technical specifications in other Divisions of this Project Manual.
- 1.2 RELATED REQUIREMENTS .1 Section 01 35 43 : Environmental Procedures
- 1.3 REFERENCES .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
- .2 Environmental Choice Program
- .1 CCD-016-[97(R2005)], Thermal Insulation Materials.
- .2 CCD-020-[95(R2007)], Gypsum Wallboard.
- .3 CCD-029-[96], Water Conserving Products.
- .4 CCD-045-[95], Sealant and Caulking Compounds.
- .5 CCD-046-[95], Adhesives.
- .6 CCD-047-[98(R2005)], Architectural Surface Coatings.
- .7 CCD-048-[95(R2006)], Surface Coatings - Recycled Water-Borne.
- .8 CCD-127-[95], Recycled Plastic Products.
- .9 CCD-144-[2003], Naturally-Derived Phenol Substitutes.
- .10 CCD-150-[2004], Steel for Use in Construction Products.
- .11 CCD-152-[2001(R2005)], Flooring Products.
- .12 CCD-167-[2007], Mosaic Tiles.
- .3 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-[2004], FSC Principle and Criteria for Forest Stewardship.
- .4 Green Seal Environmental Standards (GS)
- .1 GS-03-[97], Environmental Criteria for Anti-Corrosive Paints.
- .2 GS-11-[11], Standard for Paints and Coatings.
- 1.4 ACTION AND INFORMATIONAL SUBMITTALS .1 Submit in accordance with Section 01 33 00.
- .2 Submittals required:
- .1 Submit name and experience of Green Design Co-ordinator to Departmental Representative for approval.
- .2 Compliance Report indicating requirement to purchase energy efficient and environmentally benign products.
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- .3 Use Report indicating understanding of requirement to use materials and methods of construction, which improve energy and water efficiency, reduce hazardous by-products, and use recycled materials, or materials, which can be reused.
 - .3 Submit 2 copies of WHMIS MSDS in accordance with Section [01 35 29.06 - Health and Safety Requirements] [01 35 43 - Environmental Procedures]. Indicate VOC emissions, prior to installation or use:
 - .1 Adhesives.
 - .2 Caulking compounds.
 - .3 Sealants.
 - .4 Insulating materials.
 - .5 Paints.
 - .6 Floor and wall patching or levelling materials.
 - .7 Lubricants.
 - .8 Clear finishes for wood surfaces.
 - .4 Construction Schedule:
 - .1 Submit schedule of construction prior to start of work, in co-ordination with scheduling requirements, including:
 - .1 Sequence of finish applications and allowances for curing times.
 - .2 Identification of finish types.
 - .3 Delivery schedules of manufactured materials which are anticipated to off-gas in timely manner, which will allow for airing of those materials prior to their scheduled installation.
- 1.5 HAZARDOUS MATERIALS
- .1 Follow methods and procedures specified in Section 02 81 01 - Hazardous Materials.
 - .2 Take measures to ensure chemical spills do not enter drains.
 - .3 Provide proper storage and containment of herbicides and indoor pesticides.
 - .1 Design and construction of storage spaces for hazardous materials in accordance with authorities having jurisdiction.
 - .2 Include ventilation of areas, which contain potential sources of air contamination.
 - .1 Comply with standards for storage of flammable, combustible and hazardous materials, explosives, compressed gas cylinders, and reactive, corrosive and oxidizing materials.
 - .3 Storage conditions, ventilation requirements, construction materials storage areas, containers, drums and tanks, compatibility issues, and labelling: in accordance with
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federal and municipal guidelines supplemented as follows:

- .1 Confine storage of chemicals and hazardous wastes to designated areas with security of access.
- .2 Ensure access to hose bib and water for mixing concentrated chemicals.
- .3 Include containment to prevent spills from entering drains.
- .4 Include venting to exterior.
- .5 Keep storage areas under negative pressure, where possible.

1.6 SITE MANAGEMENT

- .1 Enhancing ecological value of site by maintaining the native vegetation along the waterway

1.7 EROSION AND SEDIMENTATION CONTROL

- .1 Follow methods and procedures specified in Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Establish long-term soil stabilization program as indicated.
- .3 Develop an Erosion and Sedimentation Control Plan to control stormwater runoff and other erosion measures.
- .4 Protect stockpiled topsoil.

1.8 REDUCING SITE DISTURBANCES

- .1 When building is on a previously undeveloped site comply with following requirements:
 - .1 Avoid major alterations to sensitive topography, vegetation and wildlife habitat in areas indicated.
 - .2 Create traffic patterns, which cause minimum site disruptions, as per Departmental Representative's approval.
- .2 Minimize disturbances to watershed using site water management measures to ensure that watersheds and groundwater will be preserved.
- .3 Construct and erect erosion barriers to locations indicated and as directed by Departmental Representative.
- .4 Take measures to avoid soil compaction.
- .5 Re-grade and plant vegetation in accordance with Sections 32 91 19.13 - Topsoil Placement and Grading.

<u>1.9 GENERAL CONSTRUCTION MATERIALS/PRACTICES</u>	.1	Materials and Resources
	.1	Use uncontaminated demolition materials for fill and hardcore and/or granular base.
	.2	Incorporate reused building materials as indicated.
	.3	Use products and services that meet criteria of EcoLogo guidelines.
	.4	Provide list of non-endorsed products and services, provided the green labelled product or services are capable of meeting specified performance requirements.
	.2	Construction Waste Management
	.1	Follow recommendations and requirements of this projects construction, renovation and demolition (CRD) waste management plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
	.2	Recycled Content
	.1	Use materials with post-consumer and post-industrial recycled content.
	.3	Local/Regional Materials
	.1	Use systems and materials having 10 %, by cost, of total products or materials manufactured within 800 kilometers if transported by truck or 2400 kilometers if transported by rail or water of project site.
	.4	Wood
	.1	Use lumber sourced from independently certified well-managed forests in accordance with CAN/CSA-Z809 or FSC or SFI
<u>1.10 PAINTS, STAINS, AND VARNISHES</u>	.1	Use paints and coatings with VOC limits to CCD-047.
<u>1.11 SEALANTS, ADHESIVES AND COMPOUNDS</u>	.1	Use adhesives with VOC limits to CCD-046.
	.2	Use sealant products with VOC limits to CCD-045.
<u>1.12 EXTERIOR SITE</u>	.1	Take measures to prevent soil erosion before, during, and after construction by controlling storm-water runoff and wind erosion. Use:
	.1	Detention ponds.
	.2	Infiltration trench.
<u>PART 2 - PRODUCTS</u>		Not Used.
<u>PART 3 - EXECUTION</u>		Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 Work under this section relates to condition surveys and monitoring of structures and buildings which are adjacent to the construction site and which may be affected by excavation, dewatering and vibration producing activities (such as sheet pile driving/vibrating, concrete demolition work, excavation of frozen ground, and operation of heavy construction equipment).
- .2 The Contractor is advised that structures, buildings and water supply wells are located close to the proposed work and that construction activities are to be conducted in such a manner to preclude damage to these structures, buildings and wells. The Contractor shall be responsible for any damage caused by their activities.
- .3 The Contractor shall undertake environmental monitoring of the sediment and erosion control system including water quality of discharge from dewatering operations.
- .4 The scope of work described in this section is a minimum requirement for conducting a condition survey and monitoring of the work. The Contractor Design Engineer together with the Monitoring Engineer are to review and advise the Departmental Representative on movement and vibration criteria and any additional monitoring requirement.
- .5 The monitoring work under the present scope only covers the construction area and immediate surroundings. The Contractor shall take full responsibility for other areas as part of their haul routes.

1.2 RELATED SECTIONS

- .1 Section 01 11 00 - Summary of Work
- .2 Section 01 33 00 - Submittal Procedures
- .3 Section 01 35 43 - Environmental Procedures
- .4 Section 01 77 00 - Closeout Procedures
- .5 Section 02 41 16 - Structure Demolition
- .6 Section 31 23 33 - Excavating and Backfilling
- .7 Section 35 20 22 - Dewatering and Diversion

1.3 MEASUREMENT AND

- .1 There shall be no separate measurement for payment
-

PAYMENT PROCEDURES

for the work under this Section. Include cost in the Contract Lump sum Price.

- .2 Payment shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.

1.4 INDEPENDENT INSPECTION AGENCIES

- .1 An Independent Inspection/Monitoring Firm(s) shall be retained by the Contractor for the purpose of inspecting and/or monitoring portions of Work as described in this section. Cost of such services will be borne by the Contractor.

- .2 The Independent Inspection/Monitoring Firm(s) shall be qualified and competent in:

- .1 Performing condition surveys;
- .2 The determination of allowable movement including displacement and vibration at structures and embankments;
- .3 the protection of adjacent buildings, shoreline structures and embankments;
- .4 the protection of adjacent roadways;
- .5 the protection of groundwater wells;
- .6 the establishment of measurement procedures and their implementation;
- .7 monitoring and reporting.

- .3 The Condition Survey shall be undertaken by a qualified and competent inspector.

- .4 If requested by the Departmental Representative, submit the inspector and monitoring specialist qualification and experience.

1.5 DEFINITIONS

- .1 Monitoring Engineer: refers to the independent inspection / monitoring firm which is responsible for the work under this section.

- .2 Design Engineer: refers to the engineer/engineering firm retained by the Contractor to design and oversee the construction of the temporary and permanent works (construction of cofferdam, temporary construction access roads and diversion system and any other temporary works) required to complete the work under the Contract.

1.6 CONSTRUCTION CONTROL AND MONITORING

- .1 At least fifteen (15) days prior to start of work, the Contractor shall submit their Construction Control and Monitoring (CCM) plan. The plan shall be prepared in conjunction with the work area dewatering and water diversion construction plans, demolition plan and environmental management plan for sediment and erosion control.

- .2 As a minimum the CCM plan is to cover:
-

- .1 The format of the Condition Survey;
- .2 The extent of the Condition Survey;
- .3 the methodology to be used to monitor existing cracks in existing buildings and other structures including embankments;
- .4 the extent and methodology for soil movement monitoring program at existing structures and embankments, including establishment of critical movement criteria, type of monitoring equipment and frequency of measurement;
- .5 the vibration monitoring program, including influence vibration zone, safe and critical vibration levels and anticipated vibration levels at the closest structure, including type of monitoring equipment and frequency of measurement;
- .6 the turbidity control and drainage water as part of the sediment and erosion control plan;
- .7 the format for report reading of CCM plan;
- .8 measures to protect existing groundwater wells and their services

- .3 Prior to commencement of the work meet with Departmental Representative to discuss the CCM plan, report format, report frequencies, emergency report and distribution list.

1.7 GROUNDWATER WELL MONITORING

- .1 The Departmental Representative will be undertaking a monitoring program of the drinking wells of the adjacent properties. The program will include sampling and testing of water and water levels prior to commencement of work and during the construction and post-construction phases.
- .2 Result of the initial sampling and sampling during the construction and post-construction phases will be shared with the Contractor.
- .3 If water quality changes during the construction phase of the project, the Contractor will be advised. The Contractor will be required to immediately stop work and take appropriate measures to reduce or eliminate water quality problems

1.8 TURBIDITY CONTROL AND DRAINAGE WATER

- .1 The Contractor shall undertake quality (turbidity) monitoring of any discharge water to a receiving stream as part of their final Sediment and Erosion Control Plan as set out in Section 01 35 43 and 35 42 19.

1.9 CONDITION SURVEY

- .1 Prior to commencement of the work, a Pre-Construction Condition Survey Report of adjacent properties and structures, within 50 meters of the defined construction limit at a minimum, that may

- be affected by the work under this contract shall be submitted by the Contractor.
- .2 The Condition Survey shall be undertaken by the Contractors qualified inspector together with the Departmental Representative, private landowners and Township/municipality representatives (as applicable).
 - .3 The survey shall include the location and condition of adjacent properties.
 - .4 As a minimum the building and shoreline structures Condition Survey Reports are to cover the above and sub-grade accessible interior walls, exterior visible walls, ceiling, roof and floors, stone open fire pit, stone retaining walls and stairs. The reports shall detail, by sketches, video tape, photographs, and/or notes, the existing structural and cosmetic condition, but should not be limited to areas of building exhibiting distress (damage). Any significant cracks are to be identified and monitored.
 - .5 Condition Surveys are to be performed for all building and structures located within 40 metres from the edge of excavation and dewatering work, and/or 50 meters from vibration producing activities. As a minimum, the following properties and structures are to be surveyed:
 - .1 Adjacent properties: cottages upstream and downstream of the dam.
 - .2 Coordinate survey with the Departmental Representative.
 - .6 Furthermore, Condition Survey is to be performed for:
 - .1 Township and municipalities roads to be used as Haul Routes.
 - .2 Staging areas.
 - .3 Shoreline at perimeter of construction areas.
 - .7 The contractor shall perform a monthly inspection of the Haul Routes and report their findings to the Township/Municipality and Departmental Representative. Repair and make good any damage to the satisfaction of the Local Authorities and the Departmental Representative.
 - .8 Upon completion of the work under the contract a Post-Construction Condition Survey shall be performed on all properties, buildings or structures that were surveyed as part of the Pre-Construction Condition Survey. The survey needs to focus on the same issues that were identified under the original survey, plus any new issues that may
-

have developed during the construction period.

1.10 CONDITION SURVEY
REPORT

- .1 Prepare and submit a DRAFT Pre-Construction Condition Survey Report for review and approval by the Departmental Representative prior to construction commencement.
- .2 Revise as required by the Departmental Representative and submit Final version of survey report.
- .3 For each property surveyed, provide four (4) copies of the Condition Survey Report (PDF or approved alternative) with annotation of location of interest and comments on the existing conditions.
- .4 One copy of the approved report is to be provided to the respective individual landowner and/or township/municipality. One copy is to be maintained on site.

1.11 MONITORING

- .1 The Contractor will be responsible to carry out monitoring. Monitoring work is to include:
 - .1 Monitoring of cracks in buildings and other structures which were identified as part of the Pre-Construction Condition Surveys;
 - .2 Vibration (seismographic) monitoring.
- .2 Cracks in buildings and structures monitoring:
 - .1 Displacement monitoring gauges shall be installed across any significant existing crack to monitor for any additional building/structure distress due to work under this contract.
 - .2 Location and number of gauges will be established by the Contractor and the Departmental Representative.
 - .3 Gauges shall be read prior to commencement of construction activities and shall continue on a weekly basis until the completion of vibration producing construction activities.
 - .4 The Departmental Representative is to be advised of any significant crack displacement detected by the monitoring gauges.
- .3 Vibration (Seismograph) monitoring:
 - .1 The monitoring engineer shall:
 - .1 Establish vibration influence zones and safe vibration levels and develop the Contractors vibration monitoring program for the adjacent structures as required.
 - .2 Supervise the Contractor vibration monitoring program.
 - .2 During vibration producing activities, the Contractor shall monitor vibration levels, and shall not exceed the established safe

- level to preclude damage to the adjacent structures.
- .3 The vibration monitoring equipment shall be capable of:
 - .1 Continuously record peak particle velocity.
 - .2 Providing permanent record of the entire vibration event.
 - .3 Providing an alarm when vibration limit exceed the established safe vibration level.
 - .4 Remotely monitored by the Monitoring Engineer.
 - .4 Copies of all vibration records and associated construction activities (sheet pile driving/vibrating, concrete demolition work, excavation of frozen ground, and operation of heavy construction equipment) data shall be provided to the Design Engineer and Departmental Representative on a daily basis.
 - .5 Reporting:
 - .1 The Monitoring Firm shall provide a written record of findings including new data and its interpretation including other figures and graphs. The record shall be continuous and shall be provided within 24 hours of the measurements being taken.
 - .2 The Contractor Design and Monitoring Engineer shall provide recommendations based on the findings to the Departmental Representative.
 - .3 The report shall be clear and concise and be acceptable to the Departmental Representative.
 - .4 Action requirements by the Contractor shall be clearly defined with schedule of implementation.
 - .5 An addendum to the report shall be made by the Monitoring Engineer based on the result of the action taken by the Contractor to address the construction issue.
 - .4 Take appropriate measures to reduce vibration to adjacent properties and structures. If vibration measurements exceeds set criteria, immediately stop all construction activity and inform Design engineer and Departmental Representative of the situation. Provide and implement remedial action to rectify the situation. Obtain written permission from Departmental Representative prior to resuming construction activities.
 - .5 Immediately repair any damage to any adjacent
-

structure to the satisfaction of the Departmental Representative.

- .6 Turbidity control and drainage water:
 - .1 The monitoring firm shall provide a protocol and methodology for monitoring the total suspended solids (TSS) from any discharge point to a watercourse.
 - .2 The Ministry of Environment has established criteria wherein the allowable increase in TSS from background levels is 25 mg/l.
 - .3 Reporting shall be undertaken as set out in this Section.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED SECTIONS .1 Section 01 52 00 - Construction Facilities.
- 1.2 SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00.
- 1.3 INSTALLATION AND REMOVAL .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use and restore site to original conditions or better.
- 1.4 DEWATERING .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.
- .1 Also in accordance with Section 01 35 43.
- 1.5 TEMPORARY HEATING AND VENTILATION .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to facilitate progress of work and provide adequate ventilation to meet health regulations for safe working environment.
- .4 Ventilating:
- .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
- .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .5 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
- .1 Conform with applicable codes and standards.
-

- .2 Enforce safe practices.
- .3 Prevent abuse of services.
- .4 Prevent damage to finishes.
- .5 Vent direct-fired combustion units to outside.

- .6 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.6 TEMPORARY POWER
AND LIGHT

- .1 There is no lighting or power supply on site. Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Provide and maintain temporary lighting throughout project.
- .3 Access to private power supply on neighboring property is prohibited without prior arrangements being made with the private owner. Pre-existing agreements for use and access of neighboring private land and facilities are in place between the private property ownership and Parks Canada. These agreements do not include access to any utilities. Any requests for use of the private owner's property or facilities not explicitly indicated in these specifications and/or on the contract drawings must be approved first by the Departmental Representative. Do not contact the private owner directly.
- .4 Power distribution lines are located near site but there are no utility poles in the immediate vicinity of the dam. Where tying into municipal power supply advise Departmental Representative and contact the applicable jurisdictional power utility authorities.

1.7 WATER SUPPLY

- .1 There is no running water supply of any kind, potable or otherwise on site. No drilled well exists.
- .2 Provide and pay for potable water supply for cast-in-place concrete works. Do not draw water from water course for concrete work.
- .3 Water may be drawn from river and in fact may be encouraged for other activities on the job site such as cleaning, or watering of grassed areas during establishment period. Where drawing water from river, first advise Departmental Representative of intended use for approval. Where deemed unacceptable potable water must be used.

- .4 Ensure any water supply is filtered and treated to a potable state. Unfiltered and untreated water drawn from another water source may introduce foreign contaminants, organisms or invasive plants or species which may be an ecological threat to the site environment.

1.8 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws. Burning rubbish and construction waste materials is not permitted on site without exception.

PART 2 - PRODUCTS

2.1 NOT USED

Not Used.

PART 3 - EXECUTION

3.1 TEMPORARY
EROSION AND
SEDIMENTATION
CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED SECTIONS
- .1 Section 01 14 00 - Work Restrictions.
 - .2 Section 01 33 00 - Submittal Procedures.
 - .3 Section 01 35 29 - Health and Safety Requirements.
 - .4 Section 01 35 43 - Environmental Procedures.
 - .5 Section 01 51 00 - Temporary Utilities.
 - .6 Section 01 56 00 - Temporary Barriers and Enclosures.
- 1.2 SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00.
- 1.3 INSTALLATION AND REMOVAL
- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
 - .2 Identify areas which have to be graveled to prevent tracking of mud.
 - .3 Indicate use of supplemental or other staging area.
 - .4 Provide construction facilities in order to execute work expeditiously.
 - .5 Remove from site all such work after use and restore site to original conditions or better.
- 1.4 SCAFFOLDING
- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- 1.5 HOISTING
- .1 Provide, operate and maintain hoists required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
 - .2 Hoists to be operated by qualified operator.
- 1.6 SITE STORAGE/LOADING
- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with equipment, debris piles, and removable bins outside of pre-approved staging area determined in advance of Work.
- 1.7 CONSTRUCTION PARKING
- .1 Parking will be permitted on site provided it does not disrupt the use of the facilities.
-

- .2 The site area is limited and the Contractor must arrange and pay for any additional storage or work areas that are needed to complete the work.
- .3 Provide and maintain adequate access to project site.
- .4 Clean areas where used by Contractor's equipment.
- .5 Provide snow removal during progress of work as required for access to project site.

1.8 SECURITY

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays and for duration of project completion.

1.9 OFFICES

- .1 Provide a temporary portable office trailer for use as a site office by the Departmental Representative:
 - .1 Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 50% opening windows and one lockable door.
 - .2 Insulate building and provide heating system to maintain 22 degrees C inside temperature at -20 degrees C outside temperature.
 - .3 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19 mm thick plywood.
 - .4 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10 % upward light component.
 - .5 Provide private washroom facilities adjacent to office complete with flush or chemical type toilet, lavatory and mirror and maintain supply of paper towels and toilet tissue.
 - .6 Equip office with 1 x 2 m table, 4 chairs, 6 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.
 - .7 Maintain in clean condition.
 - .8 Provide internet connection
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Contractor and subcontractors to provide their own offices as necessary.
- .4 Location of offices to be coordinated with the Departmental Representative.

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- 1.10 LIVING FACILITIES
- .1 Living facilities and meals to be arranged by the Contractor.
- 1.11 EQUIPMENT, TOOL AND MATERIALS STORAGE
- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials. Storage space on site is very limited. Keep materials, tools and equipment within approved designated areas. Plan material deliveries or waste removals in a manner to limit site storage requirements.
- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities and private operator's site operations.
- 1.12 SANITARY FACILITIES
- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- 1.13 CONSTRUCTION SIGNAGE
- .1 No other signs or advertisements, other than warning signs, are permitted on site.
- .2 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .3 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by Departmental Representative.
- 1.14 PROTECTION AND MAINTENANCE OF TRAFFIC
- .1 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .2 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs.
- .3 Protect travelling public from damage to person and property.
-

- .4 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
 - .1 Also in accordance with Section 01 14 00.
- .5 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
 - .1 Also in accordance with Section 01 14 00.
- .6 Do not construct new access trails or haul roads.
- .7 Provide necessary signs, barricades, and distinctive markings for safe movement of traffic.
- .8 Dust control: adequate to ensure safe operation at all times.
- .9 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .10 Provide snow removal during period of Work.

1.15 CLEAN-UP

- .1 Remove debris, waste materials, from work site daily to waste disposal staging area.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways and restore roadways to original conditions or better.
- .3 Store materials resulting from demolition activities that are salvageable and removed from work site daily to waste disposal staging area.
- .4 Stack stored new or salvaged material.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 TEMPORARY
EROSION AND
SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control drawings.
- .2 Inspect, repair, and maintain erosion and

sedimentation control measures during construction until permanent vegetation has been established.

- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

PART 1 - GENERAL

1.1 <u>RELATED REQUIREMENTS</u>		Not Used
1.2 <u>REFERENCES</u>	.1	Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
	.2	Canadian General Standards Board (CGSB) .1 CGSB 1.59-[97], Alkyd Exterior Gloss Enamel. .2 CAN/CGSB 1.189-[00], Exterior Alkyd Primer for Wood.
	.3	Canadian Standards Association (CSA International) .1 CSA-O121-[M1978(R2003)], Douglas Fir Plywood.
	.4	Ontario Ministry of Natural Resources (OMNR) .1 Reptile and Amphibian Exclusion Fencing: Best Practices, Version 1.0. Species at Risk Branch Technical Note. [2013]
1.3 <u>INSTALLATION AND REMOVAL</u>	.1	Provide temporary controls in order to execute Work expeditiously.
	.2	Remove from site all such work after use.
1.4 <u>HOARDING</u>	.1	Erect temporary site enclosure using new 1.2 m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m on center, Fast Fence or similar approved product. Provide one lockable truck gate. Maintain fence in good repair.
	.2	Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.
1.5 <u>GUARD RAILS AND BARRICADES</u>	.1	Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs, and deck of dam.
	.2	Provide as required by governing authorities
1.6 <u>REPTILE EXCLUSION FENCING</u>	.1	Erect temporary reptile exclusion fences as directed by the Departmental Representative per OMNR Best Practices 2013.
1.7 <u>WEATHER ENCLOSURES</u>	.1	Design enclosures to withstand wind pressure and snow loading.
1.8 <u>DUST TIGHT SCREENS</u>	.1	Provide dust tight screens or partitions to

- localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.
- 1.9 ACCESS TO SITE .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.
- 1.10 PUBLIC TRAFFIC FLOW .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.
- 1.11 FIRE ROUTES .1 Maintain access to property including overhead clearances for use by emergency response vehicles.
- 1.12 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY .1 Protect surrounding private and public property from damage during performance of Work.
.2 Be responsible for damage incurred.
- 1.13 PROTECTION OF BUILDING FINISHES .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
.2 Provide necessary screens, covers, and hoardings.
.3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.
.4 Be responsible for damage incurred due to lack of or improper protection.
- 1.14 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- PART 2 - PRODUCTS
- 2.1 NOT USED .1 Not used.
- PART 3 - EXECUTION
- 3.1 NOT USED .1 Not used.

END OF SECTION

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Field engineering survey services to measure and stake site.
- .2 Survey services to establish and confirm inverts for Work.
- .3 Installation of geodetic bench marks on top of the new dam structure tied-in with existing referenced bench mark elevation.
- 1.2 MEASUREMENT AND PAYMENT PROCEDURES .1 There shall be no separate measurement for payment for the work under this Section. Include cost in the Contract Lump Sum Price.
- .2 Payment shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work.
- 1.3 REFERENCES .1 Owner's identification of existing survey control points and property limits.
- 1.4 QUALIFICATIONS OF SURVEYOR .1 Qualified registered land surveyor, licensed to practice in Ontario, acceptable to Departmental Representative and Owner.
- 1.5 SURVEY REFERENCE POINTS .1 Locate, confirm and protect control points prior to starting site work. Relocate and place permanent reference points during construction and after completion of Work.
- .2 Make no changes or relocations without prior written notice to Departmental Representative.
- .3 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .4 Require surveyor to replace control points in accordance with original survey control.
- 1.6 SURVEY REQUIREMENTS .1 Establish two permanent benchmarks on site, referenced to established benchmarks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2 Establish lines and levels, locate and lay out, by instrumentation.
- .3 Stake for grading, new construction features, fill and topsoil placement and landscaping features.

.4 Stake batter boards for foundations.

.5 Establish new foundation and sill elevations.

1.7 EXISTING SERVICES

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

.2 Remove abandoned service lines within 5 m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

1.8 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of foundations, new structures and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines.

1.9 SUBMITTALS

.1 Submit name and address of Surveyor to Departmental Representative

.2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

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 RELATED REQUIREMENTS

- .1 Section 01 74 21 - Construction/Demolition Waste Management and Disposal
- .2 Section 02 81 01 - Hazardous Materials

1.2 REFERENCES

- .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
- .2 United States Environmental Protection Agency (USEPA)
 - .1 EPA 833-F-11-006 - Stormwater Best Management Practices: Concrete Washout [2012]

1.3 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
 - .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
 - .3 Clear snow and ice from access to building, remove from site.
 - .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
 - .5 Provide on-site containers for collection of waste materials and debris.
 - .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .7 Dispose of waste materials and debris at designated dumping areas off site.
 - .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
 - .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
-

- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .13 Collect, retain and dispose all the concrete washout water (or washwater) and solids in leak proof containers in accordance with:
 - .1 EPA 833-F-11-006 - Stormwater Best Management Practices: Concrete Washout (attached);
 - .2 Section 01 74 21 Construction/Demolition Waste Management and Disposal; and
 - .3 Section 02 81 01 - Hazardous Materials.

1.4 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
 - .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
 - .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
 - .4 Remove waste products and debris including that caused by Owner or other Contractors.
 - .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
 - .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
 - .7 Clean and polish hardware, stainless steel, and mechanical and electrical fixtures.
 - .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, walls, and deck.
 - .9 Clean lighting reflectors, lenses, and other
-

lighting surfaces.

- .10 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .11 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .12 Remove dirt and other disfiguration from exterior surfaces.
- .13 Sweep and wash clean concrete areas.
- .14 Clean equipment and fixtures to sanitary condition.
- .15 Clean drainage systems.
- .16 Remove snow and ice from access to dam.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2

PART 2- PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 WASTE
MANAGEMENT GOALS

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss PWGSC's waste management goal and Contractor's proposed Waste Reduction Workplan for Construction, Renovation and /or Demolition (CRD) waste to be project generated.
- .2 Carefully deconstruct and source separate materials/equipment and divert waste destined for landfill to maximum extent possible.
- .3 Reuse, recycle, compost, burn or sell material for reuse except where indicated otherwise. On site sales are not permitted.
- .4 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.
- .5 Protect environment and prevent environmental pollution damage.

1.2 RELATED
SECTIONS

- .1 Section 01 35 29.06 - Health and safety requirements.
- .2 Section 01 35 43 - Environmental procedures.
- .3 Section 01 41 00 - Regulatory requirements.
- .4 Section 01 74 11 - Cleaning.
- .5 Section 02 41 21 - Removals.
- .6 Section 02 81 01 - Hazardous Materials

1.3 REFERENCES

- .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
- .2 Reference Standards:
 - .1 Ontario Ministry of Environment:
 - .1 Ontario 3 R's Regulations (regulation 102/94) for waste management programs applicable to construction and demolition projects greater than 2,000 m².
 - .2 Ontario Environmental Protection Act (EPA)
 - .1 Regulation 102/94, Waste Audits

and Waste Reduction Workplans.
.2 Regulation 103/94, Source
Separation Programs.

.3 Public Works and Government
Services Canada (PWGSC)
.1 2002 National Construction,
Renovation and Demolition Non-
Hazardous Solid Waste Management
Protocol.

1.4 ACTION AND
INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Prepare and submit following prior to project start-up:
 - .1 One copy and one electronic copy of completed Waste Audit (WA).
 - .2 One copy and one electronic copy of completed Waste Reduction Workplan.
- .3 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.
- .4 Registration of activities on the Ontario Hazardous Waste Information Network (HWIN), if applicable.

1.5 WASTE AUDIT (WA)

- .1 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 separate wastes.
 - .2 Source separate the following waste:
 - .1 Cement and concrete.
 - .2 Corrugated cardboard.
 - .3 Wood.
 - .4 Steel.

1.6 WASTE REDUCTION
WORKPLAN (WRW)

- .1 Prepare and submit WRW (Schedule B) at least 10 days prior to project start-up.
- .2 WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations.
- .3 WRW should include but not limited to:
 - .1 Applicable regulations.
 - .2 Specific goals for waste reduction, identify existing barriers and develop strategies to overcome them.
 - .3 List of approved Disposal Facilities
 - .4 List of approved Haulers
 - .5 Destination of materials identified.

- .6 Deconstruction/disassembly techniques and schedules.
- .7 Methods to collect, separate, and reduce generated wastes.
- .8 Location of waste bins on-site.
- .9 Security of on-site stock piles and waste bins.
- .10 Protection of personnel, sub-contractors.
- .11 Clear labelling of storage areas.
- .12 Details on materials handling and removal procedures.
- .13 Recycler and reclaimer requirements.
- .14 Quantities of materials to be salvaged for reuse or recycled and materials sent to landfill.
- .15 Requirements for monitoring on-site wastes management activities.

- .4 Monitor and report on waste reduction by documenting total volume (in tonnes) and cost of actual waste removed from project.

1.7 WASTE SOURCE
SEPARATION PROGRAM
(WSSP)

- .1 As part of Waste Reduction Workplan, prepare a WSSP prior to project start-up.
 - .2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill.
 - .3 Provide list and drawings of locations that will be made available for sorting, collection, handling and storage of anticipated quantities of reusable and recyclable materials.
 - .4 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
 - .5 Locate containers to facilitate deposit of materials without hindering daily operations.
 - .6 Locate separated materials in areas which minimizes material damage.
 - .7 Clearly and securely label containers to identify types/conditions of materials accepted and assist in separating materials accordingly.
 - .8 Monitor on-site waste management activities by conducting periodic site inspections to verify: state of signage, contamination levels, bin locations and condition, personnel participation, use of waste tracking forms and collection of waybills, receipts and invoices.
-

- .9 On-site sale of salvaged materials is not permitted.
- 1.8 USE OF SITE AND FACILITIES
- .1 Execute Work with minimal interference and disturbance to normal use of premises.
- .2 Maintain security measures established by facility and provide temporary security measures approved by Departmental Representative.
- 1.9 WASTE PROCESSING SITES
- .1 Province of Ontario:
- .1 Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto ON M4V 1P5.
Telephone: 1-800-565-4923 or 416-323-4321
Fax: 416-323-4682
- .2 Recycling Council of Ontario, 215 Spadina Ave. #225, Toronto ON M5T 2C7.
Telephone: 416-657-2797
Fax: 416-960-8053
Email: rco@rco.on.ca
Website: <http://www.rco.on.ca/>
- .2 Contractor responsible for accessing a licensed/approved landfill site for both hazardous and nonhazardous materials. Submit location of the licensed landfill site to Departmental Representative for review.
- 1.10 QUALITY ASSURANCE
- .1 After award of Contract, a mandatory site examination will be held for this Project for Contractor responsible for renovation demolition/deconstruction waste management.
- .1 Date, time and location will be arranged by Departmental Representative.
- .2 Waste Management Meeting: Waste Management Coordinator is to provide an update on status of waste diversion and management activities at each meeting. Written monthly Waste Diversion Report summary to be provided by Waste Management Coordinator.
- .3 Submit proof that all waste is being disposed of at a licensed landfill site or waste transfer site. A copy of the disposal/waste transfer site's license and a letter verifying that said landfill site will accept the waste must be supplied to Departmental Representative prior to removal of waste from the demolition site.
- 1.11 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 become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed and salvaged materials from movement or damage.
- .6 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.
- .7 Separate and store materials produced during project in designated areas.
- .8 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.
 - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.
 - .4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

1.12 DISPOSAL OF
WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste volatile materials mineral spirits oil paint thinner into waterways, storm, or sanitary sewers.
- .3 Concrete waste water having a pH \geq 12.5 must be disposed of in accordance with Section 02 81 01 - Hazardous Materials.
- .4 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Total tonnage generated.
 - .4 Tonnage reused or recycled.
 - .5 Reused or recycled waste destination.
- .5 Remove materials on-site as Work progresses.
- .6 Prepare project summary to verify destination and quantities on a material-by-material basis.

-
- 1.13 SCHEDULING .1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.
- PART 2 - PRODUCTS
- 2.1 NOT USED .1 Not Used.
- PART 3 - EXECUTION
- 3.1 APPLICATION .1 Do Work in compliance with WRW and WSSP.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.
- 3.2 CLEANING .1 Progress Cleaning: clean in accordance with Section 01 74 11.
- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .2 Source separate materials to be reused/recycled into specified sort areas.
- 3.3 DIVERSION OF MATERIALS .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.
- .1 Mark containers or stockpile areas.
- .2 Provide instruction on disposal practices.
- .2 On-site sale of salvaged recovered reusable recyclable materials is not permitted.
- 3.4 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT .1 Schedule G - Government Chief Responsibility for the Environment:
-

Province	Address	General Inquiries	Fax
Ontario	Ministry of the Environment and Climate Change 135 St. Clair Avenue West Toronto ON M4V 1P5 Environment Canada Toronto ON	416-323-4321 800-565-4923 416-734-4494	416-323-4682

END OF SECTION

PART 1 - GENERAL

1.1 RELATED
REQUIREMENTS

- .1 Section 01 74 11 - Cleaning.
- .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.2 INSPECTION AND
DECLARATION

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Departmental Representative's inspection.
 - .2 Departmental Representative Inspection:
 - .1 Departmental Representative and Contractor to inspect Work and identify deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Certificates required have been submitted.
 - .4 Work: complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.
 - .2 When Work is deemed incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
 - .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

- .6 Final Payment:
 - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
- .7 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.3 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 11.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Product data, materials and finishes and related information.
- .2 Warranties and bonds.
- 1.2 RELATED REQUIREMENTS .1 Section 01 45 00 - Quality Control.
- 1.3 SUBMISSION .1 Prepare instructions and data using personnel experienced in maintenance and operations of described products.
- .2 Copy will be returned after final inspection, with Departmental Representative's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 If requested, furnish evidence as to type, source and quality of products provided.
- .5 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of manuals and documentation in English.
- .6 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .7 Pay costs of transportation.
- 1.4 FORMAT .1 Organize data in the form of a manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
.1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
-

1.5 CONTENTS - PROJECT
RECORD DOCUMENTS

- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in "dwg" format on CD.
- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names
 - .2 Addresses and telephone numbers of Departmental Representative and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
 - .1 Section 01 45 00.

1.6 AS-BUILT
DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in Supplementary Conditions, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed product data.
 - .6 Field test records.
 - .7 Inspection certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this

Project Manual.

.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

.6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of Work.

.7 If project is completed without significant deviations from Contract drawings and specifications, submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

1.7 RECORDING
INFORMATION ON
PROJECT RECORD
DOCUMENTS

.1 Other Documents: maintain inspection certifications, field test records, required by individual specifications sections.

.2 Provide digital photos, if requested, for site records.

1.8 FINAL SURVEY

.1 Submit final site survey certificate certifying that completed Work are in conformance, or non-conformance with Contract Documents.

1.9 MATERIALS AND
FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
.1 Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual specifications sections.

1.10 DELIVERY,
STORAGE AND
HANDLING

.1 Store maintenance materials, and special tools in manner to prevent damage or deterioration.

- .2 Store components subject to damage from weather in weatherproof enclosures.
- .3 Store paints and freezable materials in a heated and ventilated room.
- .4 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.11 WARRANTIES AND BONDS

- .1 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.

PART 2 - PRODUCTS

- 2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

- 3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 This section specifies the requirements for demolition to complete work as indicated by the drawings and specification.
- .2 Work includes but is not limited to:
 - .1 Staged demolition of the existing Horseshoe Lake Dam. This includes:
 - .1 Removal of existing concrete as shown in the project drawings.
 - .2 Preparation of all concrete surfaces against which new concrete is to be cast.
 - .3 Disposing off site all concrete debris and removed steel reinforcement.
 - .4 Disposing off site of all material not designated for salvage or reuse by owner

1.2 RELATED SECTIONS

- .1 Section 01 35 43 - Environmental Procedures.
- .2 Section 01 41 00 - Regulatory Requirements
- .3 Section 01 74 21 - Waste Management and disposal.
- .4 Section 02 41 21 - Removals.
- .5 Section 03 30 00 - Cast in place concrete.
- .6 Section 32 91 19 - Topsoil Placement.
- .7 Section 35 20 22 - Dewatering.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2 National Building Code of Canada (NBCC), including User's Guide, Part 8 - Safety Measures at Construction and Demolition Sites (2015).
- .3 Ontario Occupational Health and Safety Act (OSHA).
- .4 Ontario Building Code (OBC).
- .5 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Assessment Act (CEAA), 1992, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33
 - SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

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- 1.4 MEASUREMENT AND PAYMENT .1 Measurement Procedures: in accordance with Section 01 22 01 - Measurement and Payment.
- .2 The work will be measured and paid for under payment items included in the Unit Price Table:
.1 Item No. 1 - Concrete Removal: This item covers the work described in section 1.1.2.1.1.
- .3 No payment will be made for excavation or demolition beyond the limits shown on the drawings, which has not been authorized by the Departmental Representative. Any overbreak beyond these limits shall be replaced with concrete at the Contractor's expense.
- 1.5 SUBMITTALS .1 Submittals in accordance with Section 01 33 00.
- .2 Hazardous Materials: provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.
- .3 Waste Reduction Workplan: prior to beginning of work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 21 and indicate:
.1 Descriptions of and anticipated quantities of materials to be salvaged reused, recycled and landfilled.
.2 Schedule of selective demolition.
.3 Number and location of dumpsters.
.4 Anticipated frequency of tippage.
.1 Name and address of haulers and waste facilities.
- .4 Certificates: submit certified weight bills and or receipts from authorized disposal sites and reuse and recycling facilities for material removed from site upon request of Departmental Representative.
.1 Written authorization from Departmental Representative is required to deviate from haulers and facilities listed in Waste Reduction Workplan.
- .5 Prior to demolition of the existing structure, establish reference points (minimum of 4) that will allow the transfer of the coordinates and elevations of the existing geodetic bench mark to the new geodetic bench mark on the new structure or such other approach as approved by the Departmental Representative. Provide all data regarding the reference points to the Departmental Representative. Survey work shall be undertaken by an Ontario Legal Survey.
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- 1.6 QUALITY ASSURANCE .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEAA, TDGA, Fisheries Act, Species at Risk Act, and applicable Provincial/Territorial regulations.
- 1.7 DELIVERY, STORAGE AND HANDLING .1 Perform Work in accordance with Section 01 35 43.
- .2 Storage and Protection.
- .1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.
- .2 Remove and store materials to be salvaged, in manner to prevent damage.
- .3 Store and protect in accordance with requirements for maximum preservation of material.
- .4 Handle salvaged materials as new materials.
- .3 Waste Management and Disposal.
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21.
- .2 Divert excess materials from landfill to site approved by Departmental Representative.
- .3 Separate for reuse and recycling and place in designated containers Steel, Metal waste in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Ensure emptied containers are sealed and stored safely.
- .6 Source separate for recycling materials that cannot be salvaged for reuse including wood, metal, concrete and asphalt.
- .7 Remove materials that cannot be salvaged for reuse or recycling and dispose of in accordance with applicable codes at licensed facilities.
- 1.8 SITE CONDITIONS .1 Site Environmental Requirements.
- .1 Perform work in accordance with Section 01 35 43.
- .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- Review existing site conditions and take necessary precautions to protect environment and adjacent non-work areas.
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- 1.9 SCHEDULING .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
.1 Notify Departmental Representative in writing when unforeseen delays occur.
- 1.10 EQUIPMENT .1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.
- PART 2 - EXECUTION
- 2.1 PREPARATION .1 Prevent movement, settlement, or damage to any parts of structures that are to remain in place. Provide bracing and shoring as required.
.2 Keep Noise, dust, and inconveniences to nearby occupants to a minimum.
.3 Provide temporary dust screens, covers, railings, supports and other protection as required.
.4 Sawcut and line drill existing concrete to depth indicated on drawings. Use small, hand operated chippers for demolition and excavation components from approximately 1 metre away from sawcuts.
.1 Take special care not to damage the structural integrity of the remaining portion of the remaining concrete by using equipment of appropriate weights (maximum 10kg).
- 2.2 PROTECTION .1 Support affected structures and, if safety of structure being demolished or remaining component of structure appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
- 2.3 SAFETY CODE .1 Install temporary barriers and enclosures for demolition work in accordance with Section 01 56 00.
.2 Blasting operations not permitted during demolition.
- 2.4 DEMOLITION .1 Demolish components of structure as shown on drawings and specified in specifications.
.2 Crush concrete generated due to demolition of structure to size suitable for recycling
.1 For further information regarding acceptable uses contact Provincial/Territorial aggregate
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producers associations and or Ministries of
Transportation.

- .3 Selective demolition as indicated on drawings.
- .4 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.

2.5 REMOVAL OPERATIONS

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Remove designated trees if required, during demolition.
 - .1 Obtain written approval of Departmental Representative prior to removal of trees not designated on the drawings.
- .4 Grind, chip, or shred other vegetation for mulching and composting.
- .5 Stockpile topsoil for final grading and landscaping.
 - .1 Provide erosion control and seeding if not immediately used.
 - .2 Provide reptile fencing around stockpiles to prevent turtle nesting. Submit drawing to Departmental Representative for approval.

2.6 STOCKPILING

- .1 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .2 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling Procedures.

2.7 REMOVAL FROM SITE

- .1 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project.
- .2 Transport material designated for alternate disposal using approved facilities listed in Waste Reduction Workplan and in accordance with applicable regulations.
 - .1 Written authorization from Departmental Representative is required to deviate from facilities listed in Waste Reduction Workplan.
- .3 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

- .1 Disposal Facilities: approved and listed in Waste Reduction Workplan.
- .2 Written authorization from Departmental Representative is required to deviate from disposal facilities listed in Waste Reduction Workplan.

2.8 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work.

2.9 CLEANING

- .1 Remove debris, trim surfaces and leave work site clean, upon completion of Work
- .2 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section covers the removal and re-installation, after concrete work is completed, of the following items:

- .1 Log lifting devices
- .2 Dam Safety Signs (some new signs will also be installed to complement new public cross walk)
- .3 Gauge system

.2 This section includes the removal of existing stoplogs and all other items that not listed above but must be removed to complete the work and reinstalled after, as described in the specification and/or as shown on the drawings.

.3 Refer to drawings for locations of items to be re-installed. Some items may require modification prior to installation to suit the new dam as indicated on drawings and these specifications. Other minor modifications such as mounting details and hardware may also be coordinated on site with Departmental Representative.

1.2 RELATED SECTIONS

.1 Section 01 22 01 - Measurement and Payment

.2 Section 02 41 16 - Structure Demolition

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Removals of existing concrete dam including concrete deck, abutment, and concrete piers, including steel gain liners, above the existing dam sill will be measured by cubic meter for payment and includes all costs related to removal, transport and disposal of waste material off site. Removals extending beyond limits directed by Departmental Representative will not be paid for.

.2 Removal of existing dam sill concrete to partial depth as directed by Departmental Representative shall be measured by cubic metre for payment and includes all costs related to removal, transport and disposal of waste material off site. Removals extending beyond limits directed by Departmental Representative will not be paid for.

.3 Payment for all concrete removals not measured for payment as described above will be included in the Lump Sum Price.

1.4 PROTECTION

.1 Protect existing structures or parts of structures designated to remain. In the event of damage, make repairs and replacements to the approval of, and at no additional cost, to the Departmental Representative.

.2 Protect all exposed electrical wiring and conduits during the concrete excavation, forming, heating and placement of concrete.

PART 2 - PRODUCTS

2.1 NOT USED Not used.

PART 3 - EXECUTION

3.1 PREPARATION
.1 Inspect the site and verify with the Departmental Representative objects designated to be removed and objects to be preserved.

.2 Notify appropriate utility authorities as required before starting any excavation, demolition, clearing and grubbing.

3.2 REMOVALS
.1 Do not disturb adjacent work designated to remain in place.

.2 Items not designated to be salvaged are to be disposed of in a manner approved by the Departmental Representative. Some items may also be reclaimed by Parks Canada. Where such is the case coordinate hand over and transport of material to Parks Canada storage facility with Departmental Representative.

3.3 SALVAGE
.1 Carefully dismantle materials designated to be salvaged and safely stockpile at locations designated / approved by the Departmental Representative.

.2 Carefully dismantle components designated to be salvaged, label, and take all measurements required for re-installation. Store in a location approved by the Departmental Representative.

3.4 REINSTALLATION
.1 Reinstall all items which were removed as a result of construction activities to match prior to construction condition and the Departmental Representative's approval.

.2 Reinstall as indicated on the drawings or as per existing details, and to the Departmental Representative's approval all items which were removed as a result of construction activities. Supply and install new anchors and hardware, for all items listed in this section, as required for re-installation.

3.5 DISPOSAL OF MATERIALS
.1 Dispose of materials not designated for salvage or reuse in work off the site.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

Not used.

1.2 REFERENCES

- .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
- .2 Definitions:
 - .1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
 - .2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
 - .3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.
 - .1 Waste water having a pH \geq 12.5 is considered a hazardous waste under Ontario Regulation 347.
- .3 Reference Standards:
 - .1 Canadian Environmental Protection Act, 1999 (CEPA 1999)
 - .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).
 - .2 Department of Justice Canada (Jus)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDG Act) [1992], (c. 34).
 - .2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).
 - .3 Green Seal Environmental Standards (GS)
 - .1 GS-11-[2008, 2nd Edition], Paints and Coatings.
 - .2 GS-36-[00], Commercial Adhesives.
 - .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .5 National Research Council Canada Institute for Research in Construction (NRC-IRC)
 - .1 National Fire Code of Canada-[2005].
 - .6 South Coast Air Quality Management District

(SCAQMD), California State, Regulation XI.
Source Specific Standards

.1 SCAQMD Rule 1113-[A2007], Architectural
Coatings.

.2 SCAQMD Rule 1168-[A2005], Adhesive and
Sealant Applications.

.7 R.R.O. 1990, Regulation 347, General – Waste
Management

1.3 ACTION AND
INFORMATIONAL SUBMITTALS

.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
hazardous materials and include product
characteristics, performance criteria,
physical size, finish and limitations.

.2 Submit two copies of WHMIS MSDS in accordance
with Sections 01 35 29.06 - Health and Safety
Requirements and 01 35 43 - Environmental
Procedures to Departmental Representative for
each hazardous material required prior to
bringing hazardous material on site.

1.4 DELIVERY, STORAGE AND
HANDLING

.1 Deliver, store and handle materials in accordance
with [with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver
materials to site in original factory packaging,
labelled with manufacturer's name and address.

.3 Transport hazardous materials and wastes in
accordance with Transportation of Dangerous Goods
Act, Transportation of Dangerous Goods Regulations,
and applicable provincial regulations.

.1 When exporting hazardous waste to another
country, ensure compliance with Export and
Import of Hazardous Waste and Hazardous
Recyclable Materials Regulations.

.4 Storage and Handling Requirements:

.1 Co-ordinate storage of hazardous materials
with Departmental Representative and abide by
internal requirements for labelling and
storage of materials and wastes.

.2 Store and handle hazardous materials and
wastes in accordance with applicable federal
and provincial laws, regulations, codes, and
guidelines.

.3 Store and handle flammable and combustible
materials in accordance with National Fire
Code of Canada requirements.

.4 Keep no more than 45 litres of flammable and
combustible liquids such as gasoline,
kerosene and naphtha for ready use.

.1 Store flammable and combustible liquids

- in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
- .2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative
 - .5 Transfer of flammable and combustible liquids is prohibited within buildings.
 - .6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.
 - .7 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.
 - .8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
 - .9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
 - .10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:
 - .1 Store hazardous materials and wastes in closed and sealed containers.
 - .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
 - .3 Store hazardous materials and wastes in containers compatible with that material or waste.
 - .4 Segregate incompatible materials and wastes.
 - .5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.
 - .6 Store hazardous materials and wastes in secure storage area with controlled access.
 - .7 Maintain clear egress from storage area.
 - .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
 - .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
 - .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
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PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Description:
- .1 Bring on site only quantities hazardous material required to perform Work.
 - .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

PART 3 - EXECUTION

- 3.1 CLEANING .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .4 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal
- .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
 - .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
 - .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
 - .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
 - .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
 - .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
 - .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
 - .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
 - .1 Hazardous wastes recycled in manner constituting disposal.
 - .2 Hazardous waste burned for energy recovery.
 - .3 Lead-acid battery recycling.
 - .4 Hazardous wastes with economically
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recoverable precious metals.

END OF SECTION

PART 1- GENERAL

1.1 RELATED SECTIONS

- .1 Section 03 20 00 - Concrete Reinforcing.
- .2 Section 03 30 00 - Cast-in-Place Concrete.

1.2 MEASUREMENT PROCEDURES

- .1 No measurement will be made under this Section. Include costs in items related to cast-in-place concrete for which concrete formwork, falsework and accessories are required.

1.3 REFERENCES

- .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
- .2 ASTM
 - .1 ASTM C260-/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .5 ASTM D412-06a(2013), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .6 ASTM D570 -98(2010)el, Standard test Method for Water Absorption of Plastics
 - .7 ASTM 0624-00(2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .8 ASTM D1751-04(2013), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types.
 - .9 ASTM D1752-04a(2008), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .3 CSA
 - .1 CSA A23.1-14, Concrete Materials and Methods of Concrete Construction
 - .2 CSA A23.2-14, Test Methods and Standard Practices for Concrete.

- .3 CAN/CSA-086.1-01 (R2006), Engineering Design in Wood (Limit States Design).
- .4 CAN/CSA-086.181-05, Supplement No. 1 to -01, Engineering Design in Wood (Limit States Design).
- .5 CSA 0121-08, Douglas Fir Plywood.
- .6 CSA 0151-09 (R2014), Canadian Softwood Plywood.
- .7 O153-13, Poplar Plywood
- .8 CSA S269.1-16, Falsework for Construction Purposes.
- .9 CAN/CSA-S269.3-M92 (R2013), Concrete Formwork.

1.4 SHOP DRAWINGS

- .1 Master Plan of Concrete Placement
 - .1 Submit master plan showing separate concrete placements and locations of construction joints, including proposed construction joints in addition to those indicated on the drawings.
- .2 Joints: Expansion, Construction and Control
 - .1 Submit detailed shop drawing of each joint type. Submit an elevation or section take through the plane of the joint showing the walls, piers and slabs at the joint.
 - .2 Details of waterstop system, types, splices, methods of securing and supporting waterstop in forms to maintain proper orientation and location during concrete placement.
 - .3 Details of joint fillers, sealant, adhesives and other appurtenances.
- .3 Formwork
 - .1 Shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Comply with CSA 8269.1, for falsework drawings.
 - .3 Comply with CSA S269.3 for formwork drawings.
 - .4 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, and materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.
 - .5 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
 - .6 Indicate sequence of erection and removal of formwork/falsework to minimize exposure time to adverse weather conditions.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 and Section 01 35 43.

- .2 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOCs. Maximum VOC level to be 250g/L based on EPA test method 24 and biodegradability as described by EPA as having a half-life of 28 days or less based on ASTM D5684/OECD 301B.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Formwork and Falsework:
 - .1 Wood and wood product formwork materials to CAN/CSA 086.1 CSA 0153.
 - .2 Falsework materials: to CSA S269.1.
 - .3 Form ties: use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.
 - .4 Form release agent: non-toxic, biodegradable, low VOC. Maximum VOC level to be 250g/L based on EPA test method 24 and biodegradability as described by EPA as having a half-life of 28 days or less based on ASTM D5684/OECD 301B.
 - .5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 to 24 mm²/s at 40°C, flashpoint minimum 150°C, open cup.
 - .6 Formwork liner: Reusable Type III controlled permeability formwork (CPF) liner consisting of integrally bonded non-woven fabric and plastic mesh.
 - .1 A maximum compression of less than 10% under pressure of 200 kPa.
 - .2 A maximum pore size of less than 0.05 mm.
 - .3 A minimum water retention capacity of 1.3 litres/m².
 - .4 A maximum absorbency of 0.1 litres/m².
- .2 Waterstops:
 - .1 Aggregate embedded bitumen waterstop bands such as BFL Mastix 40/70R for new concrete to existing concrete/rock;
 - .2 Aggregate embedded bitumen waterstop bands such as BLF Mastix 40/70R4 for new concrete to new concrete.
 - .3 Hydrophilic waterstop where shown on the contract drawings
 - .4 PVC waterstop where shown on the contract drawings
- .3 Backing rods:
 - .1 Closed cell polyethylene foam backer rod. Rod

diameter shall be 3 mm larger than the joint width.

- .4 Concrete brick:
 - .1 Acceptable for support of bottom layer of bar in foundation. Broken concrete blocks and wood supports not acceptable.
- .5 Bond breaker:
 - .1 Polyethylene tape or coated paper
- .6 Tape for joints:
 - .1 Adhesive-backed glazed butyl or polyethylene tape, same width as joints, that will adhere to premolded joint material or concrete surface.
- .7 Premoulded joint fillers:
 - .1 ASTM 0175-05 (2011) - Standard Specification for preformed Closed Cell polyolefin Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .8 Joint Sealer: to CAN/CGSB-19.12 Sealing Compound, Two part component, elastomeric, chemical curing. Type I for Horizontal joints, Type II for vertical joints.

PART 3 - EXECUTION

3.1 GENERAL

- .1 General
 - .1 Commence concrete placement after joint preparation is complete.
 - .2 Construction Joints in Unrestrained Slab on Grade and Sill Slabs.
 - .1 Slabs may be placed continuous from outside edge to outside edge unless shown otherwise.
 - .3 Construction Joints placed in Slab on Grade and Suspended Slabs Restrained by Connecting Walls
 - .1 Place slabs in strips with the larger dimension in any single placement no greater than 10 m.
 - .4 Locate construction joints in suspended slabs near the middle quarter of the spans of slabs, unless indicated otherwise on the Drawings.
 - .5 Checker boarding for slab pouring is not permitted.
- .2 Construction Joints in Walls
 - .1 Locate construction joints 2000 mm minimum away from junction of two or more walls, a

column or beam supported on wall, nearest edge of an opening wider than 600 mm, and a construction joint in a slab on which the wall rests.

- .2 Place wall in sequential section with a distance between vertical construction joints not exceeding 10 m.

3.2 SURFACE PREPARATION

- .1 Construction Joints:
 - .1 Perform cleaning so as not to damage water stop, if one is present.
 - .2 **Saturate concrete substrate continuously for 24 hours prior to pour.**
 - .3 Vacuum ponding water from the joint prior to concrete placement.
 - .4 Apply two coats of bonding agent and pour concrete immediately.

3.3 FORMWORK INSTALLATION AND REMOVAL

- .1 Formwork Fabrication and Erection:
 - .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
 - .2 Fabricate and erect falsework in accordance with CSA S269.1.
 - .3 Do not place shores and mud sills on frozen ground.
 - .4 Provide site drainage to prevent washout of soil supporting mud sills and shores.
 - .5 Fabricate and erect formwork in accordance with CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1.
 - .6 Align form joints and make watertight. Keep form joints to minimum.
 - .7 Use 25 mm chamfer strips on external corners and edges of deck unless specified otherwise. Form 76 mm radius fillet on all edges and corners of piers unless specified otherwise. Refer to drawings for detailing of chamfers and fillets.
 - .8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
 - .9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes.
 - .10 Clean formwork in accordance with CSA A23.1, before placing concrete.
- .2 Formwork Liner:
 - .1 Install controlled permeability formwork self-adhesive liner as per manufacturer's

instructions on all formed surfaces

- .3 Form Release Agent:
 - .1 No form release agent is required with CPF formwork liner applied as indicated.
 - .2 Apply agent where CPF formwork liner cannot be installed, such as but not limited to the corner chamfers. Surface preparation:
 - .1 Protect adjacent surfaces not designated to receive concrete form release.
 - .2 Clean and prepare surfaces to receive form release in accordance with manufacturer's instructions.
 - .3 Clean form surfaces thoroughly prior to application.
 - .4 Remove all rust, scale and/or previously used form release agents from the forms in accordance with good concrete practices.
 - .5 When using new wooden forms, form release shall be applied and re-applied until complete saturation has been accomplished prior to first use.
 - .3 Application:
 - .1 Apply concrete form release in accordance with manufacturer's instructions.
- .4 Removal and Reshoring:
 - .1 With accordance to CSA A23.1 Section 6.5.
 - .2 Formwork shall be left in place until concrete has attained sufficient strength to support its own weight adequately, together with the construction loads likely imposed.
 - .1 Vertical elements: crack open formwork minimum 24 hours after concrete placement and flood cavity as required for Curing Type 3. Maintain formwork for minimum 5 days.
 - .3 Suspended elements: maintain until member has achieved minimum 75% of its design strength. Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
 - .4 Re-use formwork and falsework subject to requirements of CSA A23.1.
 - .5 Do not remove winter protection
- .5 Formwork at rock and foundation interface:
 - .1 Scribe formwork and trim panels to prepare neat contact with foundation material.

3.4 INSTALLATION OF
ACCESSORIES

- .1 Waterstops
 - .1 Install BFL Mastix Type R into existing concrete or rock by:
 - .1 Gluing with Mastix polymer black glue;
 - .2 Gluing with propane gas burner;
 - .3 Gluing with epoxy resin.
 - .2 Install BFL Mastix Type R4 vertically into fresh concrete of concreting stage.
 - .3 Protect waterstops from intense sunshine, the bands should be kept wet in this case.
 - .4 Install hydrophilic waterstop no more than 24 hours before concrete placement with the following clearances:
 - .1 Minimum 200mm concrete cover from finished concrete faces
 - .2 Where 200mm not possible, install behind reinforcement
 - .3 Minimum 75mm cover from concrete face against rock or previously placed concrete
 - .5 Install PVC waterstop prior to concrete placement. Ensure proper positioning and concrete consolidation around the waterstop.
 - .6 Follow manufacturer specifications for complete installation procedures for all waterstops.
- .2 Embedded parts:
 - .1 Set other embedded parts and openings as indicated or specified elsewhere.
 - .2 Check locations and sizes of embedded parts and openings shown on drawings.
- .3 Anchor bolts:
 - .1 Set anchor bolts to templates in coordination with appropriate trade prior to placing concrete.
 - .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.
 - .1 Drilled holes: 25 mm minimum diameter larger than bolts used to manufacturers' recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with shrinkage compensating grout
- .4 Joint filler:
 - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative. When more than one piece is

- required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .2 Locate and form construction and expansion joints as indicated. Install joint filler, bond breaker and sealer.
 - .5 Joint Sealant:
 - .1 Install to manufacturer's recommendations.

END OF SECTION

PART 1- GENERAL

- 1.1 DESCRIPTION .1 This section specifies the requirements for concrete reinforcement as described by the drawings and the specification.
- 1.2 RELATED SECTIONS .1 Section 03 10 00 - Concrete forming and Accessories.
.2 Section 03 30 00 - Cast-in-Place Concrete.
.3 Section 01 33 00 - Submittal Procedures.
- 1.3 MEASUREMENT AND REFERENCES .1 Measurement Procedures: in accordance with Section 01 22 01.
.2 Measure reinforcing steel including any dowels and splices in kilograms of steel incorporated into Work, computed from theoretical unit mass specified in CSA-G30.18 for lengths and sizes of bars as indicated or authorized in writing by Departmental Representative.
.3 Payment for concrete reinforcing shall include all material and labour for installation.
.4 LEN couplers, wire ties, bar supports, chairs, spacers and other accessories in addition to reinforcing steel are considered included in the placing of concrete and will not be measured separately for payment.
.5 All other work of this section, which is not identified as a unit price item, is to be included in the Lump Sum Price stated in the Tender Form.
- 1.4 REFERENCES .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
.2 ASTM International
.1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
.2 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
.2 CSA
.1 CSA A23.1-14, Concrete Materials and Methods

- of Concrete Construction.
 - .2 CSA A23.2-14, Test Methods and Standard Practices for Concrete.
 - .3 CSA A23.3-14, Design of Concrete Structures.
 - .4 CSA G30.3-M1983(R1998), Cold Drawn Steel wire for Concrete Reinforcement.
 - .5 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
 - .6 CSA G40.20-13, General Requirements for Rolled or Welded Structural Quality Steel.
 - .7 CSA G40.21-13, Structural Quality Steel.
 - .8 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.
 - .3 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2013, Reinforcing Steel Manual of Standard Practice.
- 1.5 SUBMITTALS
- .1 Submit in accordance with Section 01 33 00.
 - .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
 - .3 Shop Drawings:
 - .1 Submit drawings indicating placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, 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 CSA A23.3, unless otherwise indicated.
 - .1 Provide type B tension lap splices unless otherwise indicated.
- 1.6 QUALITY ASSURANCE
- .1 Submit in accordance with Section 01 33 00.
 - .1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum three (3) weeks prior to beginning reinforcing work.
 - .2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground off in dry location and in accordance with manufacturer's recommendations in clean, dry, area.
 - .2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.
- .4 Chairs, bolsters, bar supports, spacers: to CSA A23.1.
- .5 LEN Couplers permitted at locations where lapping is not feasible.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario, Canada.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

PART 3 - EXECUTION

3.1 FIELD BENDING

- .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.

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA A23.1.
- .2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .3 Minimum cover for reinforcement as per CSA A23.1 Table 17.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

END OF SECTION

PART 1- GENERAL

- 1.1 DESCRIPTION .1 This section specifies the requirements for cast-in-place concrete placed as described by the drawings and the specifications.
- 1.2 RELATED SECTIONS .1 Section 03 10 00 - Concrete forming and Accessories.
.2 Section 03 20 00 - Concrete Reinforcing.
.3 Section 05 05 20 - Anchors.
- 1.3 MEASUREMENT AND PAYMENT PROCEDURES .1 Measurement Procedures: in accordance with Section 01 22 01.
.2 Work covered by this section will be paid for under payment items included in the Unit Price Table:
.1 20 MPa concrete slab under sill slab will be measured by the cubic metre calculated from field measured dimensions authorized in writing by the Departmental Representative.
.2 Cast-in-place concrete in the sill slab will be measured by the cubic metre calculated from neat dimensions indicated on drawings.
.3 Mass cast-in-place concrete in the piers will be measured by the cubic metre calculated from neat dimensions indicated on drawings.
.4 Cast-in-place concrete in the east retaining wall will be measured by the cubic metre calculated from neat dimensions indicated on drawings
.5 Unshrinkable-Fill (U-Fill) in the west abutment will be measured by the cubic metre calculated from neat dimensions indicated on drawings
.6 Cast-in-place concrete in the deck of the dam will be measured by the cubic metre calculated from neat dimensions indicated on drawings.
No deductions will be made for volume of concrete displaced by reinforcing steel.
.7 Include in the prices of concrete the installation of all items embedded therein. Include in the prices of concrete the work described in Section 03 10 00.
.8 Include in the prices of concrete the supply and installations of waterstops.
.9 Include in the prices of concrete the supply and installation of joint filler, bond breaker and joint sealer.

- .10 Include in the prices of concrete the heating, cooling, hot and cold weather protection, curing, and finishing.
- .11 All other work, necessary to the completion of the work of this section, will not be measured separately for payment, but will be considered incidental to the work.

1.4 REFERENCES

- .1 Reference Standards:
 - .1 ASTM
 - .1 ASTM C260-/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-13, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .2 CSA International
 - .1 CSA A23.1-14 Concrete Materials and Methods of Concrete Construction.
 - .2 CSA A23.2-14 Test Methods and Standard Practices for Concrete.
 - .3 CSA-A3000-13, Cementitious Material Compendium
 - .3 ACI
 - .1 ACI 350M-06, Code Requirements for Environmental Engineering Concrete Structures
- .2 Conform to all of the latest edition of reference standards. The standards provide the minimum requirements to be met by the Contractor and concrete supplier. Additional concrete requirements have been established in this specification. The most stringent requirement shall be followed and no deviation from the requirements will be considered at the time of construction.

1.5 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Submit warranty performance parameters of concrete for review, including supporting back-up data and manufacturer's data sheets.
- .3 At least four (4) weeks prior to beginning work, submit to Departmental Representative concrete mix design and product data of the following materials proposed for use: aggregate source, curing

compound, joint filler, joint sealant, and waterstops.

- .4 Production and Delivery: provide for review by Departmental Representative deviations from CSA A23.1-14 Section 5 Production and Delivery.
- .5 Placing, Finishing and Curing: provide accurate records of start and finish time of activities, testing completed, weather conditions, manpower used and deviations from CSA A23.1-14 requirements.

1.6 QUALITY ASSURANCE

- .1 Provide Departmental Representative, minimum four (4) 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.
 - .2 Minimum four (4) weeks prior to starting concrete work, provide proposed quality control procedures that as a minimum meet the CSA A23.1-14 standards, for review by Departmental Representative on following items:
 - .1 Production.
 - .2 Delivery.
 - .3 Placing.
 - .4 Joints.
 - .5 Protection and Curing.
 - .6 Finishes.
 - .7 Formwork removal.
 - .3 Refer to CSA A23.1-14 Annex B Alkali-Aggregate Reaction. Submit test data to ensure the following:
 - .1 Use of proven non-reactive aggregates.
 - .2 Use of a low-alkali hydraulic cement.
 - .3 Use of supplementary cementing materials or other admixtures in adequate quantities in the concrete with such materials are proven effective in mitigating the detrimental effects of the reaction.
 - .4 Refer to CSA A23.1-14 8.8 Low Shrinkage Concrete and provide testing in accordance with CSA A23.2-21C. The shrinkage of the proposed mix after 28 days of drying (at the concrete age of 35 days) shall not be greater than 0.040%.
 - .5 Refer to CSA A23.1-14 Table 2, Chloride on

penetrability requirements to be less than 1500 coulombs at 28 days.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1.
- .2 Modifications to maximum time limit must be agreed by the Departmental Representative and concrete producer as described in CSA A23.1.

1.8 REQUIREMENTS OF REGULATORY AGENCIES

- .1 Conform to municipal, provincial and national codes relating to construction activities.

PART 2 - PRODUCTS

2.1 APPROVALS

- .1 All materials to be new and approved by Departmental Representative.
- .2 All concrete mixes to be approved by the Departmental Representative.

2.2 DESIGN CRITERIA

- .1 To CSA A23.1/A23.2, and as described in this specification.

2.3 MATERIALS

- .1 Cement: Normal Type GU as per CSA A3001.
- .2 Supplementary cementing materials: Type S as per CSA A3001.
- .3 Water: to CSA A23.1 Table 9 and Clause 4.1.1.2.
- .4 Aggregates: 20 mm and 40 mm aggregates to CSA A23.1.
- .5 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixture: to ASTM C494/C494M.
 - .3 Superplasticizers: to ASTM C1017.

2.4 CONCRETE MIX

- .1 Provide the following concrete mixes:
 - .1 C-1 (modified) 20 mm aggregate
 - .2 C-1 (modified) 40 mm aggregate, 30% slag.
 - .3 U-Fill
 - .4 Additional mixes as required for hot weather concreting, cold weather concreting and low heat of hydration mix to meet the requirements of Table 20 and Clause 8.5.5 of CSA A23.1.

- .2 Proportion concrete mix in accordance with CSA A23.1-14. Modifications to the mix design are with accordance to the requirements ACI 350M-06 Section 4.6 Protection Against Erosion.
- .3 Cast-in-place concrete: Class C-1 (modified).
 - .1 Hard dense aggregate
 - .2 20 mm nominal maximum aggregate size (sections up to 500 mm in thickness)
 - .3 40 mm nominal maximum aggregate size (sections thicker than 500 mm). Minimum 30% Type S Slag (sections thicker than 500mm). Elements thicker than 500 mm are considered "mass concrete" contrary to the requirements of clause 7.5.3 of CSA A23.1-14 which defines mass concrete as elements of 1.0 m or more thickness.
 - .4 Slump range 50 to 100 mm (without superplasticizers)
 - .5 35 MPa within 28 days (contrary to within 56 days as specified in Table 2 of CSA A23.1-14)
 - .6 Air content maximum 6% (contrary to air content category specified in CSA A23.1-14)
 - .7 Minimum 362 kg of cementitious material per cubic meter of concrete
- .4 U-Fill: 0.4 MPa Compressive Strength
 - .1 20 mm nominal maximum aggregate size
 - .2 Slump range minimum 150 mm

2.5 NON-SHRINK NON-METALLIC GROUT

- .1 Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents to CSA A23.1.
- .2 Compressive strength minimum 48 MPA at 28 days.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval 48 hours before placing concrete.
- .2 Pumping of concrete is permitted only after approval of equipment and mix.
- .3 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

- 3.2 FORMWORK .1 With accordance to CSA A23.1 Section 6.5 and 03 10 00 Concrete Forming and Accessories.
- 3.3 PLACING, FINISHING AND CURING .1 With accordance to CSA A23.1-14 Section 7.
- 3.4 CURING .1 Meet and exceed the requirements of CSA A23.1-14.
- .2 Install formwork liner on vertical elements to prevent moisture loss.
- .3 Curing Type 3 for all cast-in-place concrete. This requirement is the most stringent in CSA A23.1-14 and shall be followed. Consideration will not be given to any requests that reduce the curing period.
- .4 During curing period uncover only such areas that are immediately needed for finish treatment. Recover and continue curing.
- 3.5 COLD WEATHER PROTECTION .1 With accordance to CSA A23.1-14.
- .1 Protect concrete by a windproof shelter of canvas or other material to allow free circulation of inside air around fresh concrete. At no point let walls of shelter touch formwork. Provide sufficient space for removal of formwork for finishing. Supply approved heating equipment. Vent the products of combustion outside the protective shelter. Equipment shall be capable of keeping inside air at a constant temperature sufficiently high to maintain concrete at following curing temperatures:
- .2 Ensure that a minimum substrate temperature of 5 degrees Celsius shall be achieved and maintained, prior to concrete pour.
- .3 For an initial 3 days, at a temperature of not less than 15 degrees Celsius nor more than 27 degrees Celsius at concrete surfaces.
- .4 Cure at not less than 10 degrees Celsius for an extra 4 days until 7 days from final pour.
- .5 Keep concrete surfaces moist continuously while protected.
- .6 Reduce temperature at a rate not exceeding 10 degrees Celsius per day until outside temperature has been reached.
- 3.6 HOT WEATHER REQUIREMENTS .1 When applicable, during hot weather place concrete to hot weather requirements of CSA-A23.1-14. Ensure concrete temperatures at placing meet the

requirements of Table 14. Take suitable control measures when mixing ingredients.

- 3.7 FIELD QUALITY CONTROL
- .1 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Owner for review to CSA A23.2-14.
 - .1 Ensure testing laboratory is certified to CSA A283.
 - .2 Owner shall pay for costs of tests.
 - .3 If tests do not meet requirements of the Departmental Representative, take such measures as indicated in CSA A23.1 Clause 4.4.6
 - .4 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.
 - .5 Contractor to submit a quality control plan to the Departmental Representative detailing proposed method of preventing cracking due to rapid shrinkage of the concrete.
 - .6 Cold Weather Concreting
 - .1 Additional test cylinders taken during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent for a minimum period of 72 hours.
 - .2 The Contractor must have maximum-minimum thermometers installed in accessible locations within the cold weather curing enclosure prior to pouring for the Departmental Representative to inspect during the pour and curing period. Ensure thermometers are properly acclimatized to concrete pour temperature within the curing enclosure and reset immediately following the pour at start of curing period.
 - .7 Standard Strength Tests
 - .1 Provide concrete for one standard strength test consisting of 3 cylinders for each 100 m³ of concrete of each type placed in any day. If the amount placed, for each type of concrete is less than 100 m³ in a day, provide concrete for one standard strength test. One cylinder will be tested at 7 days and two at 28 days.
 - .2 Complete one standard strength test for each

25 m³ of each type in any day at the start of the project until satisfactory control is established and the proposed mix has been accepted in the field by the Departmental Representative. Whenever tests fall outside of the specified limits, the testing frequency shall revert to one test per each 25 m³ of concrete.

.8 Air Content Testing

- .1 Every load or batch of concrete shall be tested until satisfactory control of the air content is established and fewer tests are required by the Departmental Representative and Owner as per Clause 4.4.4.1.1.1 of CSA A23.1. Whenever tests fall outside of the specified limits, the testing frequency shall revert to one test per load or batch until satisfactory control is re-established.

3.8 REPAIR OF DEFICIENT
CONCRETE

.1 Cracks (<0.3 mm)

- .1 Follow manufacture application procedures as it may vary from the procedure implied below.
.2 Achieve a concrete surface profile (CSP) of CSP 3 as per the International Concrete Repair Institute (ICRI).
.3 Install flexible cementitious waterproofing to a saturated dry surface or saturated damp surface.
.4 Trowel and brush two coats to a build of 1.6 to 3 mm layer.
.5 Embed reinforcing fabric within the waterproofing along length of crack.

.2 Cracks (0.3 mm to 6 mm):

- .1 Epoxy crack inject cracks with low viscosity adhesive.
.2 Follow manufacture application procedures as it may vary from the procedure implied below.
.3 Set appropriate injection ports based on system used.
.4 Pressure inject at the lowest point and continue until there is an appearance of the resin at an adjacent port, thus indicating travel. Continue the procedure until all pressure injectable cracks have been filled.
.5 All packers shall be removed after injection is complete and all injection holes shall be patched with polymer modified repair mortar.
.6 Waterproof along length of crack and injection port holes with cementitious waterproofing and fabric reinforcement as described above in Section 3.8.1.

- .2 Cracks > 6 mm, honeycombing or deficient concrete areas:
 - .1 25 mm deep saw-cut at perimeter of deficient area.
 - .2 Remove deficient, unsound or delaminated concrete around reinforcing steel (if encountered).
 - .3 Prepare surface to ICRI CSP-4 or higher and apply bonding agent.
 - .4 Form and place polymer modified cementitious material.

- 3.9 CLEANING
 - .1 Cleaning of concrete equipment to be completed in accordance with Section 01 35 43.
 - .2 Divert unused concrete materials from landfill to local quarry or facility after receipt of written approval from Departmental Representative.

- 3.10 CONCRETE POUR RELEASE FORM
 - .1 The Contractor shall obtain and document all concrete pours approval.



CONCRETE POUR RELEASE FORM

Twelve Mile Lake Dam Reconstruction
Project No. 4256244

Location of Pour _____

Time of Pour _____

Date of Pour _____

Note: WSP, PCA and third party testing agency to be given 24 hours notice prior to pour.

1. All items of work have been completed for this pour and the following foreman have approved their work ready for inspection.

Rebar Steel	Signature:	Date:	Time:
Surface Preparation	Signature:	Date:	Time:
Inserts	Signature:	Date:	Time:

2. The formwork has been inspected by the formwork design engineer or his authorized designate for conformance to the formwork design.

Formwork Design Engineer	Signature:	Date:	Time:
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3. I have checked all items for this pour and request your inspection before pouring.

Contract Superintendent	Signature:	Date:	Time:
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4. The items of work have been inspected.

The pour may proceed subject to the Contractor being responsible for the work in accordance with the Contract.	<input type="checkbox"/>	(check)
OR		
Corrections are required as below	<input type="checkbox"/>	(check)

Resident Supervisor	Signature:	Date:	Time:
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NECESSARY CORRECTIONS AND REMARKS

END OF SECTION

PART 1- GENERAL

1.1 REFERENCES

- .1 ASTM
 - .1 ASTM C309 Specification for Liquid Membrane Forming Compounds for Curing Concrete.
 - .2 ASTM E1155M Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20, Surface Sealer for Floors.
 - .2 CGSB 51 GP 51M Polyethylene Sheet for Use in Building Construction.
- .3 CSA International
 - .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

1.2 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 ENVIRONMENTAL REQUIREMENTS

- .1 Work area:
 - .1 Make work area water tight protected against rain and detrimental weather conditions.
- .2 Temperature:
 - .1 Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .3 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by manufacturer.

- 1.4 DELIVERY, STORAGE AND HANDLING
- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
 - .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Curing Compound:
 - .1 ASTM C309, Type 2.
 - .2 Combination curing and sealing compound: ASTM C309; Clear, non yellowing compound.
 - .2 Floor Hardener:
 - .1 Non metallic and non-coloured floor hardener: Premixed blend of mineral aggregates and densifying agents, and Portland cement, shake on type; Durag Premium by Sternson Ltd.; Diamag 7 by Sika Canada Inc., Maximent by Master Builders Technologies, Ltd.; Surfex by Euclid Admixture Canada, Inc.; or Quartz Tuff by Dayton Superior Canada Limited.
 - .3 Surface Sealer:
 - .1 Clear, liquid surface hardener and dustproofer; Florseal by Sternson Ltd; Sealhard 400 by Sika Canada Inc., Floor Seal by Euclid Admixture Canada, Inc., or Day Chem Sure Hard (J 17) by Dayton Superior Canada Limited.
 - .4 Wet Curing materials:
 - .1 Non staining waterproof curing paper, burlap, or canvas coverings.

PART 3 - EXECUTION

- 3.1 DEFECT REPAIRS
- .1 General
 - .1 Provide smooth form finish in accordance with CSA A23.1.
 - .2 Remove face formwork as soon as practical to facilitate repair of surface defects. Surface defects include formwork tie holes, bugholes with nominal diameter or depth greater than 6 mm, honeycomb and defective concrete, fins,

- projections, irregularities, offsets, spalled corners, and other defects.
- .3 Avoid damaging corners and keep edges sharp.
 - .2 Formwork Tie Holes:
 - .1 Cut formwork ties 25 mm from surface of concrete.
 - .2 Make edges of depressions sharp.
 - .3 Fill depressions with preblended non shrink non ferrous grout of same colour as the concrete for exposed concrete surfaces.
 - .3 Irregularities:
 - .1 Grind smooth fins, projections, irregularities, and offsets, including those at visible construction joints.
 - .2 Where irregularities, and offsets cannot be remedied by grinding, chip concrete surface sufficiently deep and apply thoroughly bonded preblended non shrink non ferrous grout in similar procedure for repair of honeycomb and defective concrete.
 - .4 Surface Depressions:
 - .1 Fill bugholes, and other surface depressions with a sand cement mortar to match the surface of surrounding concrete.
 - .5 Spalled Corners:
 - .1 Use repair materials of similar appearance and strength as the surrounding concrete to reconstruct corner to match adjacent corners.
 - .6 Honeycomb and Defective Concrete:
 - .1 Do not repair honeycomb and defective concrete until reviewed by Departmental Representative and permission granted to proceed with the repair work.
 - .2 Remove honeycomb and defective concrete down to sound concrete with edges slightly undercut or perpendicular to the surface. Remove a minimum depth of 25 mm. No feather edges are permitted.
 - .3 Pre-dampen patch area.
 - .4 Use preblended non shrink non ferrous grout of same colour as the concrete for exposed concrete surfaces.
 - .5 Use bonding agents in patching work.
 - .6 Patch surface slightly higher than the surrounding concrete.
 - .7 Wet cure patches to equivalent of 10 days minimum.
 - .8 When patched surface has hardened, rub surface with carborundum brick to a true surface, free from streaks, discolourations, and other imperfections, to match flush with surrounding

concrete.

3.2 CONCRETE FINISHING

- .1 Sack-Rubbed Finish:
 - .1 Unless otherwise specified, provide sack rubbed finish on exposed concrete surfaces.
 - .2 Do not commence rubbing or grinding until surface defects are repaired and patching materials are hardened.
 - .3 Dress surfaces by rubbing or grinding with bricks of carborundum, emery, or other abrasive material to a smooth and even surface to the best grade of concrete work. Wet and rub surfaces until surfaces are even and of uniform smooth appearance. Prevent rounding edges, obliterating the bevel lines on edges and corners, and chipping or cracking the finished edges.
 - .4 After completion of surface preparation apply sack rubbed cement finish to form a smooth finish of uniform appearance. Apply a second coat of sack rubbed cement finish to produce a smooth uniform appearance if required to obtain acceptance.
 - .5 On completion thoroughly wash the surfaces with clean water.
- .2 Related Unformed Surfaces:
 - .1 Screed and float tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring in units cast in forms to a texture consistent with that specified for the formed surface unless some different finish is specified elsewhere.
- .3 Underside Elevated Slab Finish:
 - .1 After forms are removed grind off projections and patch defective areas.
- .4 Slabs or Floor Surfaces:
 - .1 Provide float finish as per CSA A23.1 Clause 7.6.4 Final Finishing.

3.3 CURING CONCRETE

- .1 Refer to 03 30 00 Cast-in-place Concrete for curing requirements.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies requirements for drilling anchor holes, and supply and installation of anchors, including grouting, as described by the drawings and the specification.

.2 The site lies in an area of granitic gneiss bedrock with relative compressive strength of 62 MPa for diametral and 79 MPa for axial.

1.2 SHOP DRAWINGS

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

1.3 QUALIFICATIONS

.1 The installation of the rock anchors is to be performed by a contractor with experience in this type of work.

.2 The Contractor is obligated to provide examples of relevant experience to the Departmental Representative, if requested. Proof of the crew experience providing the work may also be requested.

1.4 MEASUREMENT AND PAYMENT

.1 The work of the anchor installation will be measured and paid in accordance with Section 01 22 01. This work will be paid for under the payment item included in the Unit Price Table:

.1 Rock Anchors - per linear metre (m).

.2 The price for rock anchors includes:

.1 Drilling including casing when required; setting; supplying and placing the anchor grout; and proof testing of anchors selected by Departmental Representative.

.3 Housing and heating are included in the unit price for each anchor.

.4 All other work, necessary for the completion of the work of this section, will not be measured separately for payment, but will be considered as incidental to the work of this section.

1.5 SEQUENCE OF WORK

.1 Rock anchors shall be installed with drilling for anchors before the sill or retaining wall concrete is cast.

.2 Rock anchors must be tested and accepted prior to the hook being coupled to the bar.

PART 2 - PRODUCTS

2.1 MATERIALS-GENERAL

- .1 Use materials approved by the Departmental Representative.
- .2 Supply anchors in one piece, up to maximum continuous length produced by manufacturer. Strength of couplings to be equal to bar.
- .3 Anchors to be complete with all accessory parts as specified by the manufacturer, and additional accessories indicated on the drawings or described in the specification.
- .4 Adhesive type anchors to be anchored with epoxy acrylate resin. Polyester resins will not be accepted.
- .5 All steel components of the anchor to be hot dipped galvanized.
- .6 Clean steel surfaces of all deleterious matter. Remove grease or oils thoroughly. Bars showing pitting will be rejected.
- .7 Store bars straight, and protect threads.
- .8 Deliver cementitious materials in clearly marked, sealed bags.
- .9 Store materials in dry, heated enclosure maintained between 2 and 40 degrees C.

2.2 ROCK ANCHORS

- .1 Deformed bars to CAN/CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement, grade 400R in the sill of sluice as shown on drawings.

2.3 TYPE A ANCHORS GROUT

- .1 Proportion non-shrink non-metallic grout mix to comply with the following requirements:
 - .1 3 days compressive strength: 42 MPa;
 - .2 7 days compressive strength : 48 Mpa;
 - .3 28 day compressive strength: 56 MPa;
 - .4 Do not use expanding or shrinkage compensating agents, unless otherwise approved by Departmental Representative.
 - .5 Use admixtures, including superplasticizers and anti-washout agents as required.
 - .6 Alternatively, a cable grout approved by the manufacturer of the anchors can be used.

PART 3 - EXECUTION

3.1 GENERAL

.1 Except as specified in this section, install to the manufacturer's recommendations.

.2 Minimum substrate temperature shall be maintained at 5° Celsius minimum, prior to grouting.

.3 The Contractor is to provide to the Departmental Representative a complete list of equipment which will be used for work, prior to starting any work.

3.2 INSTALLATION

.1 Drill holes at least 40mm larger than the bar diameter. Clean thoroughly by air or water jet.

.2 Install bars with grout and de-air tubes securely attached.

.3 Mortar the drill hole opening.

.4 Pump grout through grout tube until continuous flow of grout is coming out of the de-air tube.

.5 Install bars as directed by manufacturer instructions.

3.3 GROUT MIXING

.1 Provide water free of deleterious materials.

.2 Add water to mixer before cement.

.3 Mix for 3 minutes minimum, with high speed mixer (1000 rpm minimum), or paddle mixer (150 rpm minimum).

.4 Provide holding tank with paddle mixer.

.5 Inject grout within initial setting time.

3.4 INSTALLATIONS

.1 Test compressive strength of grout using 50mm cube specimens in accordance with CAN/CSA-A23.2-6B-09 (See A23.2-09).

.2 Obtain samples for testing from each different batch of grout, from the grout tube.

3.5 TESTING

.1 Proof test 10% of installed dowels with a Test Load of 70kN per dowel

3.6 MANUFACTURER SPECIFICATIONS

.1 Keep a manual of manufacturers' specifications and installation procedures at the work site.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies requirements for the supply and installation of all parts embedded in cast-in-place concrete including anchors unless specifically noted otherwise; other metal fabrications as described by the drawings and specification;

.2 The work includes but is not necessarily limited to the supply and installation of:

- .1 Davit (rated for 500kg) and embedded parts
- .2 Bollards (removable)
- .3 Railings and gates
- .4 Stainless steel plate storage box (1,800mm long x 750mm wide x 600 mm tall with lockable lid)
- .5 Log rests

.3 The work includes but is not necessarily limited to the installation of the following owner supplied metals:

- .1 ASCE 60lb rails
- .2 Stoplog sills
- .3 Main stoplog gains complete with jacking pins and rests
- .4 Stainless steel angle with cast in place shear studs edging stoplog gains
- .5 Aluminum Stoplog gain covers
- .6 Bollards (fixed)
- .7 Log Pinning Mechanisms
- .8 Steel Half Logs
- .9 Pier nosings with cast in place shear studs and service gains, complete with jacking pins and rests

1.2 RELATED SECTION

.1 Section 03 30 00 - Cast In Place Concrete.

1.3 REFERENCE

.1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.

.2 ASTM International

- .1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A276/A276M-16a, Standard Specification for Stainless Steel Bars and Shapes.
- .3 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .4 ASTM A480/A480M - 16a Standard Specification

for General Requirements for Flat-Rolled
Stainless and Heat-Resisting Steel Plate,
Sheet, and Strip.

- .5 ASTM A780-09, Standard Practice for Repair of
Damaged and uncoated Areas of Hot-Dip
Galvanized Coatings.
 - .6 ASTM A603-98(2009) e1, Standard Specification
for Zinc-Coated steel Structural wire rope.
 - .7 ASTM A492-95(2009), Standard Specification
for stainless steel rope wire.
 - .8 ASTM A449-14, Standard Specification for Hex
Cap Screws, Bolts and Studs, Steel, Heat
Treated, 120/105/90 ksi Minimum Tensile
Strength, General Use
- .3 Canadian General Standards Board (CGSB) CGSB 1-
GP-1BlM-99 Coating, Zinc-Rich, Organic, Ready Mixed.
- .4 CSA International
- .1 CSA G40.20-04 (R2009)/G40.21-04 (R2009), General
Requirements for Rolled or Welded Structural
Quality Steel/Structural Quality Steel.
 - .2 CSA S16-14, Design of Steel Structures.
 - .3 CSA W48-06 (R2011), Filler Metals and Allied
Materials for Metal Arc Welding (Developed in
co-operation with the Canadian Welding
Bureau).
 - .4 CSA W59-13, Welded Steel Construction (Metal
Arc Welding) Metric.
 - .5 CSA W59.2-M1991 (R2013), Welded Aluminum
Construction.
 - .6 CSA G4.00 (R2006), Steel Wire Rope for General
Purpose and for Mine Hoisting And Mine
Haulage.
- .5 Health Canada / Workplace Hazardous Materials
Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).
- .6 American Welding Society
- .1 AWS D1.6/D1.6M, Structural Welding Code
Stainless Steel.
- .7 Society for Protective Coatings (SSPC)
- .1 SSPC SP10/NACE No 2, Near-White Blast
Clearing.
 - .2 SSPC PA2, Procedure for Determining
Compliance to Dry Coating Thickness
Requirements.
- 1.4 ACTION AND .1 Submit in accordance with Section 01 33 00
INFORMATIONAL SUBMITTAL .2 Shop Drawings:
.1 Submit drawings for all items listed in 1.1.2
and 1.1.3 in accordance with Section 01 33

00.

- .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.5 MEASUREMENT AND PAYMENT .1 In accordance with Section 01 22 01 -Measurement and Payment

1.6 DELIVERY, STORAGE AND HANDLING .1 **Items identified as 'provided by owner' in the contract documents are to be moved to the site from the storage facility at:**

.1 **1452 Eagle Lake Rd Haliburton ON (West Guilford Self-Storage Units)**

.2 At the start of the contract, Contractor is to inventory all items stored at the above storage facility and notify the Departmental Representative immediately of any items required for installation and indicated as being provided by Owner which are not present or which are deficient.

.3 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.4 Storage and Handling Requirements:
.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations.
.2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W or 350W, unless noted otherwise.

.2 Stainless steel sections and plates: to ASTM A480, Grade 304L or 316L, unless noted otherwise.

.3 Aluminum sections and bars: Grade 6061 or 6063.

.4 Welding materials: to CSA W59, W59.2 and AWS D1.6/D1.6M.

.5 Welding electrodes: to CSA W48 Series.

.6 Bolts and anchor bolts: to ASTM A307.

.7 Zinc primer: zinc rich, ready mix to CGSB 1-GP-181M.

.8 PVC coated wire strand rope: to ASTM A603-98.

2.2 FABRICATION

.1 Prepare shop drawings in accordance with Section 01 33 00.

.2 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush. Do welding work in accordance with CSA W59.

2.3 STOPLOG EMBEDDED PARTS TOLERANCES

.1 Stoplog embedded parts shall not exceed the tolerances below:

- .1 Maximum deviation from true verticality for the overall height: 3 mm for each face.
- .2 Maximum deviation from general slope for each face: 2 mm, anywhere along the height.
- .3 Total width of lateral guide: 400 +-6 mm, anywhere along the height.
- .4 Total distance between lateral faces of guides for one passage: nominal distance +- 6 mm, anywhere along the height.
- .5 For the downstream face, maximum difference of 1.5 to 2 mm from every measurement when checking parallelism with the sill axis.

2.4 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m², Coating Grade 85, to ASTM A123/A123M.

- .1 Touch-up primer for galvanized coating SPCC 20 Type I inorganic zinc rich.

.2 Surface preparation and painting. Refer to 3.3.1 and 3.3.2.

.3 Metals shall have the following finish:

- .1 Plain steel
 - .1 Stoplog sill beams
 - .2 Stoplog gains: main stoplog gains and downstream service gains
 - .3 Stoplog rests
- .2 Hot-Dipped Galvanized
 - .1 Railings and gates
 - .2 Components of log pinning mechanisms as shown on Drawings
 - .3 Steel half logs
- .3 Stainless steel
 - .1 Gain cover perimeter edge angle
 - .2 Storage box
- .4 Aluminum

- .1 Stoplog gain covers
- .2 Components of log pinning mechanisms as shown on Drawings

.4 For stainless steel metal, the surface area in contact with concrete shall be coated with Bitumastic 300M by Carboline.

.5 Where metal finish not specified in the drawings or specifications, assume stainless steel and confirm with Departmental Representative.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION

- .1 Do welding work in accordance with CSA W59, W59.2 or AWS D1.6/D1.6M unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections. The various elements shall be securely fixed and adequately braced to ensure precise location and to avoid any warpage, misalignment or deformation during erection.
- .3 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .4 Supply components for work by other trades in accordance with shop drawings and schedule.
- .5 Deliver items over for casting into concrete together with setting templates to appropriate location and construction personnel.
- .6 Touch-up scratched galvanized surfaces with zinc primer where damaged.
- .7 Touch-up scratched painted surfaces as per 3.3.3.

- .8 The required location of cast-in-place or post-installed concrete anchors shall be determined precisely, using templates as necessary. Preparation of holes and installation of post-installed anchors shall comply with the instructions provided by the manufacturer of the anchors.

3.3 Surface Preparation and Painting

- .1 Surface preparation
- .1 Rough textured welds and sharp edges shall be blended out with a grinder and weld spatter removed.
 - .2 Surface shall undergo abrasive blasting in accordance with SP10 standard by SSPC. The surface shall be inspected as required in visual inspection standard SP10 by SSPC-vis-1.
 - .3 All equipment, components, and surfaces that need not be cleaned and prepared for painting shall nevertheless be adequately protected against damage during cleaning operations.
 - .4 The Contractor shall use an abrasive that will yield the surface depth profile recommended by the paint manufacturer.
 - .5 The use of abrasive silica is not acceptable.
- .2 Painting Application
- .1 After preparation, the surface shall be coated with at least two (2) coats of high coverage epoxy paint. The paint product shall be Interseal 670HS by International or Amercoat 385 by Ameron, or an equivalent approved by the Departmental Representative.
 - .2 Generally, the colour of painted equipment shall be black, code 17038 of the American FED-STD-595C standard.
 - .3 The application and drying period for each coat of paint shall comply with the paint manufacturer instructions. All coats of paint in a given protection system shall originate from the same manufacturer. Minimum dry coat thickness shall be 125 microns per coat.
 - .4 The application method shall ensure even distribution of the paint and prevent excessive build-up and drippings.
 - .5 Instrument calibration, the measurement of dry coats and the acceptance criteria shall be carried out or managed in accordance with the SSPC-PA2 standard.
 - .6 All the equipment, components and surfaces that need not be painted shall be adequately protected to prevent being covered during paint application.
- .3 Paint Touch-up

- .1 Any paint touch-up shall be performed using the same paint system and to the requirements of this specification, except with respect to surface preparation and visual inspection. Surfaces shall be prepared using mechanical tools as required in SSPC-SP3 and visual inspection carried out to the applicable section of ST3 and SSPC-Vis-1.

.4 Inspection

- .1 Inspection of surface preparation shall be performed immediately before paint application.
- .2 The thickness of each coat of paint shall be measured during application to ensure required wet coating, followed by a verification of the dry coat after application.

3.4 GAINS, RAILINGS, TRACKS .1 Install gains, gain covers, railings, and rails in locations as indicated.

3.5 PROTECTION .1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 Section 31 24 13 -Roadway Embankments
- .2 Section 31 23 33.01 -Excavating, Trenching and Backfilling
- .3 Section 31 32 19.01 -Geotextiles
- .4 Section 32 91 19 13 Topsoil Placement and Grading
- 1.2 MEASUREMENT AND PAYMENT .1 Measurement Procedures: in accordance with Section 01 22 01, the Items Backfill Material, Granular A, and Granular B will be paid per cubic meter.
- .2 The Unit Price will be for all labour, material and equipment necessary to supply, deliver, and place all aggregate materials as identified in the Contract Documents, Standards and Drawings. The Unit Bid Price includes any double handling of material during the manufacturing or delivery of the aggregate materials outlined in the Contract Documents.
- 1.3 REFERENCES .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
- .2 ASTM International
- .1 ASTM D4791-[10], Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .3 U.S. Environmental Protection Agency (EPA)/Office of Water
- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- 1.4 ACTION AND INFORMATIONAL SUBMITTALS .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 aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
-

- .1 Submit 3 samples.
- .2 Allow continual sampling by Departmental Representative during production.
- .3 Provide Departmental Representative with access to source and processed material for sampling.
- .4 Supply new or clean sample bags or containers according appropriate to aggregate materials.
- .5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.
- .3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
 - .1 Greatest dimension to exceed 5 times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
 - .2 Reclaimed asphalt pavement.
 - .3 Reclaimed concrete material.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock (no limestone, only granite)
 - .2 Gravel [and crushed gravel] composed of naturally formed particles of stone.
 - .3 Light weight aggregate, including slag and expanded shale.
 - .4 Reclaimed asphalt pavement.

.5 Reclaimed concrete material.

- 2.2 SOURCE QUALITY CONTROL
- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 2 weeks minimum before starting production.
 - .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
 - .3 Advise Departmental Representative 2 weeks minimum 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, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.
 - .1 Use methods and equipment approved in writing by Departmental Representative.
- .2 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.
 - .1 Use only equipment approved in writing by Departmental Representative.
- .3 Stockpiling:
 - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
 - .2 Stockpile aggregates in sufficient quantities to meet project schedules.
 - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
 - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent

contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.

- .5 Surround all stockpiled materials with reptile and amphibian exclusion fencing in accordance with Section 01 35 43.
- .6 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .7 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.
- .8 Stockpile materials in uniform layers of thickness as follows:
 - .1 Maximum 1.5 m for coarse aggregate and base course materials.
 - .2 Maximum 1.5 m for fine aggregate and sub-base materials.
 - .3 Maximum 1.5 m for other materials.
- .9 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .10 Do not cone piles or spill material over edges of piles.
- .11 Do not use conveying stackers.
- .12 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
 - .4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.
 - .5 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .6 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.
-

- .7 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to Departmental Representative.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS Not used.
- 1.2 MEASUREMENT PROCEDURES
- .1 In accordance with Section 01 22 01 -Measurement and Payment
 - .2 There will be no measurement of work included in this Section.
 - .3 Payment shall be included in the Lump Sum Price for General Site Work.
- 1.3 REFERENCES
- .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
 - .2 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- 1.4 DEFINITIONS
- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
 - .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
 - .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
 - .4 Underbrush clearing consists of removal from treed areas of undergrowth and deadwood, and disposing of fallen timber and surface debris.
 - .5 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than specified depth below existing ground surface.
- 1.5 ACTION AND INFORMATION .1 Provide submittals in accordance with Section
-

SUBMITTALS

01 33 00 - Submittal Procedures.

- .2 Samples:
 - .1 Submit 1 samples of each material listed below for approval prior to delivery of materials to project site.
 - .2 Tree wound paint: one liter can with manufacturer's label.
 - .3 Herbicide: one liter can with manufacturer's label.
- .3 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Submit manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

- .1 Do construction occupational health and safety in accordance with Section [01 35 29.06 - Health and Safety Requirements].
- .2 Safety Requirements: worker protection.
 - .1 Workers must wear gloves, respirators, dust masks, long sleeved clothing, eye protection and protective clothing when applying herbicide materials.
 - .2 Workers must not eat, drink or smoke while applying herbicide material.
 - .3 Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.

1.7 STORAGE AND PROTECTION

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees, which are to remain.
 - .1 Repair damaged items to approval of Departmental Representative.
 - .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.
 - .1 Trim limbs and tops, and saw into saleable lengths.
 - .2 Stockpile adjacent to site.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Bituminous based paint of standard manufacture specially formulated for tree wounds.
- .2 Herbicide: effective for killing annual and perennial weeds, and bamboo grass, by being absorbed through roots and foliage.
 - .1 Spray applied on non-crop land areas.
 - .2 Type as approved by Departmental Representative
- .3 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 line[s] 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.
- .5 Confirm timing for clearing and grubbing is acceptable to Departmental Representative and is in accordance with Sections 01 35 43 -Environmental Procedures and 01 14 00 -Work Restrictions.

3.2 APPLICATION

- .1 Manufacturer's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

- 3.3 CLEARING
- .1 Clearing includes felling, trimming, 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 Clear as directed by Departmental Representative, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
 - .3 Cut off branches overhanging area cleared as directed by Departmental Representative.
 - .4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.
 - .5 Apply herbicide [in accordance with manufacturer's label to top surface of stumps designated not to be removed.
- 3.4 ISOLATED TREES
- .1 Cut off isolated trees as directed by Departmental Representative at height of not more than 300 mm above ground surface.
 - .2 Grub out isolated tree stumps.
 - .3 Prune individual trees as indicated.
 - .4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.
 - .5 Cut limbs and branches to be trimmed close to bole of tree or main branches.
 - .6 Paint cuts more than 3 cm in diameter with approved tree wound paint.
- 3.5 UNDERBRUSH CLEARING
- .1 Clear underbrush from areas as directed by Departmental Representative to within 100 mm of ground surface].
- 3.6 GRUBBING
- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
 - .2 Grub out stumps and roots to not less than 200 mm below ground surface.
 - .3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 1.00 m³.
-

- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground

3.7 REMOVAL AND DISPOSAL

- .1 Remove cleared and grubbed materials off site to disposal area designated by Departmental Representative.
- .2 Cut timber greater than 125 mm diameter to lengths and stockpile as indicated. Stockpiled timber becomes property of Departmental Representative.
- .3 Mulch and spread cleared and grubbed vegetative material on site as directed by Departmental Representative.
- .4 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative.

3.8 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for stripping of topsoil to the approval of Departmental Representative.

3.9 CLEANING

- .1 Proceed in accordance with Section [01 74 11 - Cleaning].
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

1.1 PRICE AND PAYMENT
PROCEDURES

.1 In accordance with Section 01 22 01 -Measurement and Payment

1.2 REFERENCES

.1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.

.2 Definitions:

.1 Rock: any solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.

1.3 ACTION AND INFORMATION
SUBMITTAL

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

.2 Blasting Submittals (if required): submit for approval, written proposal of operations for removal of rock by blasting to Departmental Representative.

.1 Indicate proposed method of carrying out work, types and quantities of explosives to be used, loading charts and drill hole patterns, type of caps, blasting techniques, blast protection measures for items such as flying rock, vibration, dust and noise control. Include details on protective measures, time of blasting and other pertinent details.

.2 Submit records to Departmental Representative at end of each shift. Maintain complete and accurate record of drilling and blasting operations.

.3 Sustainable Standards Certification:

.1 Erosion and Sedimentation Control: submit copy of Erosion and Sedimentation Control Plan for project highlighting implementation measures.

.4 Qualification Statements:

.1 Retain licensed explosives expert to program and supervise blasting work, to interpret recommendations of pre-blasting report, and to determine precautions, preparation and operations techniques.

.2 Submit documentation verifying explosives expert's qualifications.

1.4 DELIVERY STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Packaging Waste Management: remove for recycling packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Not used.

PART 3 - EXECUTION

3.1 ROCK REMOVAL

- .1 Perform excavation in accordance with Erosion and Sedimentation Control Plan.
 - .2 Co-ordinate this Section with Section 01 35 29.06 - Health and Safety Requirements.
 - .3 Remove rock to alignments, profiles, and cross sections as indicated.
 - .4 Explosive blasting is not permitted unless absolutely required to achieve project goals and only with prior approval of Departmental Representative and in accordance with DFO Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters.
 - .5 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and to avoid damage to adjacent structures.
 - .6 Excavate rock to horizontal surfaces with slope not to exceed 1:10.
 - .7 Prepare rock surfaces which are to bond to concrete, by scaling, pressure washing and broom cleaning surfaces.
 - .8 Excavate trenches to lines and grades to minimum of 100 mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along barrel of pipe.
 - .9 Cut trenches to widths as indicated.
 - .10 Remove boulders and fragments which may slide or roll into excavated areas.
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.11 Correct unauthorized rock removal at no extra cost, in accordance with Section 31 23 33.01 -Excavating, Trenching and Backfilling.

3.2 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Rock Disposal:

.1 Dispose of surplus removed rock off site in accordance with Section 01 74 21 - Construction/demolition Waste Management and Disposal.

.2 Do not dispose removed rock into landfill. Send material to appropriate location as approved by Departmental Representative.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

3.3 PROTECTION

.1 Prevent damage to surroundings and injury to persons in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS
- .1 Section 02 41 16 -Structure Demolition
 - .2 Section 02 41 21 -Removals
 - .3 Section 31 05 16 -Aggregate Materials
 - .4 Section 31 23 16.26 -Rock Removal
 - .5 Section 31 24 13 -Roadway Embankments
 - .6 Section 31 32 19.01 -Geotextiles
 - .7 Section 35 20 22 -Dewatering
- 1.2 MEASUREMENT PROCEDURES
- .1 In accordance with Section 01 22 01 -Measurement and Payment
 - .2 There will be no measurement of work included in this Section.
 - .3 Payment shall be included in the Lump Sum Prices for **General Site Work** as well as in the cost of removal of the existing dam.
- 1.3 REFERENCES
- .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
 - .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117-[04], Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-[05], Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-63[2002], Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-[00ae1], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557-[02e1], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D4318-[05], Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
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- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.
 - .4 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC 2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
 - .5 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-[13], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-[13], Cementitious Materials for Use in Concrete.
 - .2 CSA-A23.1/A23.2-[14], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .6 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- 1.4 DEFINITIONS
- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
 - .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
 - .3 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
 - .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
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- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422: Sieve sizes to CAN/CGSB-8.1.
 - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 10
0.02 mm	10 - 80
0.005 mm	0 - 45
 - .3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Submit for review by Departmental Representative proposed dewatering methods as described in PART 3 of this Section.
 - .3 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
 - .4 Submit to Departmental Representative written notice when bottom of excavation is reached.
 - .5 Submit to Departmental Representative testing and inspection results as described in PART 3 of this Section.
- .3 Preconstruction Submittals:
 - .1 Submit construction equipment list for major

equipment to be used in this section prior to start of Work.

- .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, location plan of relocated and abandoned services, as required.

- .4 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Inform Departmental Representative at least 2 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
 - .3 Submit 70 kg samples of type of fill specified including representative samples of excavated material.
 - .4 Ship samples to Departmental Representative, in tightly closed containers, to prevent contamination and exposure to elements.
 - .5 At least 2 weeks prior to beginning Work, inform Departmental Representative of source of fly ash and submit samples to Departmental Representative.
 - .1 Do not change source of Fly Ash without written approval of Departmental Representative.

1.6 QUALITY ASSURANCE

- .1 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.
- .3 Keep design and supporting data on site.
- .4 Engage services of qualified professional Engineer who is registered or licensed in Province of Ontario, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .5 Do not use soil material until written report of soil test results are approved by Departmental Representative.
- .6 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and/or recycling

in accordance with Section 01 74 21 -
Construction/Demolition Waste Management and
Disposal.

- .2 Divert excess materials from landfill to local recycling facility for reuse as directed by Departmental Representative.

1.8 EXISTING CONDITIONS

- .1 Examine geotechnical report.
 - .2 Buried services:
 - .1 Before commencing work establish location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation Work, notify applicable Departmental Representative and authorities having jurisdiction, establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .6 Confirm locations of buried utilities by careful test excavations or soil hydrovac methods.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before re-routing. Costs for such Work to be paid by Contractor.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
 - .10 Confirm locations of recent excavations adjacent to area of excavation.
 - .3 Existing buildings and surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately
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- make repair as directed by Departmental Representative.
- .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to [ASTM C136]. Sieve sizes to [CAN/CGSB-8.1].
 - .3 Table:

Sieve Designation	% Passing	
Type 1	Type 2	
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

- .2 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of 0.4 MPa at 28 days.
 - .2 Maximum cement content of 25 kg/m³ with 40% by volume fly ash replacement: to CSA-A3001, Type GU.
 - .3 Minimum strength of 0.07MPa at 24 h.
 - .4 Concrete aggregates: to CSA-A23.1/A23.2.
 - .5 Cement: Type GU.
 - .6 Slump: 160 to 200 mm.
- .4 Shearmat (if required): honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.

.5 Geotextiles: to Section 31 32 19.01 - Geotextiles.

PART 3 - EXECUTION

- 3.1 SITE PREPARATION .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- 3.2 PREPARATION/PROTECTION .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.
- 3.3 STRIPPING OF TOPSOIL .1 Begin topsoil stripping of areas as indicated after area has been cleared of brush and removed from site.
- .2 Strip topsoil to depths as directed by Departmental Representative.
.1 Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Departmental Representative.
.1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Dispose of unused topsoil off site as directed by Departmental Representative.
- 3.4 STOCKPILING .1 Stockpile fill materials in areas designated by Departmental Representative.
.1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.
- .4 Surround all stockpiled materials with reptile and
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amphibian exclusion fencing in accordance with Section 01 35 43.

3.5 COFFERDAMS, SHORING,
BRACING AND UNDERPIPPING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements and Health and Safety Act for the Province of Ontario.
 - .1 Where conditions are unstable, Departmental Representative to verify and advise methods.
 - .2 Construct temporary Works to depths, heights and locations as indicated and approved by Departmental Representative.
 - .3 During backfill operation:
 - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
 - .4 When sheeting is required to remain in place, cut off tops at elevations as indicated.
 - .5 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site and restore watercourses as directed by Departmental Representative.

3.6 DEWATERING AND HEAVE
PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
 - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in a manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of

excavation limits.

- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.7 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
 - .2 Excavate to lines, grades, elevations and dimensions as indicated.
 - .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 Excavation must not interfere with bearing capacity of adjacent foundations.
 - .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
 - .6 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
 - .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
 - .8 Restrict vehicle operations directly adjacent to open trenches.
 - .9 Dispose of surplus and unsuitable excavated material in approved location.
 - .10 Do not obstruct flow of surface drainage or natural watercourses.
 - .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
 - .12 Notify Departmental Representative when bottom of excavation is reached.
 - .13 Obtain Departmental Representative approval of completed excavation.
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- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
 - .15 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected Standard Proctor maximum dry density.
 - .16 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.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
 - .17 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.
- 3.8 FILL TYPES AND COMPACTION
- .1 Use types of fill as indicated or specified on the drawings.
- 3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES
- .1 Place and compact granular material for bedding and surround of underground services as indicated.
 - .2 Place bedding and surround material in unfrozen condition.
- 3.10 BACKFILLING
- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
 - .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 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
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- .5 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 1 m.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative:
 - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
- .6 Place unshrinkable fill in areas as indicated.
- .7 Consolidate and level unshrinkable fill with internal vibrators.
- .8 Install drainage system in backfill as indicated.

3.11 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.
 - .2 Replace topsoil as directed by Departmental Representative in accordance to Section 32 91 19.13 - Topsoil Placement and Grading.
 - .3 Reinstate natural ground to elevation which existed before excavation unless otherwise indicated or directed by Departmental Representative.
 - .4 Reinstate pavements disturbed by excavation to thickness, structure and elevation which existed before excavation.
 - .5 Clean and reinstate areas affected by Work as directed by Departmental Representative.
 - .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
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- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 Section 31 23 16.26 -Rock Removal
- .2 Section 31 23 33.01 -Excavating, Trenching and Backfilling
- .3 Section 31 32 19.01 -Geotextiles
- .4 Section 32 91 19.13 -Topsoil Placement
- 1.2 MEASUREMENT PROCEDURES .1 In accordance with Section 01 22 01 -Measurement and Payment
- .2 There will be no measurement of work included in this Section.
- .3 Payment shall be included in the Lump Sum Price for General Site Work.
- 1.3 REFERENCES .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
- .2 Definitions:
- .1 Rock Excavation: excavation of:
- .1 Material from solid masses of igneous, sedimentary or metamorphic rock which, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort with a Caterpillar D9 crawler bulldozer or equivalent to be considered integral with parent mass.
- .2 Boulder or rock fragments measuring in volume 1 cubic meter or more.
- .2 Common Excavation: excavation of materials that are not Rock Excavation or Stripping.
- .3 Unclassified Excavation: excavation of whatever character other than stripping encountered in the Work.
- .4 Free Haul: distance that excavated material is hauled without compensation. Free haul distance 0.5 km or less.
- .5 Stripping: excavation of organic material covering original ground.
- .6 Over Haul: authorized hauling in excess of free haul distance that excavated material is moved.
- .7 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.
- .8 Waste Material: material unsuitable for
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embankment, embankment foundation or material surplus to requirements.

.9 Borrow Material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work.

.10 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.3 Reference Standards:

.1 ASTM International

.1 ASTM D698-12e2, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft³) (600 kN-m/m³).

.2 American Association of State Highway and Transportation Officials (AASHTO)

.1 AASHTO T99-10, Standard Method of test for Moisture-Density Relations of Soils Using a 2.5 kg (5.5lb) Rammer and 305 mm (12 in) Drop.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit for approval and review blasting program including preshear details, powder factors fly-rock control, and vibration monitoring methods.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements:

.1 Adhere to regulations of authority having jurisdiction when blasting is required.

.2 Adhere to Provincial and National Environmental requirements when potentially toxic materials are involved.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Embankment materials require approval by Departmental Representative.

.2 Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps or other unsuitable material.

.3 Borrow material:

.1 Obtain from sources such as quarry, or borrow pit as approved by Departmental Representative.

.1 Earth Embankment materials to consist of acceptable earth material and processed rock material free from

objectionable quantities of organic matter, frozen soil, stumps, trees, moss, and other unsuitable materials.

- .2 Rock Embankment material to consist of fragmented rock produced by drilling and blasting operations, and boulders which cannot be placed in layers as specified for Earth Embankments.

- .1 Rock Embankment to conform to gradation as follows:

Sieve Designation	Percent Passing by Weight
150 mm	100
100 mm	85 - 100
75 mm	10 - 50
No. 200	* 0 - 3

- .2 *Gradation is determined by that portion passing 75 mm screen.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that condition of substrate is acceptable for roadway embankment Work:
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 COMPACTION EQUIPMENT

- .1 Compaction equipment: vibratory rollers or vibrating plate compactors capable of obtaining required density in materials on project.
 - .1 Demonstrate compaction equipment effectiveness on specified material and lift thickness by documented performance of test-strip before start of Work.
 - .2 Replace or supplement equipment that does not achieve specified densities.
- .2 Operate compaction equipment continuously in each embankment when placing material.

3.3 WATER DISTRIBUTORS

- .1 Apply water with equipment capable of uniform distribution.

3.4 STRIPPING

- .1 Place top soil and finish grading in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.
- .2 Commence topsoil stripping of areas as indicated after brush, weeds and grasses have been removed from these areas.
- .3 Strip topsoil to depths as directed by Departmental Representative. Do not mix topsoil with subsoil.
- .4 Stockpile in locations as directed by Departmental Representative.
 - .1 Stockpile height: not to exceed 2 m.
- .5 Dispose of unused topsoil off site as directed by Departmental Representative.
- .6 Remove clearing and grubbing debris from stripping.
- .7 Spread organic stripping, on completion of excavation and embankment construction, on slopes and trim or remove from site if quantity exceeds ability to grade on site.

3.5 EXCAVATING

- .1 General:
 - .1 Notify Departmental Representative when waste materials are encountered and remove to depth and extent directed.
 - .2 Sub-excavate 500 mm below subgrade in cut sections unless otherwise directed by Departmental Representative.
 - .1 Compact top 150 mm below sub-excavate to minimum 95% maximum dry density, to ASTM D698.
 - .2 Replace with approved embankment material and compact to specified embankment density.
 - .3 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points as directed by Departmental Representative.
 - .4 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points as directed by Departmental Representative.
- .2 Drainage:
 - .1 Maintain profiles, crowns and cross slopes to provide good surface drainage.
 - .2 Provide ditches as work progresses to provide drainage.
 - .3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.

- .3 Rock excavation:
 - .1 Notify Departmental Representative when material appearing to conform to classification for rock is encountered, to enable measurements to be made to determine volume of rock. Provide 24 hour notification.
 - .2 No blasting will be permitted.
 - .3 Shatter rock to 200 mm below subgrade elevation as indicated.

- .4 Borrow Excavation:
 - .1 Completely use in embankments, suitable materials removed from right-of-way excavations before taking material from borrow areas.
 - .2 Obtain embankment materials, in excess of what is available from cut areas, from designated borrow areas.
 - .1 Departmental Representative to designate extent of borrow areas and allowable depth of excavation.
 - .2 Remove waste and stripping material from borrow pits to designated locations.
 - .3 Slope edges of borrow areas to minimum 2:1 and provide drainage as directed.
 - .4 Trim and leave borrow pits in condition to permit accurate measurement of material removed.

3.6 EMBANKMENTS

- .1 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces.
 - .1 Method used to be to be pre-approved in writing by Departmental Representative.

 - .2 Break up or scarify existing road surface prior to placing embankment material.

 - .3 Do not place material which is frozen nor place material on frozen surfaces except in areas authorized by Departmental Representative.

 - .4 Maintain crowned surface during construction to ensure ready run-off of surface water.

 - .5 Drain low areas before placing materials.
 - .1 Place and compact to full width in layers not exceeding 200 mm loose thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.
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- .6 Where material consists of rock:
 - .1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1 m.
 - .2 Distribute rock material to fill voids with smaller fragments to form compact mass.
 - .3 Fill surface voids at subgrade level with rock spalls or selected material to form earth-tight surface.
 - .4 Do not place boulders and rock fragments with dimensions exceeding 150 mm within 300 mm of pavement subgrade elevation.
- .7 Deductions from excavation will be made for overbuild of embankments.

3.7 COMPACTION

- .1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.
- .2 Deposit, spread, and level, embankment material in layers 200 mm maximum thickness before compaction.
 - .1 Compact each layer of embankment until compaction equipment achieves no further significant consolidation.
 - .2 Ensure required compaction for each layer before placing any material for next layer.
- .3 Use specialized compaction equipment supplemented by routing, hauling, and leveling equipment over each layer of fill.
- .4 Obtain written approval from Departmental Representative before using specialized compaction equipment such as tamping rollers, vibratory rollers, or other alternate compaction equipment that produces the required results
 - .1 For tamping rollers, use equipment that exerts 1000 kPa minimum of pressure on tamping surface of each tamping foot in transverse row.
- .5 Compact each layer to minimum 95% maximum dry density: ASTM D698 except top 150 mm of subgrade.
 - .1 Compact top 150 mm to 100% maximum dry density.
- .6 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

3.8 FINISHING

- .1 Shape entire roadbed to within 10 mm of design elevations not uniformly high or low.

- .2 Finish slopes, ditch bottoms and borrow pits true to lines, grades and drawings where applicable. Scale slope by removing loose fragments, for cut slopes in bedrock steeper than 1:1.
- .3 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.
- .4 Hand finish slopes that cannot be finished satisfactorily by machine.
- .5 Round top of backslope 1.5 m both sides of top of slope.
- .6 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.
- .7 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.

3.9 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.10 PROTECTION

- .1 Maintain finished surfaces in condition conforming to this section until acceptance by Departmental Representative.
- .2 Provide silt fences, erosion protection and reptile exclusion fencing as required to mitigate and prevent impacts to the environment and the public.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 Section 31 37 00 -Rip-Rap
- .2 Section 31 05 16 -Aggregate Materials
- .3 Section 31 23 33.01 -Excavating Trenching and Backfilling.
- 1.2 MEASUREMENT AND PAYMENT .1 In accordance with Section 01 22 01 -Measurement and Payment
- .2 Measure geotextiles in square metres of surface covered by material. No allowance will be made for seams and overlaps.
- 1.3 REFERENCES .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
- .2 ASTM International
- .1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM D4491-17, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- .3 ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
- .4 ASTM D4716-14, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
- .5 ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-4.2 No. 11.2-2004, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
- .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
- .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
- .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
- .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes -
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Bursting Strength of Geotextiles
Under No Compressive Load.

- .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
- .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

.4 CSA International

- .1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 Ontario Provincial Standard Specifications (OPSS)

- .1 OPSS 1860-November 2010, Material Specification for Geotextiles.

1.4 ACTION AND
INFORMATIONAL SUBMITTALS

- .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.

.3 Samples:

- .1 Submit following samples 2 weeks prior to beginning Work.
 - .1 Minimum length of 2 m of roll width of geotextile.
 - .2 Methods of joining.

.4 Test and Evaluation Reports:

- .1 Submit copies of mill test data and certificate at least 2 weeks prior to start of Work.

1.5 DELIVERY, STORAGE AND
HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Storage and Handling Requirements:

- .1 Store materials off ground and 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.

- .3 Packaging Waste Management: remove for recycling packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.
 - .1 Composed of: minimum 95% by mass of polypropylene or polyester with inhibitors added to base plastic to resist deterioration by UV and heat exposure for 60 days.
 - .2 Physical properties:
 - .1 Thickness: to CAN/CGSB-148.1, No.3, minimum 3.5 mm.
 - .2 Tensile strength and elongation (in any principal direction): to ASTM D4595.
 - .1 Tensile strength: minimum 1450 N, wet condition.
 - .2 Elongation at break: 70 to 110%.
 - .3 Tear strength: minimum 600 N.
 - .3 Bursting strength: to CAN/CGSB-148.1, No.6.1 minimum 3500 kPa, wet condition.
 - .4 UV Stability: to ASTM 04355 minimum 50% tensile strength retained after 500 hours.
 - .3 Hydraulic properties:
 - .1 Filtration opening size (FOS): to CAN/CGSB-148.1 No.10 40 - 110 µm.
 - .4 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to ASTM A123/A123M.
 - .5 Factory seams: sewn in accordance with manufacturer's recommendations.
 - .6 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

PART 3 - EXECUTION

- 3.1 EXAMINATION
- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative

- 3.2 INSTALLATION
- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with hooks.
 - .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
 - .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
 - .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
 - .5 Join successive strips of geotextile by sewing.
 - .6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
 - .7 After installation, cover with overlying layer within 4 hours of placement.
 - .8 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
 - .9 Place and compact soil layers in accordance with Sections 31 23 33.01 - Excavating, Trenching and Backfilling and 31 24 13 - Roadway Embankments
- 3.3 CLEANING
- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility
- 3.4 PROTECTION
- .1 Vehicular traffic not permitted directly on geotextile.
 - .1 Replace all geotextiles traveled on with new material at the direction of the Departmental Representative.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 Section 31 05 16 -Aggregate Materials
.2 Section 31 24 13 -Roadway Embankments
.3 Section 31 32 19.01 -Geotextiles
- 1.2 MEASUREMENT PROCEDURES .1 In accordance with Section 01 22 01 -Measurement and Payment
.2 Measure rip-rap without cement mortar in cubic meters of material placed.
- 1.3 REFERENCES Not used.
- 1.4 WASTE MANAGEMENT DISPOSAL .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
.3 Place materials defined as hazardous or toxic in designated containers.
.4 Fold up metal banding, flatten and place in designated area for recycling.
.5 Divert left over aggregate materials from landfill to local facility for reuse as approved by Departmental Representative.
.6 Divert left over geotextiles to local plastic recycling facility as approved by Departmental Representative.

PART 2 - PRODUCTS

- 2.1 STONE .1 Hard, with relative density (formally specific gravity) not less than 2.65, durable quarry stone, not limestone but only granite, free from seams, cracks or other structural defects, to meet following size distribution for use intended:
.1 Coarse 75-100 mm caliber rip-rap:
.1 Not more than 10% of total volume of stones with individual volume less than 10 dm³.
.2 Not less than 50% of total volume of stones with individual volume of 8.5 dm³ or more.
.3 Remaining percentage of total volume to

- have uniform distribution of stones between 7.5 and 10 dm³ size.
- .4 Supply rock spalls or cobbles to fill open joints
- .2 Heavy 300-500 mm caliber rip-rap:
 - .1 Not more than 10% of total volume of stones with individual volume less than 30 dm³.
 - .2 Not less than 50% of total volume of stones with individual volume of 40 dm³ or more.
 - .3 Remaining percentage of total volume to have uniform distribution of stones between 30 and 40 dm³ size.

2.2 CEMENT MORTAR Not used.

2.3 GEOTEXTILE FILTER .1 Geotextile: in accordance with Section 31 32 19.01 - Geotextiles.

PART 3 - EXECUTION

- 3.1 PLACING
- .1 Where rip-rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.
 - .2 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
 - .3 Place geotextile on prepared surface in accordance with Section 31 32 19.01- Geotextiles and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.
 - .4 Place rip-rap to thickness and details as indicated.
 - .5 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.
 - .6 Hand placing:
 - .1 Use larger stones for lower courses and as headers for subsequent courses.
 - .2 Stagger vertical joints and fill voids with rock spalls or cobbles.
 - .3 Finish surface evenly, free of large openings and neat in appearance.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 Section 31 11 00 -Clearing and Grubbing.
.2 Section 31 24 13 -Roadway Embankments
- 1.2 MEASUREMENT AND PAYMENT .1 In accordance with Section 01 22 01 -Measurement and Payment
.2 There will be no measurement of work included in this Section.
.3 Payment shall be included in the Lump Sum Prices for Site restoration and General Site Work.
- 1.3 TESTING .1 Testing of topsoil: Departmental Representative will pay for cost of tests if required. Should topsoil quality be found to be substandard, the Contractor shall repay the full value of performed testing.
- 1.4 REFERENCES .1 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
.2 Agriculture and Agri-Food Canada
.1 The Canadian System of Soil Classification, Third Edition, 1998.
.3 Canadian Council of Ministers of the Environment
.1 PN1340-[2005], Guidelines for Compost Quality.
.4 U.S. Environmental Protection Agency (EPA)/Office of Water
.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- 1.5 DEFINITIONS .1 Compost:
.1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
.2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
.3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N
-

ratio below 25), and contain no toxic or growth inhibiting contaminates.

- .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category A.

1.6 ACTION AND

INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality control submittals :
 - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.7 QUALITY ASSURANCE

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.
- .3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

2.1 TOPSOIL

- .1 Topsoil for seeded areas: mixture of particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.
 - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.
 - .2 Contain no toxic elements or growth inhibiting materials.
 - .3 Finished surface free from:
 - .1 Debris and stones over 50 mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .4 Consistency: friable when moist.

2.2 SOIL AMENDMENTS

- .1 Fertilizer:
 - .1 Fertility: major soil nutrients present in following amounts:
 - .2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
 - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
 - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
 - .5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .6 Ph value: 6.5 to 8.0.
 - .2 Peatmoss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous, brown in colour.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded particle minimum size: [5] mm.
 - .3 Sand: washed coarse silica sand, medium to coarse textured.
 - .4 Organic matter: compost Category A, in accordance with [CCME PN1340], unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
 - .5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.
 - .6 Limestone:
 - .1 Ground agricultural limestone.
 - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
 - .7 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.
- 2.3 SOURCE QUALITY CONTROL
- .1 Grubbed and stockpiled local soil from the project site is preferred over importing any soil from off site in order to reduce the risk of importing invasive plant species.
 - .2 Advise Departmental Representative of sources of topsoil to be utilized with sufficient lead time for testing.
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- .3 Contractor is responsible for amendments to supply topsoil as specified.
- .4 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .5 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.
 - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared of brush, weeds and grasses and removed from site.
 - .2 Strip topsoil to depths as directed by Departmental Representative.
 - .1 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
 - .3 Stockpile in locations as directed by Departmental Representative.
 - .1 Stockpile height not to exceed 2 m.
 - .4 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill as directed by Departmental Representative.
 - .5 Protect stockpiles from contamination and compaction.
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3.3 PREPARATION OF EXISTING GRADE

- .1 Verify that grades are correct.
 - .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
 - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
 - .2 Remove debris which protrudes more than [75] mm above surface.
 - .3 Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
 - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
- .4 Spread topsoil to following minimum depths after settlement.
 - .1 150 mm for seeded areas.
 - .2 135 mm for sodded areas.
 - .3 300 mm for flower beds.
 - .4 500 mm for shrub beds.
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.5 SOIL AMENDMENTS

- .1 For turf: apply and thoroughly mix soil amendments into full specified depth of topsoil as directed by Departmental Representative.

3.6 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
 - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by [Departmental Representative] [DCC Representative] [Consultant].
 - .1 Leave surfaces smooth, uniform and firm

against deep footprinting.

- 3.7 ACCEPTANCE .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.
- 3.8 SURPLUS MATERIAL .1 Dispose of materials except topsoil not required off site in accordance with Section 01 74 21 -Waste Management and Disposal.
- 3.9 CLEANING .1 Proceed in accordance with Section [01 74 11 - Cleaning].
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

- 1.1 DESCRIPTION
- .1 This Section specifies plant material, accessories, mulch, planting, tree support, mulching and maintenance.
 - .2 The scope of work includes supplying and planting ten (10) native species trees (pine and oak) in the east cofferdam access area. Locations to be determined in the field by Departmental Representative.
 - .3 The scope of work includes restoring natural areas by mulching.
- 1.2 MEASUREMENT AND PAYMENT
- .1 There will be no separate measurement of Tree, Shrubs and Ground Cover Planting for payment.
 - .2 Payment of Tree, Shrubs, and Ground Cover Planting shall be included in the Lump Sum Price.
- 1.3 RELATED REQUIREMENTS
- .1 Section 32 94 00 General Landscaping
 - .2 Section 31 11 00 Clearing and Grubbing
- 1.4 REFERENCES
- .1 Definitions:
 - .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.
 - .2 Reference Standards:
 - .1 Agriculture and Agri-Food Canada (AAFC).
 - .1 Plant Hardiness Zones in Canada-[2000].
 - .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
 - .3 Canadian Nursery Landscape Association (CNLA)
 - .1 Canadian Standards for Nursery Stock-[2006].
 - .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .5 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- 1.5 ADMINISTRATIVE REQUIREMENTS
- .1 Scheduling: obtain approval from Departmental Representative of schedule 7 days in advance of shipment of plant material.
 - .2 Schedule to include:
 - .1 Quantity and type of plant material.
 - .2 Shipping dates.

- .3 Arrival dates on site.
- .4 Planting Dates.

1.4 ACTION AND
INFORMATIONAL
SUBMITTALS

- .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 trees, shrubs, ground cover, fertilizer, mycorrhiza, anti-desiccant, anchoring equipment, and mulch as applicable and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit [2] copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
- .3 Samples:
 - .1 Submit samples of mulch.

1.5 QUALITY
ASSURANCE

- .1 Qualifications:
 - .1 Landscape Contractor: to be a Member in Good Standing of Landscape Ontario Horticultural Trades Association.
 - .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
 - .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Ornamental Maintenance designation.

1.6 DELIVERY,
STORAGE AND
HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
 - .2 Protect plant material from damage during transportation:
 - .1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
 - .2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
 - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
- .3 Storage and Handling Requirements:
 - .1 Immediately store and protect plant material which will not be installed within [1] hour[s] in accordance with supplier's written recommendations

and after arrival at site in storage location approved by Departmental Representative.

.2 Protect stored plant material from frost, wind and sun and as follows:

.1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil and watering to full depth of root zone.

.2 For pots and containers, maintain moisture level in containers.

.3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.

1.7 WARRANTY

.1 For plant material over 75 mm caliper the 12 months warranty period is extended to 24 months.

.2 End-of-warranty inspection will be conducted by Departmental Representative.

.3 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

.1 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.

.1 Source of plant material: grown in Zone 4B in accordance with Plant Hardiness Zones in Canada.

.2 Plant material must be planted in zone specified as appropriate for its species.

.3 Plant material in location appropriate for its species.

.2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.

.3 Trees: with straight trunks, well and characteristically branched for species.

.4 Trees larger than 200 mm in caliper: half root pruned during each of two successive growing seasons, the latter at least one growing season before arrival on site.

.5 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.

.6 Collected stock: maximum 40 mm in caliper, with well developed crowns and characteristically

branched; no more than 40% of overall height may be free of branches.

.1 During collection, ensure 10% maximum seed crop (or plants) are collected from healthy population of many individuals, and from several plants of same species.

.2 Leave remainder for natural dispersal and as food for dependent organisms.

2.2 WATER .1 Free of impurities that would inhibit plant growth.

2.3 STAKES .1 Wood, pointed one end, 38 x 38 x 2300 mm.

2.4 WIRE TIGHTENER .1 Type 1: galvanized steel, stamped plate type, triangular shape.

.2 Type 2: turnbuckle, galvanized steel, 9.5 mm diameter with 270 mm open length.

2.5 GUYING WIRE .1 Type 1: steel, 3 mm wire.

.2 Type 2: 1.5 mm diameter multi-wire steel cable.

.3 Type 3: 3 mm diameter multi-wire steel cable.

2.6 CLAMPS .1 U-bolt: galvanized, 13 mm diameter, c/w curved retaining bar and hex nuts.

.2 Crimp type.

2.7 ANCHORS .1 Wood:

.1 Type 1: 38 x 38 x 460 mm.

.2 Type 2: 38 x 67 x 600 mm.

.2 Drive-in type.

.1 Type 1: 13 mm diameter x 75 mm long, aluminum.

.2 Type 2: 18 mm diameter x 120 mm long, aluminum.

.3 Screw-in type:

.1 Type 1: 100 mm diameter steel disc.

2.8 GUYING COLLAR .1 Tube: plastic, 13 mm diameter, nylon reinforced.

2.9 TRUNK PROTECTION .1 Wire mesh: galvanized, electrically welded 1.4 mm wire with 25 x 25 mm mesh and fastener.

.2 Plastic: perforated spiralled strip.

.3 Burlap: clean 2.5 kg/m² minimum mass and 150 mm

minimum wide, and twine fastener.

.4 Tar impregnated crepe paper and twine fastener.

2.10 MULCH

.1 Bark chip: varying in size from 25 to 50 mm in diameter, from bark of coniferous trees.

.2 Wood chip: varying in size from 50 mm to 75 mm and 5 to 20 mm thick, free of bark, small branches and leaves.

.3 Shredded wood: varying in size from 25 to 125 mm in length, from coniferous trees.

.4 Synthetic or inorganic mulch.

2.11 FERTILIZER

.1 Synthetic commercial type as recommended by manufacturer.

.1 Ensure new root growth is in contact with mycorrhiza.

.2 Use mycorrhiza as recommended by manufacturer's written recommendations.

2.12 ANTI-DESICCANT

.1 Wax-like emulsion.

2.13 FLAGGING TAPE

.1 Fluorescent, orange colour.

2.14 SOURCE QUALITY CONTROL

.1 Obtain approval from Departmental Representative of plant material prior to planting.

.2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for planting installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative

3.2 PRE-PLANTING PREPARATION

.1 Proceed only after receipt of written acceptability of plant material from Departmental Representative.

.2 Remove damaged roots and branches from plant

material.

- .3 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.
- .4 Locate and protect utility lines.
- .5 Notify and acquire written acknowledgment from utility authorities before beginning excavation of planting pits for trees and shrubs.
- .6 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control drawings.
 - .1 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .2 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXCAVATION AND
PREPARATION OF
PLANTING BEDS

- .1 Preparation of planting beds in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.
- .2 For individual planting holes:
 - .1 Stake out location and obtain approval from Departmental Representative prior to excavating.
 - .2 Excavate to depth and width as indicated.
 - .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
 - .4 Scarify sides of planting hole.
 - .5 Remove water which enters excavations prior to planting. Notify Departmental Representative if water source is ground water.

3.4 PLANTING

- .1 For bare root stock, place 50 mm backfill soil in bottom of hole.
 - .1 Plant trees and shrubs with roots placed straight out in hole.
- .2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball.
 - .1 Do not pull burlap or rope from under root ball.
- .3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .4 Plant vertically in locations as indicated.
 - .1 Orient plant material to give best appearance in relation to structure, roads and walks.
- .5 For trees and shrubs:

- .1 Backfill soil in 150 mm lifts.
 - .1 Tamp each lift to eliminate air pockets.
 - .2 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.
 - .3 After water has penetrated into soil, backfill to finish grade.
 - .2 Form watering saucer as indicated.
 - .6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
 - .7 Water plant material thoroughly.
 - .8 After soil settlement has occurred, fill with soil to finish grade.
- 3.5 TRUNK PROTECTION
- .1 Install trunk protection on deciduous trees as indicated.
 - .2 Install trunk protection before installation of tree supports.
- 3.6 TREE SUPPORTS
- .1 Install tree supports as required.
 - .2 Use single stake tree support for deciduous trees less than 3 m in height and evergreens less than 2 m in height.
 - .1 Place stake on prevailing wind side and 150 mm minimum from trunk.
 - .2 Drive stake 150 mm minimum into undisturbed soil beneath roots.
 - .1 Ensure stake is secure, vertical and unsplit.
 - .3 Install 150 mm long guying collar 1500 mm above grade.
 - .4 Thread Type 1 guying wire through guying collar tube.
 - .1 Twist wire to form collar and secure firmly to stake. Cut off excess wire.
 - .3 Use 3 guy wires and anchors for deciduous trees greater than 3 m in height and evergreens greater than 2 m in height.
 - .1 Use Type 2 guying wire with clamps for trees less than 75 mm in diameter and Type 3 guying wire with clamps for trees greater than 75 mm in diameter.
 - .2 Use Type 1 anchors for trees less than 75 mm in diameter and Type 2 anchors for trees greater than 75 mm in diameter.
 - .3 Install guying collars above branch to prevent slipping at approximately 2/3 height for evergreens and 1/2 height for deciduous trees. Collar mounting height not to exceed 2.5 m above grade.
 - .4 Guying collars to be of sufficient length to encircle tree plus [50] mm space for trunk clearance. Thread guy wire through collar encircling tree trunk and secure to lead wire by clamp or multi-wraps; cut wire ends close to wrap.

Spread lead wires equally proportioned about trunk at 120 degrees.

.5 Install anchors at equal intervals about tree and away from trunk so guy wire will form 45 degree angle with ground. Install anchor at angle to achieve maximum resistance for guy wire.

.6 Attach guy wire to anchors. Tension wire and secure by installing clamps.

.7 Install wire tightener ensuring that guys are secure and leave room for slight movement of tree.

.8 Saw tops off wooden anchors which extend in excess of 100 mm above grade or as directed by Departmental Representative.

.9 Install flagging tape to guys as indicated.

.4 After tree supports have been installed, remove broken branches with clean, sharp tools.

3.7 MULCHING

.1 Ensure soil settlement has been corrected prior to mulching.

.2 Spread mulch as indicated.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.

.1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.

.1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.

.2 Remove weeds monthly.

.3 Replace or respread damaged, missing or disturbed mulch.

.4 For non-mulched areas, cultivate as required to keep top layer of soil friable.

.5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.

.6 Remove dead or broken branches from plant material.

.7 Keep trunk protection and guy wires in proper repair and adjustment.

.8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.9 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.

.1 Water to maintain soil moisture conditions for optimum growth and health of plant material

- without causing erosion.
- .2 Reform damaged watering saucers.
- .3 Remove weeds monthly.
- .4 Replace or respread damaged, missing or disturbed mulch.
- .5 For non-mulched areas, cultivate monthly to keep top layer of soil friable.
- .6 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.
- .7 Apply fertilizer in early spring as indicated by soil test.
- .8 Remove dead, broken or hazardous branches from plant material.
- .9 Keep trunk protection and tree supports in proper repair and adjustment.
- .10 Remove trunk protection, tree supports and level watering saucers at end of warranty period.
- .11 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
- .12 Submit monthly written reports to Departmental Representative identifying:
 - .1 Maintenance work carried out.
 - .2 Development and condition of plant material.
 - .3 Preventative or corrective measures required which are outside Contractor's responsibility.

3.10 VERIFICATION

- .1 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Local/regional materials.

3.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and/or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Divert discarded burlap, wire and plastic plant containers materials from landfill to plastic

recycling facility approved by Departmental Representative.

.3 Dispose of unused fertilizer at official hazardous material collection site approved by Departmental Representative.

.4 Dispose of unused anti-desiccant at official hazardous material collections site approved by Departmental Representative.

.5 Divert unused wood and mulch materials from landfill to recycling or composting facility approved by Departmental Representative.

3.12 CLOSEOUT
ACTIVITIES

.1 Submit maintenance reports for trees, shrubs, and other plantings.

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This section specifies the requirements for reinstating damaged landscaped areas within the work and staging areas, access route and areas disturbed by the work and consists of:
- .1 Supplying, placing, and finish grading of a topsoil bed.
 - .2 All disturbed sodded areas to be covered with topsoil, smoothed to the finish grade.
- 1.2 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no measurement of General Landscaping of General Site Work and Site Restoration.
- .2 Payment of General Landscaping shall be included in the Lump Sum Price.
- 1.3 RELATED SECTIONS .1 Section 01 11 00 - Summary of Work.
- .2 Section 01 35 43 - Environmental Procedures.
- 1.4 PRELIMINARY INSPECTION .1 Establish the condition of sodded areas (if applicable) in conjunction with Departmental Representative before starting work.
- 1.5 SOURCE QUALITY CONTROL .1 At least 2 weeks before starting final work, advise Departmental Representative of proposed sources of all materials. Provide Departmental Representative with access to the sources for inspection, sampling and testing.
- .2 When proposed sources are approved, use no other sources without written authorization from Departmental Representative.
- 1.6 DELIVERY AND STORAGE .1 Schedule deliveries in order to keep storage at the job site to a minimum without causing delays.

PART 2 - PRODUCTS

- 2.1 TOPSOIL .1 New topsoil to be a friable sandy-clayish loam of good humus content, free from:
- .1 Debris and stones over 50 mm diameter.
 - .2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
- .2 Approval of topsoil material subject to soil testing and analysis. Testing of topsoil will be

carried out by testing laboratory designated by Departmental Representative. Departmental Representative will pay for cost of tests.

2.2 SOD .1 Sodding is not required at this site

2.3 SEEDS .1 Seeding is not required at this site.

PART 3 - EXECUTION

- 3.1 PREPARATION OF TOPSOIL SUB-GRADE .1 Verify that grades are correct. If discrepancies occur, notify Departmental Representative and do not start other landscape work in that area until instructed to do so in writing by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove debris which protrudes more than 75 mm above surface. Dispose of removed material off site.
- .4 Coarse cultivate entire area which is to receive topsoil to depth of 100 mm. Coarse cultivate those areas where equipment used for hauling and spreading has compacted soil.
- 3.2 PLACING AND SPREADING OF TOPSOIL .1 Place topsoil after Departmental Representative has accepted sub-grade.
- .2 Spread topsoil to 150 mm minimum depth after settlement and 80% compaction.
- .3 Manually spread topsoil around trees, shrubs and obstacles.
- .4 Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- .5 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative. Leave surfaces smooth, uniform and firm enough to resist deep footprints.
- 3.3 ACCEPTANCE OF TOPSOIL GRADING .1 Departmental Representative will inspect topsoil in place and determine acceptance of depth of topsoil and finish grading.

3.4 SURPLUS TOPSOIL
MATERIALS

.1 Dispose of materials not required off site.

END OF SECTION

PART 1 - GENERAL

- 1.1 DESCRIPTION .1 This section specifies requirements for dewatering work described by drawings and specifications.
- .2 The work includes but is not limited to:
- .1 The design, construction, maintenance and operation methods of the systems used to remove water from the work spaces.
- .1 Existing stoplogs will be left in place for use by PCA staff for operation of the dam during construction, including for dewatering and diversion purposes.
- .2 New stoplogs for the new dam will be supplied for use by PCA staff for operation of the dam during construction, including for dewatering and diversion purposes.
- .2 Provision and maintenance of dewatering systems for removal of water from the work spaces.
- .3 Removal of water from the work spaces and the continued maintenance of these spaces in the dry state for the duration of the work to meet work requirements and environmental regulations.
- .4 Supply of standby equipment to replace dewatering equipment which malfunctions.
- .5 The removal of the materials used for the dewatering structure, in accordance with the restriction window for in-water work described in Section 01 14 00 -Work Restrictions. See also Item 1.8.
- .6 Provision of a by-pass control structure as part of the cofferdam as described on the contract drawings.
- 1.2 MEASUREMENT AND PAYMENT PROCEDURES .1 There will be no separate measurement of Dewatering.
- .2 Payment of Dewatering work shall be included in the Lump Sum Price for Cofferdam and Dewatering Works.
- .3 No requests for additional payment of pumping costs will be considered unless water levels exceed the recommended crests of the cofferdams as shown on the contract drawings and in Section 35 62 16 Clause 1.7.3.
- 1.3 RELATED WORK .1 Section 01 35 43 - ENVIRONMENTAL PROCEDURES.
- 1.4 REGULATORY .1 Adhere to local, provincial and federal requirements

REQUIREMENT

relating to:

- .1 Protection of environment;
- .2 Safety of construction; and
- .3 Protection of workers.

.2 Pumping water out of dewatering enclosure: to Section 01 35 43 - Environmental Procedures.

.3 Obtain and pay costs of all required permits

1.5 SUBMITTALS

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

.2 Shop drawings presenting methodology of water-tight dewatering systems and additional components are to be submitted before dewatering systems are installed.

.3 Submit detail drawings to Regulatory Agencies, as required to satisfy conditions for granting of permits.

1.6 DESIGN CRITERIA

.1 Ensure maintenance of work spaces in a dry state for duration of work.

.2 Plan dewatering systems considering:

- .1 Initial cofferdam dewatering: Ensure there is a fish screen that complies with DFO Freshwater Intake End-of-Pipe Fish Screen Guideline when pumping in fish-bearing water to prevent impingement or entrainment of fish.
- .2 Access to dewatering systems and access to reach any portion of Work dewatered areas. Sequence of Work.
- .3 Space required for crews to work in dewatered areas
- .4 Sequence of Work.
- .5 Water levels up to the crest of the cofferdams.
- .6 Potential groundwater inflows. Sealing of rock faults and fractures to maintain dry work area.
- .7 Riverbed conditions.
- .8 Geotechnical information.
- .9 Drainage areas and patterns based on pre-construction topography and construction design.
- .10 The direction of sediment-laden run-off to detention or retention facilities on-site.
- .11 Adherence to water quality standards.
- .12 Environmental regulations and requirements.
- .13 The potential for high turbidity water and the possible need to pre-filter water prior to discharge to settling basins.

.14 The potential to manage pH levels, especially concrete pours where the work site is nor free from water.

.15 Seasonal fluctuations in water levels and flow.

.3 At all times, maintain environmental quality of water to Section 01 35 43 - ENVIRONMENTAL PROCEDURES.

.4 Ensure that no phase of Work threatens safe performance of stoplogs and additional dewatering systems.

.5 Cofferdams to be designed in reference to crest elevations provided in drawings.

1.7 WATER LEVELS

.1 Refer to Section 01 11 00 - SUMMARY OF WORK.

.2 Refer to <https://www.pc.gc.ca/apps/waterlevels>

.3 There may be considerable ponding in low areas, particularly in depressions in the bedrock.

.4 The work spaces are to be dewatered and maintained in the dewatered condition as part of the work of this section.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Dispose of water so that it does not create a safety or health hazard; or cause damage to environment, to adjacent property or to any portion of Work.

.2 Refer to Section 01 35 43 - ENVIRONMENTAL PROCEDURES.

.3 Do not release any sediment or other materials into watercourse during construction or removal of cofferdams.

.4 Check "Permit to Take Water" requirements. If the permit is required, it must be obtained from the Ontario Ministry of the Environment by the contractor.

.1 If cofferdam installation is required beyond the date stipulated in Section 01 14 00 - Work Restrictions, a request for changes to timing windows for in-water work must be submitted to PCA, if not previously approved.

.2 PCA will submit preliminary plans to MOECC on behalf of contractor; however, contractor shall submit detailed plans regarding staging, installation and removal dates of cofferdams, diversion plan, and mitigating

measures to prevent sediment from entering the watercourse.

- .5 Provide settling facilities as per approved Environmental Management Plan (EMP) to remove suspended solids before discharging water into storm sewers, water courses or drainage areas. In the event that space restrictions make settling facility size inadequate, the contractor must provide alternate means of filtering/treating water prior to discharge.
- .6 Monitoring and reporting of discharge water from dewatering is required by the contractor.
 - .1 Suspended Solids: The total suspended solids concentration at the discharge point into the watercourse should contain:
 - .1 <25 mg/L of suspended solids above background levels of the receiving waters during any short-term exposure period (e.g., 24-h).
 - .2 <5 mg/L of suspended solids above background levels of the receiving waters during longer term exposure (e.g., 30 days or more).
 - .3 If elevated turbidity beyond 25 mg/L from background levels for a short-term exposure is observed, Parks Canada will assess potential impact to the aquatic environment and additional mitigation measures may be required.
 - .2 pH Standards: At the discharge point into the watercourse, pH will be maintained between 6.5 and 9.0.
 - .1 Water with pH > 9 cannot be released directly back into the watercourse, but must be treated prior to release.
 - .2 Water with a pH > 12.5 is considered toxic and treated as a hazardous waste under Ontario Regulation 347 of the Environmental Protection Act and wastewater in this condition must be removed from the site.
 - .3 Turbidity Standards: At the discharge point into the watercourse, water should have a turbidity:
 - .1 <8 Nephelometric Turbidity Units (NTU) above background turbidity during short-term exposure periods not to exceed 24 hours.
 - .2 <2 Nephelometric Turbidity Units (NTU) above average background turbidity levels for long term exposure periods averaged over not more than 30 days.
 - .3 Monitoring of background turbidity

levels will be required to assess turbidity increases due to construction activities.

- .7 Remove all debris from the worksite upon completion of construction.
- .8 Protect and monitor the water quality and minimize the undesirable impacts of the construction upon the environment in accordance with the Canadian Water Quality Guidelines for the Protection of Aquatic Life.
- .9 Additionally, since there are cottages in the vicinity, potentially with drinking water intakes, Ontario drinking water quality guidelines cannot be exceeded (beyond parameters that currently exist) due to project activities.
- .10 Ensure all activities are in accordance with the BIA and Section 01 14 00 - Work Restrictions.

1.9 PROTECTION

- .1 Protect dewatered work spaces from damage due to floods, rain, ice, snow or other adverse climatic conditions.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 In good condition, approved by Departmental Representative and suitable for their use in Work.
- .2 Do not use materials which may cause environmental damage to waterway or to land at or near site.
- .3 Materials and methods proposed for use in the dewatering structure improvements, and the dewatering systems, must be approved by PCA.
- .4 If using sandbags, sealed sandbags must be washed of fines before placing in water.
- .5 Earth or granular materials are not acceptable for improving the water-tightness of the existing stoplog dewatering structures.
- .6 Note that PCA prefers caissons, rubber dams, sheet piling, bolted pre-engineered frame-type structures, or other types of cofferdams which do not generate turbidity.
- .7 Refer to Section 01 14 00 - Work Restrictions.

PART 3 - EXECUTION

- 3.1 GENERAL
- .1 Evaluate, plan and execute work in an expert and prudent manner giving due consideration to:
 - .1 Climatic conditions which may occur at work location during period of doing work in its entirety.
 - .2 Safety of personnel and of general public.
 - .3 Safety of work and of adjacent property.
 - .4 Safety of removals.
 - .5 Environmental requirements.
 - .6 Clearance requirements for work.
 - .7 Changes in water levels.
 - .8 Bypass of water through cofferdam.
- 3.2 DEWATERING
- .1 When existing structures are incorporated into the dewatering system, the Departmental Representative does not guarantee the water-tightness of the structures. Contractor shall take additional measures to increase the water-tightness of existing structures.
 - .2 Design, supply and install any additional methods and materials required to maintain the site in dry condition.
 - .3 The contractor may improve the water-tightness of the stoplogs in the dewatering structure with plastic sheeting, burlap bags or similar material.
 - .4 Dewater work spaces and maintain them in a fully dewatered state until work is finished.
 - .5 Continue dewatering operations, to enable work to proceed in the dry, for duration of work.
 - .6 Ensure that any drawdown of the water surface due to pumping does not affect:
 - .1 Climatic conditions which may occur at work location during period of doing work in its entirety.
 - .2 The safety or quality of the work.
 - .3 Neighbouring property in an adverse manner.
 - .4 The stability of soils.
 - .7 Intersect water draining from adjacent soil and bedrock due to lowering of the water table. Remove it from the work spaces. Prevent the loss of fines from adjacent soil. The dewatering systems must prevent seepage pressure on foundation soils which would disturb the soil and reduce the bearing capacity.
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- .8 Repeat entire dewatering procedure as often as may be necessary if flooding or other damage occurs before completion of work.

3.3 WATCHKEEPERS

- .1 Ensure continuity of dewatering by designating a watchkeeper to make periodic checks at times when work is not in progress. Watchkeeper's qualifications under this Section are to be sufficient to perform, on dewatering equipment, such duties as:
 - .1 Preventive maintenance and refuelling of generators normally performed during any shift.
 - .2 Emergency repairs of minor complexity.
 - .3 Placing standby items in service.
 - .4 Action emergency call-out, if necessary.

3.4 EQUIPMENT

- .1 General:
 - .1 Provide equipment in safe operating condition and maintain it in a safe operating condition for entire period of use and/or standby for use on work.
 - .2 Provide skilled operators for equipment.
- .2 Standard and Performance:
 - .1 Provide equipment of such quality and in such quantity as to provide sufficient capability to perform essential functions of work.
 - .2 Provide standby replacement for pumps and other essential dewatering equipment which may break down during work.
 - .3 Keep this replacement equipment available on site for immediate use.

3.5 DEWATERING REMOVAL

- .1 At approved stages in work remove all materials, temporary structures, and dewatering systems used to improve the water tightness of the stoplogs in the dewatering structure; any additional temporary structures; and dewatering systems.

3.6 CLEAN UP AND RECTIFICATION

- .1 Clean the sill excavation of accumulated sediment, debris and other materials deposited as a result of the contract activities.
- .2 Dispose of all unwanted materials in an approved manner off site.
- .3 Do not dispose of any materials into the surrounding forest or water courses.
- .4 All waste described as subject to Regulation 347, Environmental Protection Act, must be transported

with a valid "Certificate of Approval for a Waste Management System" to a site approved by the Ontario M.O.E. to accept the waste.

END OF SECTION

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Preservation of watercourses and related environments during construction activities and their restoration.
- 1.2 RELATED SECTIONS .1 Section 01 14 00 - Work Restrictions.
.2 Section 01 22 01 - Measurement and Payment.
.3 Section 01 33 00 - Submittal Procedures
.4 Section 01 35 43 - Environmental Procedures.
.5 Section 01 78 00 - Closeout Submittals.
.6 Section 31 11 00 - Clearing and Grubbing.
.7 Section 35 20 22 - Dewatering and Diversion.
.8 Section 35 49 25 - Turbidity Curtain (Silt Curtain).
- 1.3 ENVIRONMENTAL REQUIREMENTS .1 Operation of construction equipment in water is prohibited.
.2 Design and construct temporary construction access roads to minimize environmental impact to watercourse.
.3 Ensure construction activities do not impact downstream spawning beds.
.4 Dumping excavated fill, waste material, or debris in watercourse is prohibited.
.5 Underwater blasting is prohibited.
.6 Carry out work to requirements of work permits.
.7 Install turbidity curtain to prevent sediment from construction activities from entering the watercourse and being transported beyond the approved work area to Section 35 49 29. Note this will only be feasible for certain situations and flow conditions.
.8 Construction of sediment and erosion control measures and in particular the sediment trap within the dewatered area of the construction limit shall be considered by the Departmental Representative.
.1 The Contractor shall demonstrate that other alternative locations outside the dewatered area have been explored and have been found to
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be impractical or not acceptable to the regulatory and local authorities.

- .2 The Contractor shall demonstrate to the satisfaction of the Departmental Representative that there will be no short term and long term environmental impacts to the watercourse.

PART 2 - PRODUCTS

- 2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

- 3.1 PREPARATION .1 Obtain work permits from governing Federal, Provincial, Municipal and/or Conservation Authority.

- 3.2 EXISTING CONDITIONS .1 Maintain existing flow pattern in natural watercourse systems.

- 3.3 SITE CLEARING AND PLANT PROTECTION .1 Undertake site clearing to Section 31 11 00.
.2 Conduct work to provide minimal disturbance to vegetated buffer zones. Protect trees and plants on site and adjacent properties where indicated.
.3 Maintain temporary erosion and pollution control features installed under this contract.

- 3.4 DRAINAGE .1 Pumping water containing suspended materials into watercourse is prohibited.
.2 Establish rock chute spillways and energy dissipater at outlet of diversion works to accommodate safe surface water entry to watercourse as approved by the Departmental Representative.
.3 Maintain existing drainage patterns on adjacent lands to the water course to the greatest extent possible.

- .4 Undertake channel diversion system to requirements of Section 35 20 22.

- 3.5 SITE RESTORATION .1 Remove sediment and erosion control measures with approval of Departmental Representative.

- .2 Protect new planting material from disturbance by construction activities.

END OF SECTION

PART 1 - GENERAL

- 1.1 DESCRIPTION
- .1 This section specifies requirements for upstream and downstream cofferdams as described by the drawings and specifications.
 - .2 The work includes but is not limited to:
 - .1 The design, construction, maintenance and operation methods of the cofferdam systems.
 - .2 The removal of the materials used for the cofferdam structures, in accordance with the restriction window for in-water work described in Section 01 14 00 -Work Restrictions.
 - .3 Provision of a by-pass control structure as part of the cofferdam as described on the contract drawings.
- 1.2 RELATED SECTIONS
- .1 Section 31 23 16 Rock Removal
 - .2 Section 35 20 22 Dewatering
 - .3 Section 35 42 19 Preservation of Watercourse
- 1.3 REGULATIONS
- .1 Acknowledge all laws, regulations, guidelines and safety codes applicable to work involved in this section and comply strictly.
 - .2 Construction to be in accordance with the latest edition of the applicable Ontario and National codes. The above to govern except where other applicable codes or provided notes are more restrictive.
 - .3 The cofferdam construction, operation, surveillance and demolition must comply with all applicable laws, especially and not limited to:
 - .1 Ministry of Labour, Ontario - Occupational Health and Safety Act and Regulations for Construction Projects.
 - .2 Environmental Protection for Construction in Waterbodies and on Waterbody Banks (OPSS 182).
- 1.4 MEASUREMENT AND PAYMENT
- .1 In accordance with Section 01 22 01 - Measurement and Payment.
 - .2 All work associated with maintaining a dry work area, including the cofferdam system and pumping costs, are included in the Lump Sum Dewatering Works.
 - .3 No requests for additional payment of cofferdam
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costs will be considered unless water levels exceed the recommended crests of the cofferdams as shown on the contract drawings and in Clause 1.7.3.

- 1.5 PERMITTING .1 The Contractor is responsible to obtain all required permits and approvals necessary to construct, operate and demolish cofferdams.
- 1.6 SCOPE OF WORK .1 Cofferdams will be required to allow construction of concrete structures, demolition of concrete structures and the excavation of rock in the dry.
- .2 The cofferdam must be designed with a controlled bypass structure or other means to pass up to 90 cms through the work area if necessary.
- .3 The work described in this section includes:
.1 Phase 1 Upstream Cofferdam
.2 Phase 1 Downstream Cofferdam
.3 Phase 2 Upstream Cofferdam
.4 Phase 2 Downstream Cofferdam
.5 Construction, maintenance, and demolition of the cofferdams.
.6 Construction, maintenance, operation and removal of the bypass system.
- .4 Work to be in accordance with the latest editions of all government laws and regulations.
- 1.7 DESIGN REQUIREMENTS .1 The cofferdams shall be designed for the minimum of one in twenty year flood and 500 mm freeboard allowance when only one sluice is in operation. In no case shall the minimum crest elevation of the cofferdam be less than indicated in Clause 1.7.3. The expected flow for the 1:20 year flood is 75 m³/s.
- .2 Cofferdam is subject to dynamic hydraulic loads due to the staged construction, which includes operation of the existing dam. Dynamic loads to be included in the design of the cofferdam. Note that water velocities under the design flow will depend on the cofferdam design and configuration and must therefore be determined by the cofferdam designer.
- .3 The proposed crest elevation of the cofferdams are:
.1 Upstream cofferdam: EL. 308.48 m
.2 Downstream cofferdam: EL. 305.30 m
- .4 The Contractor shall become familiar with the historical minimums, maximums, averages and daily levels for this year found at:
http://www.pc.gc.ca/lhn-nhs/on/trentsevern/visit/ne-wl/trent_e.asp. If the Contractor believes the proposed minimum cofferdam crest elevations are not adequate, they shall

budget at the time of the tender any necessary modifications to raising and strengthening the cofferdams. No claims will be considered at the time of construction for inadequacy of cofferdams to maintain the work area dry below the indicated water levels.

- .5 The Contractor shall submit, at least 14 days prior to commencement of construction activities, the approved final drawings of the cofferdams for construction signed and sealed by a licensed Professional Engineer of Ontario.
- .6 The Contractor is responsible for the stability and water tightness of the cofferdams under all loading conditions.
- .7 The contract drawings only provide a schematic of the proposed construction staging and shall not be used by the Contractor in any manner for the design of the cofferdams. Cofferdams must be within the work area and limits of construction.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Contractor is fully responsible for the design and installation of the cofferdams that can include backfill with sheetpile curtain, cellular cofferdam, structural steel with drilled post or embedded post, diaphragm cofferdam, prefabricated concrete block with geosynthetic barrier or any other design to be approved by the Departmental Representative.
- .2 Rockfill/backfill with waterproof barrier cofferdam is not recommended for this project.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 The cofferdam design engineer shall be on site to witness all of the following activities applicable to the project and provide individual signed and sealed letters confirming that they were completed with accordance to the design drawings:
 - .1 Anchor installation
 - .2 Post installation
 - .3 Steel/sheetpile installation
 - .4 Backfill/rock fill installation
 - .5 Membrane installation
 - .6 Sealing of cofferdam bottom
 - .7 Sealing of cofferdam sides
 - .8 Adequacy of cofferdam stability

- .2 No dewatering or demolition work shall commence until all necessary signed and sealed letters in order to certify the cofferdam have been submitted by the Contractors cofferdam design engineer.
- .3 Erosion and sediment control and water quality monitoring shall be in compliance with all regulations.

3.2 INSPECTION

- .1 The Contractor and its engineers shall maintain a quality control program throughout the construction and service life of the cofferdams. The Contractor and its engineers are responsible for all aspects of the cofferdam including but not limited to approval of foundation bedrock conditions, site preparation and construction and materials quality control and monitoring of the cofferdams.
- .2 All observations must be compiled in a daily inspection report, with copies sent on a weekly basis to the Departmental Representative.

END OF SECTION

APPENDIX A
Geotechnical Report

REPORT N° 1, REV. 0

HORSESHOE DAM REHABILITATION

GEOTECHNICAL DRILLING REPORT

SEPTEMBER 2015

HORSESHOE DAM REHABILITATION GEOTECHNICAL DRILLING REPORT

Parks Canada Agency

Report 1, Rev. 0

Project No: 121-15275-51

Date: September 2015

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* This report has been prepared for the exclusive use of Parks Canada Agency and its representatives for the specific application described in this report. Any use that a third part makes of this report, or any reliance or decisions based on this report are sole responsibility of those parties.

TABLE OF CONTENTS

1	INTRODUCTION.....	1
1.1	PROJECT DESCRIPTION	1
1.2	BACKGROUND INFORMATION.....	1
1.3	PROJECT SCOPE OF WORK.....	1
2	SITE DESCRIPTION.....	2
2.1	GEOLOGICAL SETTING	2
2.2	EXISTING INFRASTRUCTURE.....	2
3	SITE INVESTIGATION	3
3.1	GENERAL	3
3.2	HISTORIC INVESTIGATIONS	3
3.3	2015 SITE INVESTIGATION.....	3
3.3.1	DH15-1.....	4
3.3.2	DH15-2.....	5
3.3.3	DH15-3.....	5
3.3.4	DH15-4.....	5
3.3.5	DH15-5.....	6
3.3.6	DH15-6.....	6
3.3.7	DH15-7.....	6
3.3.8	DH15-8.....	6
3.4	LAB TESTING RESULTS	6
3.4.1	CONCRETE TESTING RESULTS	7
3.4.2	BEDROCK TESTING RESULTS.....	8
3.5	ROCK QUALITY DESIGNATION	8
3.6	BEDROCK ELEVATIONS.....	9

TABLES

TABLE 1: PLANNED VERSUS ACTUAL DRILLING PLAN.....	4
TABLE 2: POINT LOAD TEST RESULTS OF CONCRETE.....	7
TABLE 3: POINT LOAD TEST RESULTS FOR BEDROCK.....	8
TABLE 4: ROCK QUALITY DESIGNATION OF BEDROCK	9

APPENDICES

Appendix A	Drill Hole Location Plan
Appendix B	Site Photos
Appendix C	Site Investigation Logs
Appendix D	Site Investigation Testing Results

1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The objective of the Horseshoe Dam Rehabilitation Project is to provide professional engineering services to develop drawings and specifications and to provide construction contract administration support in connection with the rehabilitation of the dam. The project will address structural stability issues and improve operational safety aspects of the dam as identified in the recent Dam Safety Review completed by GENIVAR (now WSP Canada Inc.) in 2014.

WSP Canada Inc. (WSP) was retained by Parks Canada Agency (PCA), as part of the Horseshoe Dam Rehabilitation Project, to perform a concrete and rock drilling investigation of the Horseshoe Dam and foundation (bedrock) conditions. The purpose of this investigation was to assess the general quality of the concrete in both the deck and apron areas of the dam, as well as to determine the geology, lithology, rock quality, rock structure, bedrock location and rock strength of the bedrock immediately below the existing dam. The factual observations, site conditions and lab results from this investigation will be utilized as input data to deliver three rehabilitation options for the Horseshoe Dam to PCA.

1.2 BACKGROUND INFORMATION

The present Horseshoe Dam was originally constructed in 1909 with subsequent alterations in 1948 and is located in Minden Hills, Ontario on the Gull River. The dam is one of 21 PCA water control structures located in the Gull River Waterway and one of the 40 in the Haliburton Sector of the Trent Severn Waterway (TSW) National Historic Site of Canada.

The Dam is a 4 (four) bay stop log sluice water control structure that is 59 m long and 9.1 m in height. At normal operating water level the dam retains 7.4 m of head. The purpose of the dam is to control the water level in Horseshoe Lake upstream. Horseshoe Lake sits at the northernmost end of the TSW and serves as one of a number of reservoir lakes that collect run-off during the non-navigation season and subsequently feed the water system to support navigation during the operational season.

The physical condition of the existing concrete dam and its appurtenant wing walls have deteriorated to a level that required immediate rehabilitation. More specifically, there is a need for general concrete rehabilitation and anchorage of the dam to satisfy dam safety requirements.

1.3 PROJECT SCOPE OF WORK

In order to support the determination of possible rehabilitation options for the Horseshoe Dam, a geotechnical drilling program and subsequent core logging and laboratory testing to determine in situ parameters of both the structural concrete and the foundation bedrock was to be completed. This report summarizes the geotechnical drilling program, bedrock geology, core logging and observations and the factual laboratory results.

2 SITE DESCRIPTION

Horseshoe Lake Dam is located in the Gull River watershed, approximately 7 km north-east of the Town of Minden. The site area has all weather access via County Road 20, and is just south of the intersection of County Road 20 and Bethel Road. Access to the dam may be gained via either the left or right abutments. A private property is located at the south or left dam abutment. The area upstream of the dam includes cottages, private homes, the Bethel Road Bridge. Downstream of the dam, a white water canoe and kayaking course is present. The Minden Generation Station dam and headpond are also located downstream of the Horseshoe Lake Dam.

2.1 GEOLOGICAL SETTING

The Horseshoe Lake Dam is located on the edge of the Algonquin Highlands Physiographic Region, in an area characterized by shallows soils overlying metamorphosed intrusive igneous rocks of the Precambrian basement. The regional rock is from the Denna Lake Structural Complex, comprised of various units including gneisses and metamorphic tectonic breccia.

A thrust fault, of unknown age, and interpreted to be an upright thrust, parallels the Gull River to the immediate west of the dam. Similarly, a second thrust fault, of unknown age and also an upright thrust fault, has been mapped to the near east of the dam.

Local bedrock outcrops were identified only at the base of the Gull Riverbed, downstream of the dam structure. Glacial erratics and glacial overburden were noted on the steep left and right bank of the river.

2.2 EXISTING INFRASTRUCTURE

The Horseshoe Lake Dam is a concrete gravity structure 4.27 metres in height above the sill. It consists of four (4) stoplog operated sluiceways. The dam is comprised of 5 concrete gravity piers and a sill slab that extends for the length of the entire control structure. The deck is reported to be comprised of reinforced concrete and is 2.7 m wide and 33.6 m long. The dam is 45.27 m long and has a 17.23 m wingwall sections that is angled upstream of the dam on the right side.

The rock foundation level varies as per a historical drawing provided by PCA and as such the thickness of the concrete below the sill level varies in depth. This is detailed in Figure 2 within Appendix A.

3 SITE INVESTIGATION

3.1 GENERAL

A geotechnical site investigation was designed to determine concrete quality and strength within the dam. Drill holes were laid out through the piers, as well as in all four downstream sluice apron locations.

3.2 HISTORIC INVESTIGATIONS

GENIVAR Inc. (now WSP) was retained by Public Works and Government Services Canada to perform a concrete coring investigation of the Horseshoe Lake Dam to assess the general quality of the concrete as input to a Dam Safety Review (DSR). The coring program was undertaken on March 11, 2012 and advanced three (3) vertical core holes designated as CH12-1 through CH12-3 to depths of up to 7.1 m (23 feet) below the deck surface. The locations of these historic holes are identified in the Geotechnical Drilling Plan included in Appendix A.

The investigation determined, based on inspections and tests, that the concrete within the dam had variable poor quality and low compressive strength, with an average of 14.2 MPa. One sample broke during preparation and it was presumed that it had a compressive strength of less than 5 MPa. Oversize aggregate was present throughout the concrete and no rebar was observed. Bedrock was encountered in a single hole at a depth of 6.5 m. The bedrock was core sampled for a further 0.6 m to borehole termination. The bedrock was found to be primarily a sound granitic gneiss with a foliation perpendicular to the core axis.

3.3 2015 SITE INVESTIGATION

The concrete coring investigation of the Horseshoe Dam was completed by WSP as part of this study. The coring program included 8 (eight) vertical holes advanced in various locations on the dam, including through the piers and through the lower sluice apron area. Three holes were planned to be drilled through the concrete and 6 (six) metres into the rock to establish rock quality. All other holes were designed to drill through the concrete/rock interface and 0.5 m into the rock for verification of rock lithology. In order to ensure that the core was not an oversize piece of aggregate within the concrete and that bedrock had been cored, a minimum core length of 0.5 m into the rock was established. The drilling plan is included as Appendix A.

Drilling was completed by Walker Drilling Ltd., of Utopia, Ontario using a Winkie Percussion Drill. The core holes were advanced using a 30 mm inside diameter (ID) diamond impregnated coring bit, with river water used for drilling lubrication. Sampling intervals were continuous from the deck surface to termination depth.

Both concrete and rock samples were logged both in the field (for DH15-1, DH15-2) and indoors for DH15-3, DH15-5 and DH15-8.

At the site, core samples were placed into labelled boxes for transport.

All boxes were later reviewed, core recovery was measured, and core samples were placed into labelled sampling bags for transport. In addition, core was photographed, and the rock was geotechnically logged, detailing Rock Quality Designation (RQD), lithological, structural and rock strength details.

Core samples of both the concrete and rock were selected and submitted to strength testing, by point load testing, to determine compressive strength.

Concrete slurry and spoils from the rock coring operation were contained and removed from site. Drilling slurry was transferred into barrels, and the material was removed by Walker Drilling and transported to a registered waste facility.

Upon completion of the drilling, the core holes were backfilled using sand concrete mix and ½ inch gravel to the hole collar by the drilling contractor.

Selected samples of various locations, heights and rock lithologies were inspected, and sections selected and submitted for laboratory analysis. Point load tests, both axial and diametral, were completed on both concrete and bedrock samples at WSP's Peterborough laboratory. Results are summarized in the laboratory testing section following.

Not all holes were drilled as planned, due to time and access constraints. Drillholes DH15-4 and DH15-6 and DH15-7 were not completed as planned and DH15-3 was shortened due to drill issues.

Drillhole collar locations were measured, using a hand tape from two (2) known reference points. The following table details the planned and actual drillhole plan.

Table 1: Planned Versus Actual Drilling Plan

Hole ID	Easting (m)	Northing (m)	Planned Drilling (m)			Actual Drilling (m)			Measured Distance from Collar to hole bottom prior to grouting
			Estimated Depth to Top of Bedrock (A)	Depth of Drilling in Bedrock (B)	Depth of Hole (A + B)	Depth to Top of Bedrock (A)	Depth of Drilling in Bedrock (B)	Depth of Hole (A + B)	
DH15-1	682719.09	4981963.78	5.7	6.0	11.7	5.7	6.0	11.70	6.80*
DH15-2	682712.17	4981966.15	8.3	6.0	14.3	6.0	7.9	13.93	8.10*
DH15-3	682697.39	4981973.59	6.1	0.5	6.6	6.1	0.0	6.10	6.10
DH15-4	682691.03	4981977.27	4.8	6.0	10.8	0.0	0.0	-	-
DH15-5	682713.95	4981977.27	3.5	0.5	4.0	0.7	0.8	1.53	1.53
DH15-6	682707.47	4981966.21	2.8	0.5	3.3	0.0	0.0	-	-
DH15-7	682700.33	4981969.65	1.8	0.5	2.3	0.0	0.0	-	-
DH15-8	682692.87	4981971.76	1.3	0.5	1.8	1.1	1.5	2.56	2.56
			Total			Total			
			54.8			35.82			

*For DH15-1 and DH15-2, an obstruction was noted at the recorded distance from the collar prior to grouting.

The following is a summary of the observations noted for each of the drillholes.

3.3.1 DH15-1

This drillhole was drilled in the leftmost pier looking downstream and collared at the deck elevation.

Concrete was encountered from hole collar to 5.7 m in depth. The concrete consisted of a grey to buff coloured matrix with angular aggregate material ranging in size from centimetres to tens of centimeters. The aggregate is granitic type rock. Generally, the core recovery was poor and the core was very fragmented and broken.

A horizontal cold joint was noted at 1.19 m from the hole collar. More persistent weathering was noted at the collar as well as at the concrete/bedrock interface. Mechanical breakage was common at the concrete/aggregate interface.

The bedrock encountered within the drill hole was a feldspathic and amphibolite rich layered gneiss varying in colour from pink to dark grey. The rock is generally medium to coarse grained and exhibited localized iron and chloritic weathering. Gneissic layering and rock foliation are defined by biotite and chlorite mineralization oriented at approximately 45 degrees to perpendicular to the vertical core axis. The foliation varied from centimeters to tens of centimetres in spacing. Possible brittle fault zones with angular gouge were encountered at 6.29 m, 7.37 m and 8.97 m from the hole collar.

3.3.2 DH15-2

This drillhole was drilled in the second pier from the left hand side looking downstream and collared at the deck elevation. Concrete was cored from the collar elevation to 6.0 m down the hole. The concrete consisted of angular particles and some boulder sized aggregated pieces of granitic type material up to 35 cm in size contained within a porous and friable concrete matrix. The concrete core was found to break from a light hammer blow. The matrix can also be scratched with light knife pressure. The typical core length retrieved was between 10 and 15 cm in length. Weathered sections were noted at 1.4 m, 3.1 m and from 5 to 6 m from the hole collar.

Rock was drilled from the concrete/bedrock interface at 6.0 from hole collar to 13.93 m (hole termination). In general the rock can be described as layered gneiss, with colour varying from pink to light grey to dark grey. Some chloritic alteration was observed and joints were noted to be oriented at approximately 45 degrees to the vertical core axis. Joint spacing varied from centimetres to tens of centimetres. Possible fault zones, with gouge material, decreased rock quality and poor recovery, were encountered at 6.0 m, 7.5 m, 8.1 m, 8.6 m, 9.8 m, 10.7 m, 12.0 m and 12.9 m from the hole collar. Nearing the end of the hole, the foliation was oriented perpendicular to the core axis.

3.3.3 DH15-3

Drillhole DH15-3 is located on the fourth pier from the left side looking downstream. This hole was only drilled in concrete due to drill issues. The hole was terminated on the concrete/bedrock interface at 6.1 m from the hole collar.

The concrete was described as small to medium grained concrete with iron staining and localized weathering. Aggregate ranged from centimetres to tens of centimetres in size and varied in shape from subrounded to angular for large size aggregate and subrounded to rounded for smaller aggregates. The Matrix was buff to grey to weathered. Very poor core recovery was recorded in this hole due to a combination of poor quality concrete and drilling issues. A heavily weathered section was recorded from 0.5 m to 0.65 m from the hole collar. Localized pitting of the concrete was recorded.

3.3.4 DH15-4

This drillhole was not drilled due to time constraints.

3.3.5 DH15-5

Drillhole DH15-5 was collared on the dam apron, below the control structure, on the leftmost sluice (looking downstream). Concrete was encountered from collar to 0.68 m. The aggregate was rounded to angular with sizing up to 10 cm in size. The matrix was grey to buff coloured and could be scratched with a knife. All recorded breaks were mechanical. The concrete core recovered was of extremely poor quality and only a single small sample could be selected for further testing.

Rock was encountered from 0.68 m to 1.5 m (hole termination). The bedrock is described as grey banded gneiss, with some light coloured layers (dirty white to grey) with poorly developed banding and foliation at approximately 45 degrees to the core axis. No significant weathering was visible on joint or foliation discontinuities.

3.3.6 DH15-6

This drillhole was not completed due lack of access to the apron area for water control purposes.

3.3.7 DH15-7

This drillhole was not completed due lack of access to the apron area for water control purposes.

3.3.8 DH15-8

Drillhole DH15-8 was collared on the right most apron (looking downstream). Concrete was encountered from hole collar to 1.07 m down the hole. A cold joint was measured at 0.51 m from the collar. The concrete is described as containing a fine grained aggregate with grey to buff coloured matrix and aggregate particles from centimetres to tens of centimetres in size varying in shape from rounded to angular. All core breaks were accessed as mechanical breaks.

Bedrock was intersected from 1.07 m from hole collar to 2.6 m (hole termination). Bedrock at the concrete/bedrock contact is described as a light grey to medium grey diorite that is fine grained and without any preferred mineral orientation. Muscovite and biotite seams were present. A fault with angular gouge was identified at 1.51 to 1.79 m from collar. Below the identified fault/gouge zone, the rock is a banded anorthosite described as having a gneissic texture with well-developed banding consisting of light to dark grey and pink layers with minor chloritic alteration. Banding and joints and subperpendicular to the core axis with an average spacing of 5 cm

3.4 LAB TESTING RESULTS

Point load tests were completed on selected samples to determine rock and concrete strength indexes. The Point Load Test (PLT) is an accepted rock mechanic testing procedure used to calculate the rock strength index. Point load tests were completed at the WSP laboratory in Peterborough. Point load tests can be used to estimate uniaxial compressive strength with the use of index-to-strength and shape conversion factors.

The point load tests involved the compression of a rock or concrete sample between conical steel platens until failure occurs. Both diametral (loading on the side of the core) and axial (loading along the core axis) tests were completed.

3.4.1 CONCRETE TESTING RESULTS

Concrete samples were selected of various holes and at varying heights within the dam structure. The calculated unconfined compressive results from the PLT are detailed in the following table.

Table 2: Point Load Test Results of Concrete

Borehole #	Sample #	Sample Depth Start (m)	Sample Depth End (m)	Approximate UCS (MPa) (Diametral)	Approximate UCS (psi) (Diametral)	Approximate UCS (MPa) (Axial)	Approximate UCS (psi) (Axial)
DH15-1	15-1-1	1.78	1.92	12	1,740	28	4,061
DH15-1	15-1-2	4.60	4.76	27	3,916	36	5,221
DH15-2	15-2-1	1.62	1.83	16	2,321	59	8,557
DH15-2	15-2-2	2.20	2.35	33	4,786	16	2,321
DH15-3	15-3-1	0.83	0.95	31	4,496	30	4,351
DH15-3	15-3-2	2.43	2.53	7	1,015	31	4,496
DH15-3	15-3-3	2.90	3.03	9	1,305	26	3,771
DH15-5	15-5-1	0.25	0.30	12	1,740	-	-
DH15-8	15-8-1	0.16	0.32	15	2,176	32	4,641
DH15-8	15-8-2	0.38	0.50	13	1,885	38	5,511
Average				18	2,538	33	4,770

Note: Sample DH15-5 could not be tested axially due to insufficient sample size.

Figure 3 in Appendix D shows a cross sectional view of the dam with the concrete strength sampled locations and strength results.

The dam has variable poor quality concrete with low compressive strength that ranged from 7 MPa to 59 MPa, with an average of 18 MPa for diametral and 33 MPa for axial PLT at the sampled conditions. The concrete, as in the 2012 campaign, was found to be relatively porous without any steel reinforcement. Horizontal cold joints within the concrete were located within two drillholes.

Consistent with the previous geotechnical campaign, aggregates of varying size (from mm to tens of centimetres in size) and shape (rounded to subrounded to angular) were present throughout the concrete in all sampled intervals. This oversized aggregate material is typical for dams of this vintage as it was cheaper to use large stone aggregate and less cement due to the relatively high cost of cement and the low cost of labour when the dam was constructed.

As a cautionary note, the PLT test results and the resultant unconfined compressive strengths are estimated to be on the high side of the in situ strength of the concrete for several reasons. First, a required minimum sample size is required for testing purposes. Poorer quality concrete was not able to be selected as it did not meet sample size requirements, or was not recovered in the drilling program as it disintegrated during the drilling process. The maximum aggregate size and the small core size may have played a considerable role in affecting the strength results of the concrete. The aggregate, consisting generally of gneissic rock, is much stronger than the concrete matrix. Some selected samples had large size aggregate which may have resulted in stronger than expected PLT results. For these reasons, it is suggested that the PLT completed in this study overestimate the strength of the concrete.

The axial PLT have a larger sample size required to complete the testing. Samples for the axial point load test should have a minimum ratio of length to diameter of 3. The diametral test has a length to diameter minimum ratio of 1.5. For this reason, the strengthening effects of the aggregate and the aggregate size may result in a higher axial PLT result.

3.4.2 BEDROCK TESTING RESULTS

Bedrock samples were selected of various holes and at varying heights within the dam structure. The calculated unconfined compressive results from the PLT are detailed in the following table.

Table 3: Point Load Test Results for Bedrock

Borehole #	Sample #	Sample Depth Start (m)	Sample Depth End (m)	Approximate UCS (MPa) (Diametral)	Approximate UCS (psi) (Diametral)	Approximate UCS (MPa) (Axial)	Approximate UCS (psi) (Axial)	Sample Type
DH15-1	15-1-3	7.55	7.70	58	8,412	107	15,519	Banded Anorthsite
DH15-1	15-1-4	7.90	8.22	145	21,030	214	31,038	Banded Anorthsite
DH15-1	15-1-5	10.95	11.21	30	4,351	107	15,519	Banded Anorthsite
DH15-2	15-2-3	7.25	7.46	21	3,046	16	2,321	Banded Anorthsite
DH15-2	15-2-4	9.70	9.8	24	3,481	20	2,901	Banded Anorthsite
DH15-2	15-2-5	12.20	12.3	108	15,664	76	11,023	Banded Anorthsite
DH15-5	15-5-2	0.68	0.93	128	18,565	108	15,664	Banded Gneiss
DH15-8	15-8-3	1.21	1.31	29	4,206	50	7,252	Diorite
DH15-8	15-8-4	1.98	2.11	18	2,611	14	2,031	Banded Anorthsite
Average				62	9,041	79	11,474	

An average unconfined compressive strength of 62 MPa for diametral and 79 MPa for axial tests was assessed. This corresponds to a medium strength rock (Bieniawski, 1984).

The results obtained in the testing program correlate well with the visual observations and field testing of the bedrock observed at the riverbed downstream of the dam. The rock was assessed as R3 or R4 rock (moderately strong to strong rock), after Robertson, 1987.

3.5 ROCK QUALITY DESIGNATION

Rock Quality Designation (RQD) is a rough measure of the degree of joint or fracture in a rock mass, measured as a percentage of the drill core in lengths of 10 cm or more and was developed in 1964 by D.U. Deere. RQD is defined as the quotient:

$$RQD = \frac{\text{Sum of lengths of core longer than 10 cm measured along the core axis}}{\text{Total length of core measured}} \times 100\%$$

The following table details the core recovery and the RQD for each of the holes:

Table 4: Rock Quality Designation of Bedrock for Horseshoe Lake Dam Drill Program

Hole ID	% Recovery	Rock Quality Designation (RQD)	RQD Classification
DH15-1	67	56	Fair quality rock
DH15-2	50	31	Poor quality rock
DH15-3*	-	-	
DH15-4**	-	-	
DH15-5	100	67	Fair quality rock
DH15-6**	-	-	
DH15-7**	-	-	
DH15-8	95	38	Poor quality rock

*bedrock was not drilled for hole DH15-3 due to drill issues

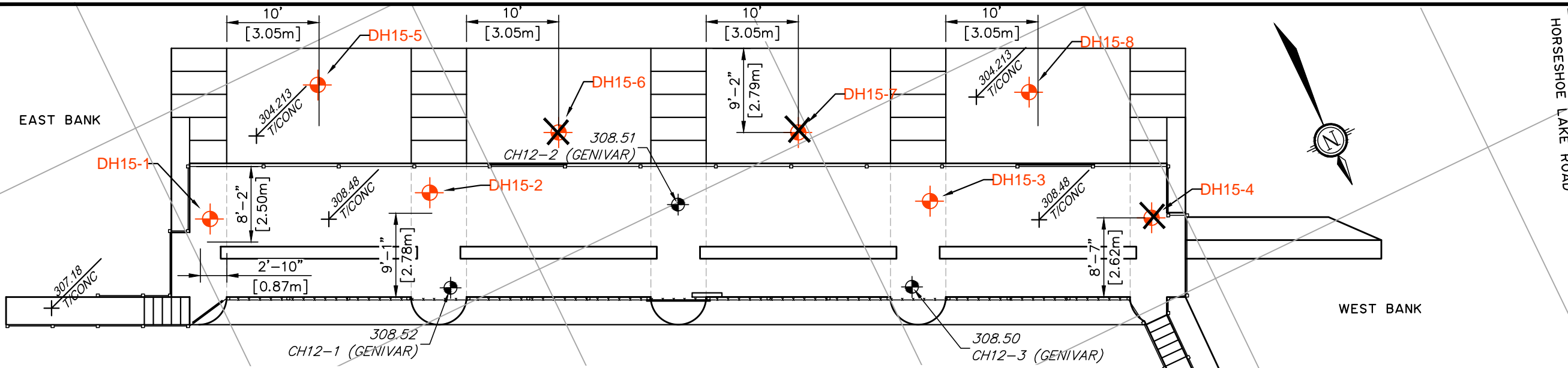
**DH15-4, DH15-6 and DH15-7 were not drilled due to access and time constraints

3.6 BEDROCK ELEVATIONS

The bedrock/concrete elevations intersected in drillholes are plotted on Figure 2 included in Appendix A. With the exception of DH15-5, the bedrock/concrete interface was at or near the 1909 historical plot. For hole DH15-5, the bedrock was interpreted to have been intersected at 0.7 m from the hole collar. Drilling was extended a further 0.82 m within rock, without any concrete matrix intercepts. It may be possible that this was a very large boulder that was placed and concrete formed around it to form the apron, or alternately, may be solid bedrock.

Appendix A

DRILL PLAN LOCATION



NOTE

COORDINATES SHOWN ARE GEODETIC AND REFER TO NAD 83, UTM ZONE 17

Point #	Hole ID#	Easting	Northing	ESTIMATED DEPTH TO TOP BEDROCK (metres) (A)	DEPTH OF DRILLING IN BEDROCK (metres) (B)	DEPTH OF DRILL HOLE (A + B)	ACTUAL DEPTH OF DRILLING IN CONCRETE (metres)	ACTUAL DEPTH OF DRILLING IN BEDROCK (metres)	ACTUAL TOTAL DEPTH (metres)
1975	DH15-1	682719.09	4981963.78	5.7	6.0	11.7	5.70	6.00	11.70
1976	DH15-2	682712.17	4981966.15	8.3	6.0	14.3	6.00	7.93	13.93
1978	DH15-3	682697.39	4981973.59	6.1	0.5	6.6	6.10	0	6.10
1979	DH15-4	682691.03	4981977.27	4.8	6.0	10.8	not drilled due to time constraint		
1980	DH15-5	682713.95	4981961.33	3.5	0.5	4.0	0.68	0.82	1.50
1981	DH15-6	682707.47	4981966.21	2.8	0.5	3.3	not drilled due to access		
1982	DH15-7	682700.33	4981969.65	1.8	0.5	2.3	not drilled due to access		
1983	DH15-8	682692.87	4981971.76	1.3	0.5	1.8	1.07	1.49	2.56
						TOTAL	54.8	TOTAL	35.82

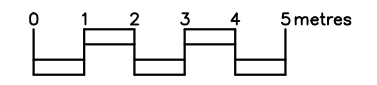
NOTES

1. GROUTING - HOLES CHECKED FOR OPENNESS AND MEASURED PRIOR TO GROUTING. DRILL HOLE MEASUREMENTS FROM COLLAR, DH15-1 OBSTRUCTION MEASURED AT 6.83m, DH15-2 OBSTRUCTION MEASURED AT 8.12m.
2. HYDRAULIC PATCH INSTALLED ON SLUICE HOLES AT COLLAR. SANDBAG INSTALLED AT COLLAR TO ALLOW FOR CURING.

LEGEND

- DENOTES DRILL HOLE 2015
- DENOTES CORE HOLE GENIVAR 2012
- DENOTES ELEVATION AND DESCRIPTION
- T/CONC DENOTES TOP OF CONCRETE
- CH12-1,2,3 DENOTES 2012 DRILL HOLE BY GENIVAR

Point No.	HOLE ID No.	Easting	Northing	DEPTH OF DRILLING IN CONCRETE (metres) (A)	DEPTH OF DRILLING IN BEDROCK (metres) (B)	DEPTH OF DRILL HOLE (A + B)
10070	CH12-1 (GENIVAR)	682712.92	4981969.28	0.69	N/A	0.69
10071	CH12-2 (GENIVAR)	682704.95	4981970.07	0.84	N/A	0.84
10072	CH12-3 (GENIVAR)	682699.16	4981975.89	6.5	0.5	7.0



PROJECT:
HORSESHOE DAM REHABILITATION

TITLE:
GEOTECHNICAL PROGRAM PLAN

WSP

600 COCHRANE DRIVE, FLOOR 5,
MARKHAM (ONTARIO)
CANADA L3R 5K3
TEL: 905 475-7270 | FAX: 905 475-5994
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PROJECT NO:
121-15275-51

SCALE:
1 : 150
(WHEN PRINTED TO 11 X 17)

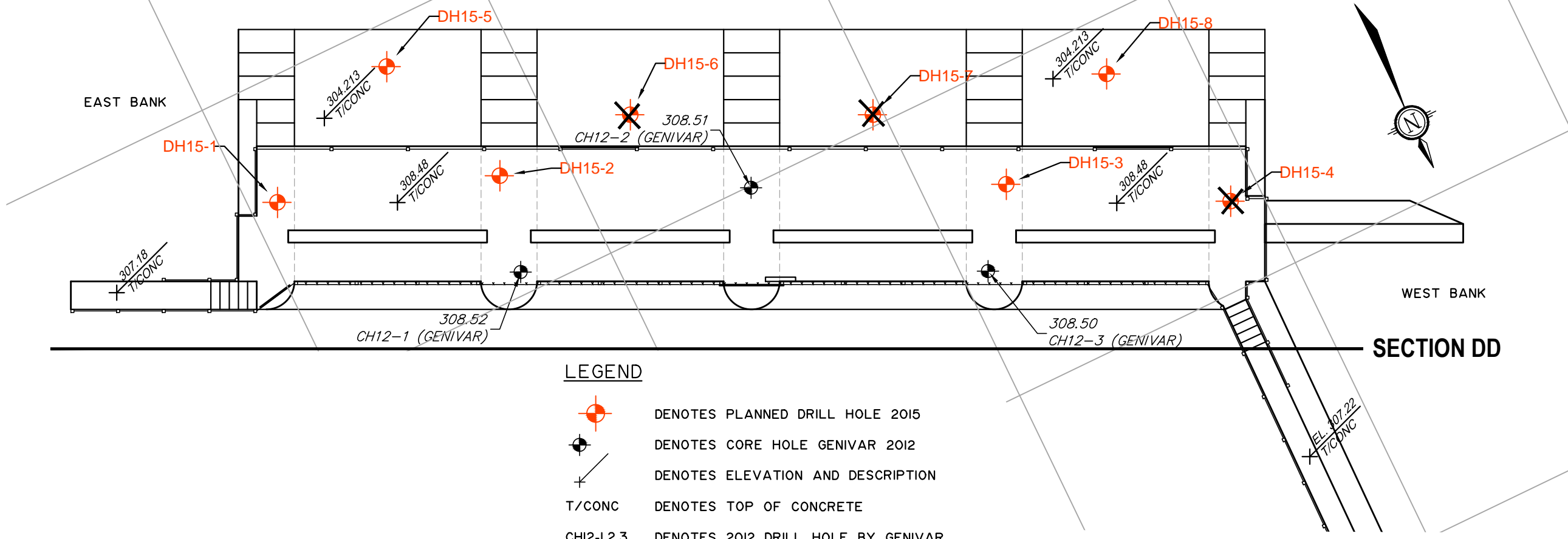
DRAWN BY:
G. HOOGWERF

CHECKED BY:
D. NELSON

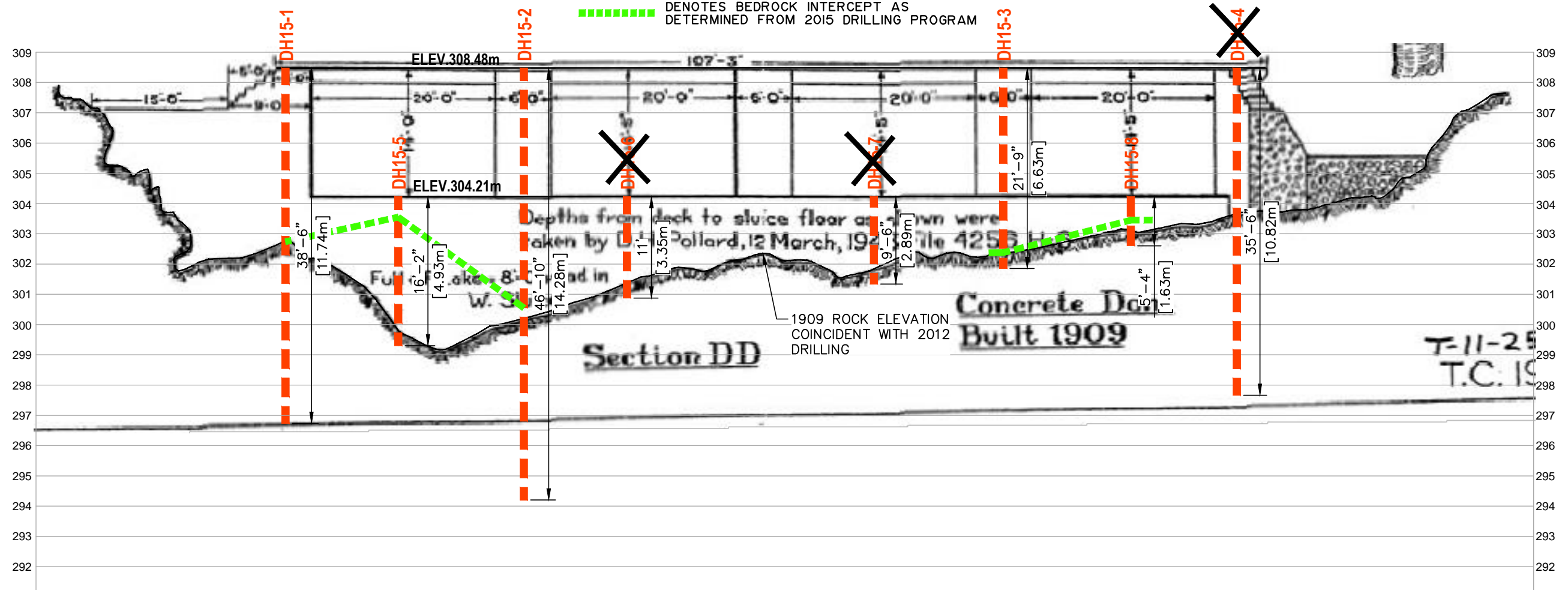
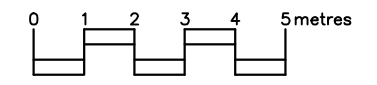
ISSUE/REVISION:
AS DRILLED ON SITE **3**

ISSUE DATE:
AUG. 21, 2015

FIGURE NO:
FIGURE 1



- LEGEND**
- DENOTES PLANNED DRILL HOLE 2015
 - DENOTES CORE HOLE GENIVAR 2012
 - DENOTES ELEVATION AND DESCRIPTION
 - T/CONC DENOTES TOP OF CONCRETE
 - CH12-1,2,3 DENOTES 2012 DRILL HOLE BY GENIVAR
 - DENOTES BEDROCK INTERCEPT AS DETERMINED FROM 2015 DRILLING PROGRAM



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Appendix B

SITE PHOTOS



Winkie Drill set up on DH15-1 looking downstream.



Set up on DH15-5 on July 3, 2015.



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Page 1 of 13



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Detail of set up and drilling on DH15-5 on July 3, 2015.



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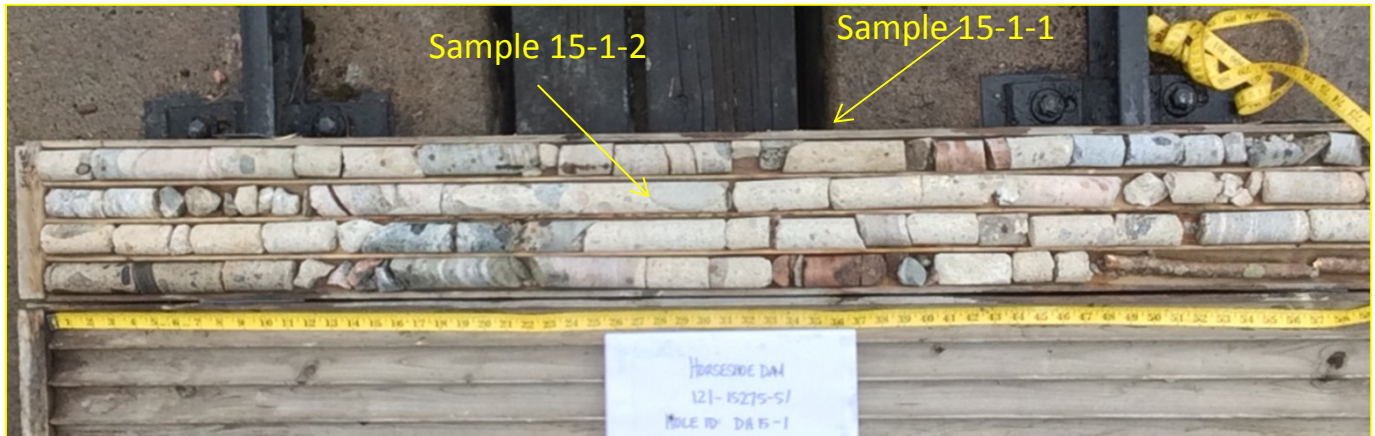
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Page 2 of 13



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DH15-1 Box 1 of 2.
 Concrete core of 30 mm size. Void at bottom of hole for last 30 cm (no core retrieved).



DH15-1 Box 2 of 2 showing rock core from 5.7 m to 11.7 m.
 Feldspathic rich layered intrusive of moderate metamorphism with gneissic texture at 45 degrees to core axis. Medium to coarse grained with poorly defined foliation.



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Page 3 of 13



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DH15-1 Box 2 of 2.

Detail of core showing medium to coarse grained units. Both dark banding and pink feldspathic banding are shown.



DH15-1 Box 2 of 2 showing detail of biotite seam



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Page 4 of 13



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DH15-2 Box 1 of 2:
 Showing concrete from hole collar to 8.3 m.
 First 71 cm of core no retrieval due to highly weathered concrete.



DH15-2 Box 2 of 2:
 Mostly dark banded rock units with some pink to buff coloured feldspathic units.



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Page 5 of 13



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DH15-2 Box 1 of 2:
Detail of concrete with rounded to angular particles and granitic type aggregate material.



DH15-2 Box 1 of 2:
Detail of aggregate material and concrete.



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Page 6 of 13



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DH15-2 Box 2 of 2:
Detail of gouge zone in rock. Rounded to angular rock fragments of small size.



DH15-2 Box 2 of 2.
Detail of large biotite crystals with no preferred orientation.



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DH15-3 Box 1 of 1.
Concrete core showing poor recovery of core.



DH15-3 detail showing very friable concrete and poor recovery sections.



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Page 8 of 13



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DH15-3 Box 1 Detail showing iron weathering within concrete core.



DH15-3 detail showing poor recovery.



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Page 9 of 13



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DH15-5 Box 1 of 1:
concrete core at the top left and bedrock on the right of box.



DH15-4 detail showing poor concrete and small sample size of sample 15-5-1.



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Page 10 of 13



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DH15-5 Box 1 of 1:
 detail of bedrock section of very good rock quality. Sample 15-5-2.



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Page 11 of 13



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DH15-8 Box 1 of 1.



DH15-8 detail showing concrete cold joint within concrete core at 0.51 m from collar.



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Page 12 of 13



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DH15-8 detail showing biotite foliation at 1.21 from hole collar



DH15-8 detail showing large chlorite crystals and chlorite foliation/alteration.



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Appendix C

SITE INVESTIGATION LOGS



Project No.: 121-15275-51
 Project Title: Horeshoe Dam Rehabilitation

CORE LOG					Sheet 1 of 3	
Hole ID: DH15-1		Location: Horseshoe Dam, Minden Hills, Parks Canada Agency				
Drill Date: June 22-24, 2015		Drill Method: Percussion, Winkie Drill				
Drill Crew: Walker Drilling, Mark Byrne (Lead)		Hole Diameter: 30 mm ID				
		Hole Depth: 11.7 m				
		Hole Orient: Vertical				
Logged by: Darlene Nelson				Date: Thursday, June 25, 2015		
Survey Coordinates: (m)		Easting 682719.09	Northing 4981963.78	Elevation Dam Deck		
Comments:						
Run #	Depth	% Recovered	RQD	Profile (Rock Type)	Description	Remarks
1	0 m - 5.7 m	80%	n/a	n/a	<p>Concrete with angular and rounded aggregates varying in diameter from centimetres to tens of centimetres. Maximum size of aggregate is 20 centimetres. Aggregate is granitic type rock. Some sections of core very broken up and rounded fragments. Last 25 cm of concrete core was not recovered due to poor quality of concrete. For the top 90 cm of hole, there was no recovery of core due to poor quality concrete. Matrix is grey to buff. Core breaks with light hammer blow. Matrix scratches with light knife pressure. Very intensely to intensely fractured/broken. Horizontal cold joint identified at 1.19 m from hole collar. More persistent weathering at surface and structure/bedrock interface. Mechanical breaks common at aggregate/matrix interface. Very intensely to intensely fractured/broken.</p>	<p>Samples:</p> <p>15-1-1 (1.78 m from hole collar, 13.5 cm in length) UCS_a = 28 Mpa UCS_d = 12 Mpa</p> <p>15-1-2 (4.60 m from hole collar, 16 cm in length) UCS_a = 36 Mpa UCS_d = 27 Mpa</p>



Project No.: 121-15275-51
 Project Title: Horeshoe Dam Rehabilitation

Hole ID: DH15-1		CORE LOG			Sheet 2 of 3	
Logged by: Darlene Nelson				Date: Thursday, June 25, 2015		
Run #	Depth	% Recovered	RQD	Profile (Rock Type)	Description	Remarks
2	5.7 m - 6.29 m	100%	85	Banded Anorthsite	Feldspathic rich layered intrusive of moderate metamorphism with gneissic texture. Alternating dark grey and pink layers with poorly defined biotite foliation. Medium to coarse grained with localized chloritic weathering. Foliation and predominant joint set at 45 degrees to core axis.	Alkaline Metatuff
3	6.29 m - 6.47 m	50%	0	Banded Anorthsite	Very fragmented rock for 10 cm - possible brittle gouge zone. Angular particles of rock	Fault Zone
4	6.47 m - 7.37 m	100%	44	Banded Anorthsite	As before, fewer amounts of biotite and no dark banding. Well developed foliation with biotite localized in areas. Foliation spacing less than 10 cm. Some foliation or jointing subparallel to drill access.	
5	7.37 m - 7.52 m	70%	0	Banded Anorthsite	Possible brittle fault gouge zone. Gouge with angular particles.	Possible fault zone



Project No.: 121-15275-51
 Project Title: Horeshoe Dam Rehabilitation

Hole ID: DH15-1		CORE LOG			Sheet 3 of 3	
Logged by: Darlene Nelson				Date: Thursday, June 25, 2015		
Run #	Depth	% Recovered	RQD	Profile (Rock Type)	Description	Remarks
6	7.52 m - 8.97 m	100%	68	Banded Anorthosite	From 8.2 m to 8.4 m, intense chloritic weathering and pervasive foliation perpendicular to core axis. As before, feldspathic medium to coarse grain layered intrusive with localized dark fine grained banding. Foliation is more stronger developed in grey layers. Some chloritic weathering and biotite foliation.	Samples: 15-1-3 (7.55 from hole collar, dark band, 15 cm sample) UCS _a = 107 Mpa UCS _d = 58 Mpa 15-1-4 (7.9 m from hole collar, pink band, 32 cm sample) UCS _a = 214 Mpa UCS _d = 145 Mpa
7	8.97 m - 9.37 m	10%	0	Banded Anorthosite	As before with gouge zone. Very angular frangments less than 5 cm in size.	Fault Zone
8	9.37 m - 11.7 m EOH	100%	63	Banded Anorthosite	As before, fewer amounts of biotite and no dark banding. Well developed foliation with biotite localized in areas. Foliation spacing less than 10 cm. Biotite seams at 10.6 m, 10.7 m (horizontal to core axis), 10.82 m, 11.04 (horizontal to core axis).	Samples: 15-1-5 (10.95 m from hole collar, 26 cm sample) UCS _a = 107 Mpa UCS _d = 30 Mpa



Project No.: 121-15275-51
 Project Title: Horeshoe Dam Rehabilitation

CORE LOG				Sheet 1 of 4		
Hole ID:	DH15-2		Location: Horseshoe Dam, Minden Hills, Parks Canada Agency			
Drill Date:	June 24-26, 2015		Drill Method: Percussion, Winkie Drill			
Drill Crew:	Walker Drilling, Mark Byrne (Lead)		Hole Diameter: 30 mm ID			
			Hole Depth: 13.93 m			
			Hole Orient: Vertical			
Logged by: Darlene Nelson			Date: Thursday, June 25, 2015			
Survey Coordinates: (m)		Easting 682712.17	Northing 4981966.15	Elevation Collared on deck of dam		
Comments: Hole on deck of dam in between Sluice 3 and 4 looking downstream						
Run #	Depth	% Recovered	RQD	Profile (Rock Type)	Description	Remarks
1	0 m - 6.0 m	100%	n/a	n/a	<p>Concrete with angular particles and some boulder sized aggregate pieces of granitic type material up to 35 cm in size with friable concrete. Core is easily broken, often along aggregate boundaries. No long pieces of core were retrieved. First 28" of core there was not any core retrieval due to weathering for several other sections there was not any core retrieval in concrete due to weak concrete.</p> <p>Some aggregate pieces have foliation and joints. Core breaks with light hammer. Matrix scratches with light knife pressure. Aggregate has varied strength, some can be scratched with knife and some biotite seams and inclusions, some aggregate cannot be scratched with knife. Typical core size is 4-6" in length. Concrete appears porous. Weathered sections at 1.4, 3.1 and from 5-6 m.</p>	<p>Samples:</p> <p>15-2-1 (1.62 m from hole collar, 21.0 cm in length) UCS_a = 59 MPa UCS_d = 16 MPa</p> <p>15-2-2 (2.2 m from hole collar, 15.0 cm in length) UCS_a = 16 MPa UCS_d = 33 MPa</p>



Project No.: 121-15275-51
 Project Title: Horeshoe Dam Rehabilitation

Hole ID: DH15-2		CORE LOG			Sheet 2 of 4	
Logged by: Darlene Nelson				Date: Thursday, June 25, 2015		
Run #	Depth	% Recovered	RQD	Profile (Rock Type)	Description	Remarks
2	6.0 m - 6.8 m	50%	0%	Banded Anorthsite	Fault gouge with weathered rock with well developed foliation and chloritic weathering. Fine grained grey to black coloured.	Possible Fault gouge zone
3	6.8 m - 7.5 m	100%	60	Banded Anorthsite	Black to grey foliated banded anorthsite with light grey banding. Some chloritic alteration. Joints are at 45 degrees to core axis. Joint spacing is cm to tens of cm.	Sample: 15-2-3 (7.25 m from hole collar, dark band, 21 cm sample) $UCS_a = 16 \text{ MPa}$ $UCS_d = 21 \text{ MPa}$
4	7.5 m - 7.7 m	10%	0	Banded Anorthsite	Fault zone with low recovery. Well developed biotite foliation and some chloritic weathering	Possible fault zone
5	7.7 m - 8.1 m	50%	0	Banded Anorthsite	White and pink feldspathic layer of banding with biotite micro crystals of no preferred orientation. Fine to medium grained with minor amounts of mafic minerals and pyrite mineralization. Biotite seam at 8.07 m. Poorer quality rock.	
6	8.1 m - 8.5 m	5%	0	Banded Anorthsite	Gouge material, fault like Poor core retrieval. Rounded and angular fragments from brittle fault area. Calcite vein.	Fault gouge



Project No.: 121-15275-51
 Project Title: Horeshoe Dam Rehabilitation

Hole ID: DH15-2		CORE LOG			Sheet 3 of 4	
Logged by: Darlene Nelson				Date: Thursday, June 25, 2015		
Run #	Depth	% Recovered	RQD	Profile (Rock Type)	Description	Remarks
8	8.5 m - 8.62 m	100%	100	Banded Anorthsite	Light coloured calcitic/quartz layer with medium sized crystals and plagioclase rich matrix.	
9	8.62 m - 9.3 m	5%	0	Banded Anorthsite	Fault gouge. Light and dark coloured angular framgents with muscovite and biotite. Little weathering.	Fault Gouge
10	9.3 m - 9.6 m	100%	0	Banded Anorthsite	Biotite seams within light coloured matrix with subhorizontal orientation Closely spaced joint spacing.	
11	9.65 m - 9.8 m	100%	40	Banded Anorthsite	White layer within rock with medium defined foliation of muscovite and some biotite. Medium sized quartz/calcite/plagioclase crystals. Foliation is subhorizontal with spacing varying from 1 to 10 cm	Sample: 15-2-4 (9.7 m from hole collar, dark band, 10 cm in length UCS _a = 20 MPa UCS _d = 24 MPa
12	9.8 m - 10.1 m	0%	0	Banded Anorthsite	Fault gouge. Angular fragments.	Fault zone
13	10.1 m - 10.7 m	100%	70	Banded Anorthsite	Grey layered banded anorthsite with minor amounts of muscovite/biotite and minor weathering. Banding is subhorizontal.	



Project No.: 121-15275-51
 Project Title: Horeshoe Dam Rehabilitation

Hole ID: DH15-2		CORE LOG			Sheet 4 of 4	
Logged by: Darlene Nelson				Date: Thursday, June 25, 2015		
Run #	Depth	% Recovered	RQD	Profile (Rock Type)	Description	Remarks
14	10.7 m - 11.0 m	50%	0	Banded Anorthsite	Fault gouge. Poor recovery	Fault zone.
15	11.0 m - 12.0 m	100%	82	Banded Anorthsite	Foliation/banding at approximately 45 degrees to core axis. Light grey with dark grey banding. Some biotite/muscovite. Some minor rust weathering on joint surfaces.	
16	12.0 m - 12.4 m	30%	0	Banded Anorthsite	Fault gouge. Poor recovery with some iron weathering.	Fault zone.
17	12.4 m - 12.9 m	100%	34	Banded Anorthsite	Pink and black layers of anorthsite. All layering is subhorizontal to the core axis	
18	12.9 m - 13.2 m	25%	0	Banded Anorthsite	Fault gouge with iron weathering on surfaces.	Fault zone.
19	13.2 m - 13.93 m (EOH)	100%	73	Banded Anorthsite	Pyrite inclusions and subhorizontal foliation/banding. Weathering present (iron) on surfaces. Pink and grey to dark coloured bandings. Joints are perpendicular to core axis.	Sample 15-2-5 (12.2 m from hole collar, 10 cm length) UCS _a = 76 MPa UCS _d = 108 MPa



Project No.: 121-15275-51
 Project Title: Horeshoe Dam Rehabilitation

CORE LOG					Sheet 1 of 1	
Hole ID: DH15-3		Location: Horseshoe Dam, Minden Hills, Parks Canada Agency				
Drill Date: 25-Jun-15		Drill Method: Percussion, Winkie Drill				
Drill Crew: Walker Drilling, Mark Byrne (Lead)		Hole Diameter: 30 mm ID				
		Hole Depth: 6.0 m				
		Hole Orient: Vertical				
Logged by: Darlene Nelson					Date: Tuesday, July 28, 2015	
Survey Coordinates: (m)		Easting 682697.39	Northing 4981973.59	Elevation Collared on deck of dam		
Comments: Hole on deck in between Spillway #3 and #4 (from left to right) looking downstream						
Run #	Depth	% Recovered	RQD	Profile (Rock Type)	Description	Remarks
1	0 m - 6.1 m	40%	n/a	n/a	Small to medium grained concrete. Aggregate is weathering in some locations. Pitting in concrete. Large size metamorphic gnessic aggregate from cm to tens of cm in size. Rounded to subrounded to angular for larger sized particules. Matrix is buff to grey to weathered. Can be scraped with knife. Rock aggregate cannot be scraped with knife. Very poor recovery may be due to drill issues. Heavily weathered to dark buff at 0.5m to 0.65 m. Poor recovery in the following sections: 0.9 m to 2.1 m, 2.6 m to 3 m, 4.3 m to 4.5 m and 5.7 m to 5.9 m.	Samples: 15-3-1 (0.83 m from hole collar, 12 cm in length) UCS _a = 30 MPa UCS _d = 31 MPa 15-3-2 (2.43 m from hole collar, 10 cm in length) UCS _a = 31 MPa UCS _d = 7 MPa 15-3-3 (2.90 m from hole collar, 13.5 cm in length) UCS _a = 26 MPa UCS _d = 9 MPa



Project No.: 121-15275-51
 Project Title: Horeshoe Dam Rehabilitation

CORE LOG					Sheet 1 of 1	
Hole ID: DH15-5		Location: Horseshoe Dam, Minden Hills, Parks Canada Agency				
Drill Date: 29-Jun-15		Drill Method: Percussion, Winkie Drill				
Drill Crew: Walker Drilling, Mark Byrne (Lead)		Hole Diameter: 30 mm ID				
		Hole Depth: 1.5 m				
		Hole Orient: Vertical				
Logged by: Darlene Nelson				Date: Tuesday, July 28, 2015		
Survey Coordinates: (m)		Easting 682713.95	Northing 4981961.33	Elevation Collared on furthest left apron		
Comments: Apron #4 on left side looking downstream						
Run #	Depth	% Recovered	RQD	Profile (Rock Type)	Description	Remarks
1	0 m - 0.68 m	75%	n/a	n/a	Concrete with aggregate (rounded to angular) with a particle size up to 10 cm. 100% mechanical breaks with core up to 4 cm in length. Matrix is grey to buff coloured and can be scratched with knife. Aggregate cannot be scratched with knife. Poor recovery of core. Sample taken may not be of sufficient length and quality to get results from point load testing.	Samples: 15-5-1 (0.25 m from hole collar, 5 cm in length) UCS _a = 12 MPa UCS _d = not done due to sample length
2	0.68 m - 1.50 m	100%	67	Banded Gneiss	Grey banded gneiss with poorly developed banding/foliation at approximately 45 degrees to the core axis. Some light coloured banding (dirty white to grey). Fine grained. No significant weathering visible on joint/foliation surfaces.	Samples: 15-5-2 (0.68 m from hole collar, 25 cm in length) UCS _a = 108 MPa UCS _d = 128 Mpa



Project No.: 121-15275-51
 Project Title: Horeshoe Dam Rehabilitation

CORE LOG					Sheet 1 of 2	
Hole ID: DH15-8		Location: Horseshoe Dam, Minden Hills, Parks Canada Agency				
Drill Date: 3-Jul-15		Drill Method: Percussion, Winkie Drill				
Drill Crew: Walker Drilling, Mark Byrne (Lead)		Hole Diameter: 30 mm ID				
		Hole Depth: 1.5 m				
		Hole Orient: Vertical				
Logged by: Darlene Nelson				Date: Tuesday, July 28, 2015		
Survey Coordinates: (Ft)		Northing 682692.87	Easting 4981971.76	Elevation Collared on right apron		
Comments: Apron #1 on right side looking downstream						
Run #	Depth	% Recovered	RQD	Profile (Rock Type)	Description	Remarks
1	0 m - 1.07 m	80%	n/a	n/a	Fine to coarse grained aggregate with grey to buff coloured matrix. Aggregate size cm to 10 cm. Rounded to angular particles. Matrix can be scraped with a knife. 100% mechanical breaks. Aggregate cannot be scraped with a knife. Cold joint at 0.51 m from hole collar.	Samples: 15-8-1 (0.16 m from hole collar, 16 cm in length) UCS _a = 32 Mpa UCS _d = 15 Mpa 15-8-2 (0.38 m from hole collar, 12 cm in length) UCS _a = 39 Mpa UCS _d = 13 Mpa



Hole ID: DH15-8		CORE LOG			Sheet 2 of 2	
Logged by: Darlene Nelson				Date: Tuesday, July 28, 2015		
2	1.07 m to 1.51 m	100%	52	Diorite	Light grey to medium grey diorite. Fine grained massive with no visual crystals or preferred orientation. Muscovite and biotite seams. Foliation very poorly developed. Joints are defined by poorly developed foliation with spacing around 5 cm.	Samples: 15-8-3 (1.21 m from hole collar, 10 cm in length) $UCS_a = 50$ Mpa $UCS_d = 29$ Mpa
3	1.51 to 1.79 m	70%	0	Diorite	Possible fault gouge area with iron staining and angular particles	Possible fault gouge.
4	1.79 m - 2.6 m	100%	34	Banded Anorthosite	Gneiss with well developed banding of light to dark grey and pink layers and chloritic alteration. Banding joints are subperpendicular to drill axis. Joints/foliation has a spacing on average of 5 cm. Some iron staining at 2.1 m. Some larger size chlorite crystals in both grey and pink layers.	Samples: 15-8-4 (1.98 m from hole collar, 13 cm in length) $UCS_a = 14$ Mpa $UCS_d = 18$ Mpa

Appendix D

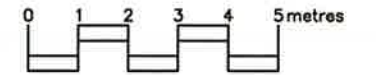
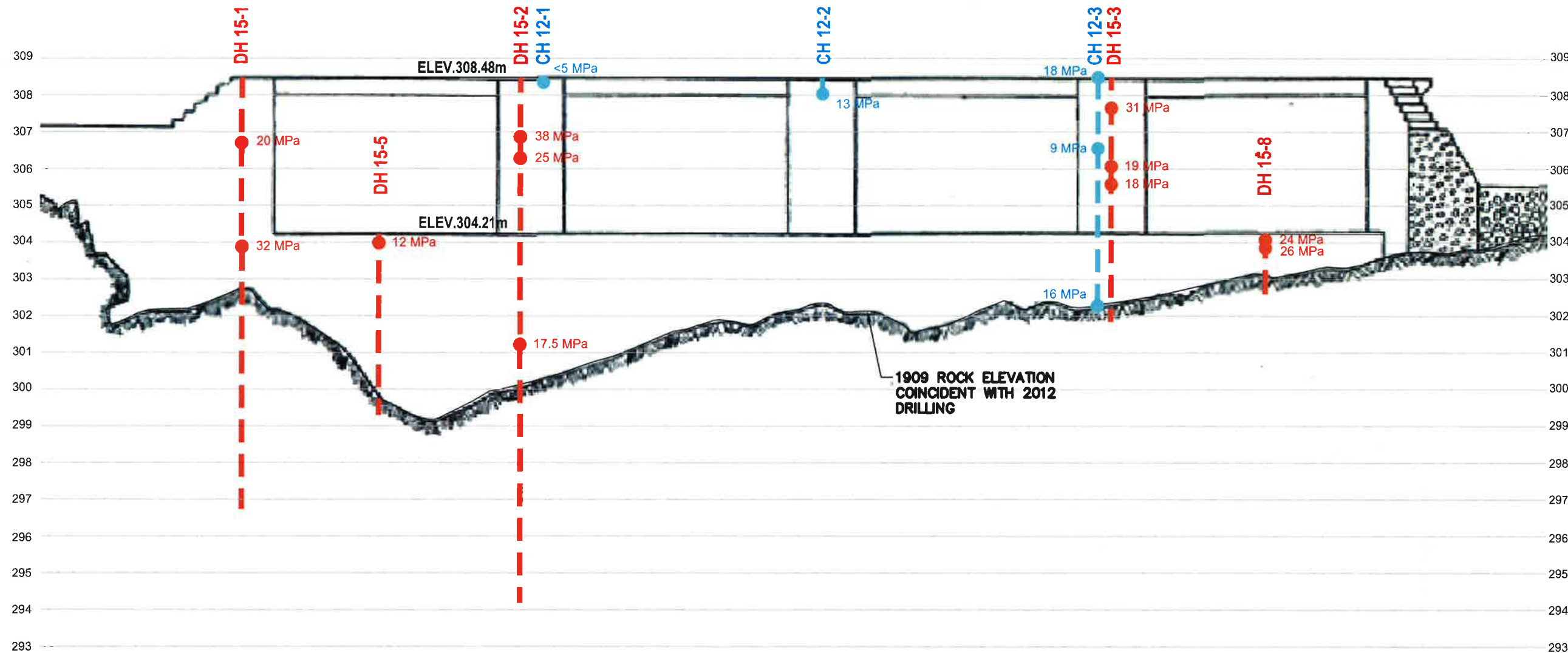
TESTING RESULTS

LEGEND

CH 12-1,2,3 DENOTES 2012 DRILL HOLE BY GENIVAR

DH 15-1,2,3,5,8 DENOTES 2012 DRILL HOLE BY GENIVAR

38 MPa DENOTES AVERAGE UNCONFINED COMPRESSIVE STRENGTH FROM POINT LOAD TESTING



PROJECT:

**HORSESHOE DAM
REHABILITATION**

TITLE:

**CONCRETE TESTING
RESULTS**



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PROJECT NO:

121-15275-51

SCALE:

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G. HOOGERWOLF

CHECKED BY:

D. NELSON

ISSUE/REVISION:

FOR REVIEW **4**

ISSUE DATE:

SEPT. 16, 2015

FIGURE NO:

FIGURE 3

Point Load Test Data ASTM D5731-08



Project: Horseshoe Dam Rehabilitation
 Tested By: LEK
 Test Device: RocTest PIL-7
 Date: 6/30/2015

Project No.: 121-15275-51
 A_p of piston m²: 0.000948
 Calibrated: 7/16/2014

Sample Details: Air Dried - tested in Laboratory

Sample ID				Data			Calculation						
Borehole Number	BH Depth Start (m)	BH Depth End (m)	Test Type (See Note)	Core Length (mm)	Diameter (D' at failure) (mm)	Max Pressure (kPa)	Load (P) (kN)	D ₅₀ ² (m ²)	D ₅₀ (mm)	I _s (MPa)	F = (D ₅₀ /0.05) ^{0.45}	I _{s(50)} (MPa)	Approximate UCS (MPa) Table 1
DH15-1-1	1.78	1.91	d	135	30	740	0.702	0.90	30	0.78	0.795	0.62	12
DH15-1-2	4.60	4.76	d	160	30	1680	1.593	0.90	30	1.77	0.795	1.41	27
DH15-2-1	1.62	1.83	d	210	30	980	0.929	0.90	30	1.03	0.795	0.82	16
DH15-2-2	2.20	2.35	d	150	30	2080	1.972	0.90	30	2.19	0.795	1.74	33
DH15-3-1	0.83	0.95	d	120	30	1920	1.820	0.90	30	2.02	0.795	1.61	31
DH15-3-2	2.43	2.53	d	100	30	440	0.417	0.90	30	0.46	0.795	0.37	7
DH15-3-3	2.90	3.04	d	135	30	580	0.550	0.90	30	0.61	0.795	0.49	9

Notes: d= diametral a= axial b= block i= irregular	Statistics	
	Mean I _{s(50)} Diametral	1.01

Point Load Test Data ASTM D5731-08



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Sample Details: Air Dried - tested in Laboratory

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Borehole Number	BH Depth Start (m)	BH Depth End (m)	Test Type (See Note)	Core Length (mm)	Diameter (D' at failure) (mm)	Max Pressure (kPa)	Load (P) (kN)	D _e ² (m ²)	D _e (mm)	I _s (MPa)	F= (D _e /0.05) ^{0.45}	I _{s(50)} (MPa)	Approximate UCS (MPa) Table 1
DH15-1-1	1.78	1.81	a	35	24	2040	1.93	1069.52	32.70	1.81	0.826	1.49	28
DH15-1-2	4.60	4.62	a	30	22	2140	2.03	840.34	28.99	2.41	0.782	1.89	36
DH15-2-1	1.62	1.64	a	27	22	3240	3.07	756.30	27.50	4.06	0.764	3.10	59
DH15-2-2	2.33	2.35	a	25	22.5	820	0.78	716.20	26.76	1.09	0.755	0.82	16
DH15-3-1	0.83	0.85	a	30	19	1620	1.54	725.75	26.94	2.12	0.757	1.60	30
DH15-3-2	2.43	2.45	a	25	17	1300	1.23	541.13	23.26	2.28	0.709	1.61	31
DH15-3-3	2.90	2.93	a	30	25	1720	1.63	954.93	30.90	1.71	0.805	1.38	26

Notes: d= diametral a= axial b= block i= irregular	Statistics	
	Mean I _{s(50)} Axial	1.70
Axial, Block, Irregular samples D _e ² =4(WD)/3.14		

Point Load Test Data ASTM D5731-08



Project: Horseshoe Dam Rehabilitation
 Tested By: KLC
 Test Device: RocTest PIL-7
 Date: 7/31/2015

Project No.: 121-15275-51
 A_p of piston m²: 0.000948
 Calibrated: 7/16/2014

Sample Details: Air Dried - tested in Laboratory

Borehole Number	Sample ID			Data			Calculation						
	BH Depth Start (m)	BH Depth End (m)	Test Type (See Note)	Core Length (mm)	Diameter (D' at failure) (mm)	Max Pressure (kPa)	Load (P) (kN)	D ₀ ² (m ²)	D ₀ (mm)	I _s (MPa)	F = (D ₀ /0.05) ^{0.45}	I _{s(50)} (MPa)	Approximate UCS (MPa) Table 1
15-1-3	7.55	7.73	d	175	30	3640	3.451	0.90	30	3.83	0.795	3.05	58
15-1-4	7.90	8.18	d	275	30	9140	8.665	0.90	30	9.63	0.795	7.65	145
15-1-5	10.95	11.21	d	149.16	30	1880	1.782	0.90	30	1.98	0.795	1.57	30
15-2-3	7.25	7.48	d	230	30	1240	1.176	0.90	30	1.31	0.795	1.04	20
15-2-4	9.70	9.75	d	51.11	31	1600	1.517	0.96	31	1.58	0.806	1.27	24
15-2-5	12.20	12.3	d	101.49	30	6820	6.465	0.90	30	7.18	0.795	5.71	108
15-5-2	0.68	0.93	d	250	30.5	8280	7.849	0.93	30.5	8.44	0.801	6.76	128
15-8-1	0.16	0.26	d	110.68	30	960	0.910	0.90	30	1.01	0.795	0.80	15
15-8-2	0.38	0.50	d	124.88	30	820	0.777	0.90	30	0.86	0.795	0.69	13
15-8-3	1.21	1.31	d	102.46	30	1820	1.725	0.90	30	1.92	0.795	1.52	29
15-8-4	1.98	2.12	d	134.57	30	1140	1.081	0.90	30	1.20	0.795	0.95	18

Notes: d= diametral a= axial b= block i= irregular	Statistics	
	Mean I _{s(50)} Diametral	2.82

Point Load Test Data ASTM D5731-08



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 A_p of piston m^2 : 0.000948
 Calibrated: 7/16/2014

Sample Details: Air Dried - tested in Laboratory

Sample ID				Data			Calculation						
Borehole Number	BH Depth Start (m)	BH Depth End (m)	Test Type (See Note)	Core Length (mm)	Diameter (D' at failure) (mm)	Max Pressure (kPa)	Load (P) (kN)	$D_e^2 (m^2)$	$D_e (mm)$	$I_s (MPa)$	$F = (D_e/0.05)^{0.45}$	$I_{s(50)} (MPa)$	Approximate UCS (MPa) Table 1
15-1-3	7.55	7.58	a	34.78	30	9140	8.66	1328.50	36.45	6.52	0.867	5.66	107
15-1-4	7.90	7.93	a	34.76	24	15280	14.49	1062.19	32.59	13.64	0.825	11.25	214
15-1-5	10.95	10.98	a	34.78	27	8420	7.98	1195.65	34.58	6.68	0.847	5.66	107
15-2-3	7.25	7.27	a	34.44	20	1320	1.25	877.01	29.61	1.43	0.790	1.13	21
15-2-4	9.70	9.72	a	34.43	22.6	1340	1.27	990.73	31.48	1.28	0.812	1.04	20
15-2-5	13.20	13.22	a	34.67	27.5	6060	5.74	1213.94	34.84	4.73	0.850	4.02	76
15-5-1	0.24	0.28	a	34.63	40	1220	1.16	1763.69	42.00	0.66	0.925	0.61	12
15-5-2	0.68	0.71	a	34.62	27	8460	8.02	1190.15	34.50	6.74	0.846	5.70	108
15-8-1	0.16	0.18	a	34.65	23.5	2220	2.10	1036.77	32.20	2.03	0.820	1.67	32
15-8-2	0.38	0.40	a	34.63	17	2140	2.03	749.57	27.38	2.71	0.763	2.06	39
15-8-3	0.93	0.96	a	34.63	27	3920	3.72	1190.49	34.50	3.12	0.846	2.64	50
15-8-4	1.98	2.01	a	34.57	30	1180	1.12	1320.48	36.34	0.85	0.866	0.73	14

Notes: d= diametral a= axial b= block i= irregular	Statistics	
	Mean $I_{s(50)}$ Axial	3.51
Axial, Block, Irregular samples $D_e^2=4(WD)/3.14$		

APPENDIX B

USEPA Stormwater Best Management Practice Concrete Washout

Minimum Measure

Construction Site Stormwater Runoff Control

Subcategory

Good Housekeeping/Materials Management

Description of Concrete Washout at Construction Sites

Concrete and its ingredients

Concrete is a mixture of cement, water, and aggregate material. Portland cement is made by heating a mixture of limestone and clay containing oxides of calcium, aluminum, silicon and other metals in a kiln and then pulverizing the resulting clinker. The fine aggregate particles are usually sand. Coarse aggregate is generally gravel or crushed stone. When cement is mixed with water, a chemical reaction called hydration occurs, which produces glue that binds the aggregates together to make concrete.

Concrete washout

After concrete is poured at a construction site, the chutes of ready mixed concrete trucks and hoppers of concrete pump trucks must be washed out to remove the remaining concrete before it hardens. Equipment such as wheelbarrows and hand tools also need to be washed down. At the end of each work day, the drums of concrete trucks must be washed out. This is customarily done at the ready mixed batch plants, which are usually off-site facilities, however large or rural construction projects may have on-site batch plants. Cementitious (having the properties of cement) washwater and solids also come from using such construction materials as mortar, plaster, stucco, and grout.

Environmental and Human Health Impacts

Concrete washout water (or washwater) is a slurry containing toxic metals. It's also caustic and corrosive, having a pH near 12. In comparison, Drano liquid drain cleaner has a pH of 13.5. Caustic washwater can harm fish gills and eyes and interfere with reproduction. The safe pH ranges for aquatic life habitats are 6.5 – 9 for freshwater and 6.5 – 8.5 for saltwater.

Construction workers should handle wet concrete and washout water with care because it may cause skin irritation and eye damage. If the washwater is dumped on the ground (Fig. 1), it can run off the construction site to adjoining roads and enter roadside storm drains, which discharge to surface waters such as rivers, lakes, or estuaries. The red arrow in Figure 2 points to a ready mixed truck chute that's being washed out into a roll-off bin, which isn't watertight. Leaking washwater, shown in the foreground, will likely follow similar



Figure 1. Chute washwater being dumped on the ground



Figure 2. Chute washwater leaking from a roll-off bin being used as a washout container

paths to nearby surface waters. Rainfall may cause concrete washout containers that are uncovered to overflow and also transport the washwater to surface waters. Rainwater polluted with concrete washwater can percolate down through the soil and alter the soil chemistry, inhibit plant growth, and contaminate the groundwater. Its high pH can increase the toxicity of other substances in the surface waters and soils. Figures 1 and 2 illustrate the need for better washout management practices.

Best Management Practice Objectives

The best management practice objectives for concrete washout are to (a) collect and retain all the concrete washout water and solids in leak proof containers, so that this caustic material does not reach the soil surface and then migrate to surface waters or into the ground water, and (b) recycle 100 percent of the collected concrete washout water and solids. Another

Stormwater Best Management Practice: Concrete Washout

objective is to support the diversion of recyclable materials from landfills. Table 1 shows how concrete washout materials can be recycled and reused.

Table 1 – Recycling concrete washout materials

Uses of Recycled Materials	Concrete Washout Materials					
	Washwater	Cement fines ^a	Fine aggregate	Coarse aggregate	Hardened concrete	Unused wet concrete
Reused to washout additional mixer truck chutes or drums	x					
Reused as a ready mixed concrete ingredient	x	x ^b	x	x		
Reused as an ingredient of precast concrete products, e.g., highway barriers, retaining wall blocks, riprap	x	x	x	x		x
Reused as crushed concrete products, e.g., road base or fill		x	x	x	x	
Reused to pave the yards of ready mixed concrete plants						x
Returned back to a surface water, e.g., river, lake, or estuary	x ^c					

a. Fine particles of cementitious material (e.g., Portland cement, slag cement, fly ash, silica fume)

b. Recyclable, if allowed by the concrete quality specifications

c. Treated to reduce the pH and remove metals, so it can be delivered to a municipal wastewater treatment plant, where it is treated further and then returned to a natural surface water

Washwater recycling, treatment, disposal

Washwater from concrete truck chutes, hand mixers, or other equipment can be passed through a system of weirs or filters to remove solids and then be reused to wash down more chutes and equipment at the construction site or as an ingredient for making additional concrete. A three chamber washout filter is shown in Figure 3. The first stage collects the coarse aggregate. The middle stage filters out the small grit and sand. The third stage has an array of tablets that filter out fines and reduces the pH. The filtered washwater is then discharged through a filter sock. An alternative is to pump the washout water out of the washout container (Fig 4) and treat the washwater off site to remove metals and reduce its pH, so it can be delivered to a publicly owned treatment works (POTW), also known as a municipal wastewater treatment plant, which provides additional treatment allowing the washwater to be discharged to a surface water. The POTW should be



Figure 3. Concrete washout filter

contacted to inquire about any pretreatment requirements, i.e., the National Pretreatment Standards for Prohibited Dischargers (40CFR 403.5) before discharging the washwater to the POTW. The washwater can also be retained in the washout container and allowed to evaporate, leaving only the hardened cementitious solids to be recycled.

Solids recycling

The course aggregate materials that are washed off concrete truck chutes into a washout container can be either separated by a screen and placed in aggregate bins to be reused at the construction site or returned to the ready mixed plant and washed into a reclaimer (Fig. 5). When washed out into a reclaimer, the fine and course aggregates are separated out and placed in different piles or bins to be reused in making fresh concrete. Reclaimers with settling tanks separate cement fines from the washwater, and these fines can also be used in new concrete unless prohibited by the user's concrete quality specifications.



Figure 4. Vacuuming washwater out of a washout container for treatment and reuse



Figure 5. Ready mixed truck washing out into a reclaimer

Hardened concrete recycling

When the washwater in a construction site concrete washout container has been removed or allowed to evaporate, the hardened concrete that remains can be crushed (Fig. 6) and reused as a construction material. It makes an excellent aggregate for road base and can be used as fill at the



Figure 6. Crushed concrete stockpile and crusher

construction site or delivered to a recycler. Concrete recyclers can be found at municipal solid waste disposal facilities, private recycling plants, or large construction sites.

Wet concrete recycling

Builders often order a little more ready mixed concrete than they actually need, so it is common for concrete trucks to have wet concrete remaining in their drum after a delivery. This unused concrete can be returned to the ready mixed plant and either (1) used to pour precast concrete products (e.g., highway barriers, retaining wall blocks, riprap), (2) used to pave the ready mixed plant's yard, (3) washed into a reclaimer, or (4) dumped on an impervious surface and allowed to harden, so it can be crushed and recycled as aggregate. Unused wet concrete should not be dumped on bare ground to harden at construction sites because this can contribute to ground water and surface water contamination.

Washout Containers

Different types of washout containers are available for collecting, retaining, and recycling the washwater and solids from washing down mixed truck chutes and pump truck hoppers at construction sites.

Chute washout box

A chute washout box is mounted on the back of the ready mixed truck. If the truck has three chutes, the following procedure is used to perform the washout from the top down: (1) after the pour is completed, the driver attaches the extension chute to the washout box, (2) the driver then rotates the main chute over the extension chute (Fig. 7) and washes down the hopper first then the main chute, (3) finally the driver washes down the flop down chute and last the extension chute hanging on the box. All washwater and solids are captured in the box.



Figure 7. Chute washout box

Chute washout bucket and pump

After delivering ready mixed concrete and scraping the last of the customer's concrete down the chute, the driver hangs a washout bucket shown in Figure 8 (see red arrow) on the end of the truck's chute and secures the hose to insure no leaks. The

driver then washes down the chute into the bucket to remove any cementitious material before it hardens. After washing out the chute, the driver pumps (yellow arrow points to the pump) the washwater, sand, and other fine solids from the bucket up into the truck's drum to be returned to the ready mixed plant, where it can be washed into a reclaimer. A removable screen at the bottom of the washout bucket prevents course aggregate from entering the pump. This course aggregate can also be returned to the plant and added to the coarse aggregate pile to be reused. All the materials are recycled.



Figure 8. Chute washout bucket and pump

Hay bale and plastic washout pit

A washout pit made with hay bales and a plastic lining is shown in Figure 9. Such pits can be dug into the ground or built above grade. The plastic lining should be free of tears or holes that would allow the washwater to escape (Fig. 10). After the pit is used to wash down the chutes of multiple ready mixed trucks and the washwater has evaporated or has been vacuumed off, the remaining hardened solids can be broken up and removed from the pit. This process may damage the hay bales and plastic lining. If damage occurs, the pit will need to be repaired and relined with new plastic. When the hardened solids are removed, they may be bound up with the plastic lining and have to be sent to a landfill, rather than recycled. Recyclers usually accept only unmixed material. If the pit is going to be emptied and repaired more than a few times, the hay bales and plastic will be generating additional solid waste. Ready mixed concrete



Figure 9. Hay bale and plastic washout pit



Figure 10. Leaking washout pit that has not been well maintained

Stormwater Best Management Practice: Concrete Washout

trucks can use hay bale washout pits, but concrete pump trucks have a low hanging hopper in the back that may prevent their being washed out into bale-lined pits.

Vinyl washout container



Figure 11. Vinyl washout pit with filter bag

The vinyl washout container (Fig. 11) is portable, reusable, and easier to install than a hay bale washout pit.

The biodegradable filter bag (Fig. 12) assists in

extracting the concrete solids and prolongs the life of the vinyl container. When the bag is lifted, the water is filtered out and the remaining concrete solids and the bag can be disposed of together in a landfill, or the hardened concrete can be delivered to a recycler. After the solids have been removed several times and the container is full of washwater, the washwater can be allowed to evaporate, so the container can be reused. The washwater can be removed more quickly by placing another filter bag in the container and spreading water gelling granules evenly across the water. In about five minutes, the water in the filter bag will turn into a gel that can be removed with the bag. Then the gel and filter bag can be disposed of together.



Figure 12. Extracting the concrete solids or gelled washwater

Metal washout container

The metal roll-off bin (Fig. 13) is designed to securely contain concrete washwater and solids and is portable and reusable. It also has a ramp that allows concrete pump trucks to wash out their hoppers (Fig. 14). Roll-off providers offer recycling services, such as, picking up the roll-off bins after the washwater has evaporated and the solids have hardened, replacing them with empty washout bins, and delivering the hardened concrete to a recycler (Fig. 15), rather than a landfill. Some providers will vacuum off the washwater, treat it to remove metals and reduce the pH, deliver it to a wastewater treatment plant for additional treatment and



Figure 13. Mixer truck being washed out into a roll-off bin

subsequent discharge to a surface water. Everything is recycled or treated sufficiently to be returned to a natural surface water.



Figure 14. Pump truck using the ramp to wash out into a roll-off bin



Figure 15. Delivering hardened Concrete to a recycler

Another metal, portable, washout container, which has a rain cover to prevent overflowing, is shown in Figure 16. It is accompanied by an onsite washwater treatment unit, which reduces the pH and uses a forced weir tank system to remove the coarse aggregate, fine aggregate, and cement fines. The washwater can then be reused at the construction site to wash out other mixer truck chutes and equipment. The solids are allowed to harden together and can be taken to a concrete recycler (Fig. 17) to be crushed and used as road base or aggregate for making precast products, such as retaining wall blocks. All materials are recycled.



Figure 16. Washout container with a rain cover and onsite washwater treatment



Figure 17. Delivering hardened concrete to a recycler

Siting Washout Facilities

Concrete washout facilities, such as washout pits and vinyl or metal washout containers, should be placed in locations that provide convenient access to concrete trucks, preferably near the area where concrete is being poured. However they

should not be placed within 50 feet of storm drains, open ditches, or waterbodies. Appropriate gravel or rock should cover approaches to concrete washout facilities when they are located on undeveloped property. On large sites with extensive concrete work, washouts should be placed at multiple locations for ease of use by ready mixed truck drivers. If the washout facility is not within view from the pour location, signage will be needed to direct the truck drivers.

Operating and Inspecting Washout Facilities

Concrete washout facilities should be inspected daily and after heavy rains to check for leaks, identify any plastic linings and sidewalls have been damaged by construction activities, and determine whether they have been filled to over 75 percent capacity. When the washout container is filled to over 75 percent of its capacity, the washwater should be vacuumed off or allowed to evaporate to avoid overflows. Then when the remaining cementitious solids have hardened, they should be removed and recycled. Damages to the container should be repaired promptly. Before heavy rains, the washout container's liquid level should be lowered or the container should be covered to avoid an overflow during the rain storm.

Educating Concrete Subcontractors

The construction site superintendent should make ready mixed truck drivers aware of washout facility locations and be watchful for improper dumping of cementitious material. In addition, concrete washout requirements should be included in contracts with concrete delivery companies.

Reference

NRMCA 2009. Environmental Management in the Ready Mixed Concrete Industry, 2PEMRM, 1st edition. By Gary M. Mullins. Silver Springs, MD: National Ready Mixed Concrete Association.

Websites and Videos

Construction Materials Recycling Association
www.concreterecycling.org

National Ready Mixed Concrete Association
www.nrmca.org

National Ready Mixed Concrete Research and Education Foundation
www.rmc-foundation.org

Additional information and videos on concrete washout containers and systems can be found by a web search for "concrete washout."

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APPENDIX C

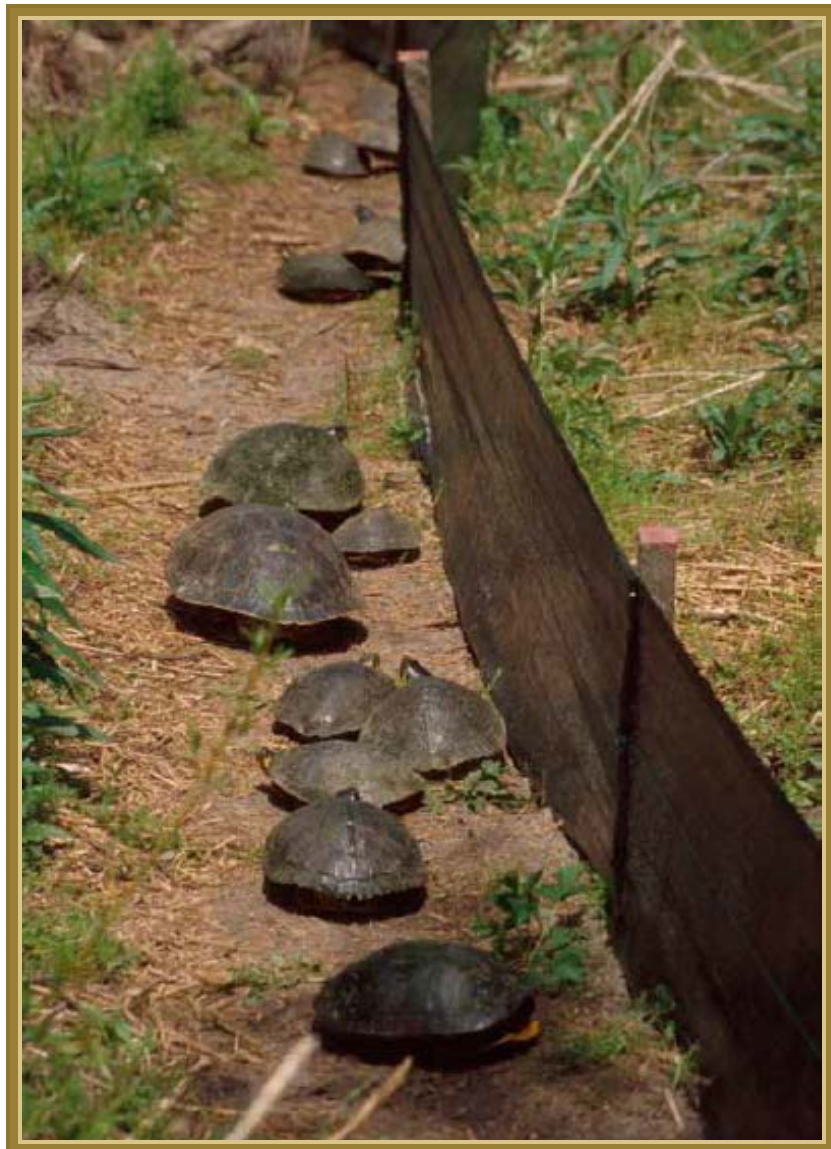
Reptile and Amphibian Exclusion Fencing

SPECIES AT RISK BRANCH BEST PRACTICES TECHNICAL NOTE

REPTILE AND AMPHIBIAN EXCLUSION FENCING

Version 1.1

July 2013



July 2013

Ontario Ministry of Natural Resources
Species at Risk Branch

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Document History

Revision Number	Revision Date	Summary of Changes	Originated	Reviewed	Authorized
1.1	June, 2013	Pre-publishing edits	June, 2013	June, 2013	June, 2013

REPTILE AND AMPHIBIAN EXCLUSION FENCING - BEST PRACTICES -

The purpose of this guidance document is to provide an overview of proven design and installation techniques for reptile and amphibian exclusion fencing. Though this document points to site and species-specific design requirements, it is important to recognize that every situation is different. This guidance is not meant to replace site-specific advice obtained from local MNR staff or experienced exclusion fencing contractors. Moreover, exclusion fences are only effective when well planned, properly constructed, and maintained.

Exclusion fencing seeks to eliminate access to specific areas where activities that could harm animals are occurring (e.g. active aggregate operations, construction sites, and roads). The selection and installation of exclusion fencing can present some challenges, particularly if multiple species are being excluded. For example, some reptiles and amphibians are able to dig under fencing while others can climb over. Some may also take advantage of burrows dug by other animals. To maintain effectiveness, the bottom of the fence should be buried or secured firmly to the ground and minimum height recommendations (Table 1) are considered.

Exclusion fence design should consider the target species as well as those that might be unintentionally impacted. Fencing material should not pose a risk of entanglement or permit individuals to pass underneath or between openings. Landscape features such as topography and substrate need to be considered as they may constrain fencing design.

Including plans for fencing in advance of a project can increase efficiency and fence

effectiveness. For example, long-term road projects that will include a permanent sound barrier could design the sound barrier such that it also meets the specifications of the required exclusion fence.

EFFECTIVE FENCE CHARACTERISTICS

The fence burial and height recommendations listed in Table 1 below have been compiled from scientific literature, established management practices, and practitioner best advice. These are general recommendations and at times other specifications may be more appropriate. For instance, in areas where the substrate does not permit fence burial, weighing down the fence with heavy items (e.g. sand bags) or backfilling may be acceptable. Where needed, speak with your local MNR staff or experienced exclusion fencing contractor to develop site-specific plans.

If multiple species are being excluded from the same area, and the species-specific fencing specifications differ, the uppermost minimum height and greatest depth recommendation should be used (Table 1). If you are excluding both Blanding's Turtle and Gray Ratsnake, for example, the exclusion fence should be a minimum of 2 m tall (see Gray Ratsnake section below for additional details).

Exclusion fences should be installed prior to emergence from hibernation. A survey of the enclosed/secluded area should be conducted immediately following fence installation to ensure that no individuals have been trapped on the wrong side of the fence.

Table 1. Recommended burial depth and height requirements of exclusion fencing for reptiles and amphibians. Recommended height is the height of the fence after it has been installed including the buried components and any installed overhangs or extended lips.

SPECIES	RECOMMENDED DEPTH OF FENCE BURIED (cm) *	RECOMMENDED HEIGHT OF FENCE (cm) **
Turtles – general	10 – 20	60
Eastern Musk Turtle, Wood Turtle	10 – 20	50
Massasauga, Eastern Hog-nosed Snake, Butler’s Gartersnake, Queensnake	10 – 20	60
Gray Ratsnake & Eastern Foxsnake	10 – 20	200
Fowler’s Toad	10 – 20	50
Snakes - general	10 – 20	100
Common Five-lined Skink	10 – 20	unknown
Salamanders	10 – 20	30

* does not include the 10 cm horizontal lip that should extend outward an additional 10 – 20 cm (see Figure 2)

** the height of fencing has been provided as an approximate. Fencing materials may in fact not be available in proportions that would allow for these precise measurements. It is most effective, if the height and burial depth recommendations are met.

DURATION OF ACTIVITIES & DEGREE OF ANTICIPATED DISTURBANCE

The type of disturbance, the proximity to disturbance, and the planned fence longevity are factors that influence which type of exclusion fence is most effective. For short-term activities (i.e. 1 to 6 months) such as minor road repairs, a light-duty geotextile fence is appropriate. Longer term or permanent fencing projects, however, require more durable materials such as – heavy-duty geotextile, wood, concrete, woven-wire, sheet metal, vinyl panels, or galvanized mesh.

GEOTEXTILE FENCES

Geotextile fences (e.g. silt fences) come in many types and qualities. They can be very effective for the temporary exclusion of reptiles and amphibians. For the purposes of this document, temporary use ranges from a few months up to 2-3 years. Winter

weather is generally damaging to geotextile materials and the cost of maintenance over the long-term should be considered during the planning phase. Depending upon the quality, geotextile can be resistant to UV degradation and the bio-chemical soil environment.

Light-duty Geotextile Fencing:

Light-duty geotextile fencing is made of nylon material and is typically purchased with wooden stakes pre-attached at 2 m to 3 m intervals (Plate 1). It can also come without pre-attached stakes. Light-duty geotextiles are largely intended for projects with shorter durations of only a few months in duration and up to one season.

Geotextile fencing with nylon mesh lining should be avoided due to the risk of entanglement by snakes.

To use light-duty geotextile fencing:

- Fencing fabric is effective if attached to wooden, heavy plastic or metal stakes using heavy-duty wire staples or tie-wire (Figure 2).
- Secure the fence on posts that are placed at 2 m to 3 m apart. If using the greater recommended distance between posts, additional maintenance may be required to maintain effectiveness.
- Securely drive the stakes into the ground to a recommended depth of 30 cm. The fencing fabric should be buried to the recommended specifications in Table 1 and back-filled with soil.
- For snakes, supporting posts should be staked on the activity side (e.g. on the side facing the aggregate stock pile or the road - Figure 2).
- Light-duty geotextile fences are not effective where rocks or other hard surfaces prevent proper anchoring of fence posts and burial of the fence fabric.
- Light-duty geotextile fences are not effective where a large amount of concentrated run-off is likely or to cross streams, ditches or waterways without specific modifications.
- Contact your local MNR staff or experienced exclusion fencing contractor for advice and recommendations.
- See general best practices section below for additional details.

Generally, light-duty geotextile fences are not effective if they exceed 1 metre in height unless purposely manufactured for greater height (e.g. stakes placed at closer intervals or cross braces). If greater height is required consider using heavy duty geotextile, hardware cloth or other fencing materials.



Plate 1. Light-duty geotextile fencing with pre-attached wooden stakes used to exclude turtles from a road as seen on a regular maintenance check (photo credit: Brad Steinberg).

Heavy-duty Geotextile Fencing:

Heavy-duty geotextile fencing is typically constructed of a thick felt-like fabric. It may also be called 'double row' or 'trenched' fencing. For support, this fencing uses a woven wire fence (e.g. chain link) or some other structure (Plate 2). It is recommended that a minimum density of 270R or equivalent woven geotextile fabric is used.

Heavy-duty geotextile material can be effective for up to 2 or 3 years with proper maintenance. This type of fencing can be damaged by small mammals chewing through or torn by heavy debris (e.g. tree branches). Therefore, it may be best suited to turtles, which are less likely to take advantage of holes or tears in the fabric. If

used to exclude snakes or other animals, more maintenance may be required.

Heavy-duty geotextile fencing:

- The wire fence should be installed on the activity side to prevent animals from leveraging and climbing into the exclusion area while allowing the animal to escape if they find themselves on the wrong side (Figure 2).
- Geotextile fences across streams, ditches or waterways should have case-specific modifications.
- Contact your local MNR staff or experienced exclusion fencing contractor for advice.
- See light-duty geotextile section above and general best practices below for additional details.



Plate 2. Example of a heavy-duty geotextile fencing used to exclude snake species (photo credit: Jeremy Rouse).

HARDWARE CLOTH FENCES

Hardware cloth (also known as galvanized mesh or Birdscreen) is durable, cost effective and useful for excluding reptiles and amphibians. The fence should be made of heavy galvanized hardware cloth with a ¼ inch mesh. For fences intended to exclude small snakes, a ⅛ inch mesh may be more effective. In contrast, fencing intended to exclude turtle species can have a larger mesh size (e.g. ½ inch). Larger mesh may have a longer lifespan as it is constructed from a thicker material compared to smaller mesh sizes.

To use hardware cloth fencing:

- Secure the fence on posts placed a recommended 2.5 m apart with the stakes on the activity side (Figure 2).
- Pull the mesh taut and staple or secure with screws and a metal stripping to prevent the mesh from being ripped when pressure is applied.
- Installing a top rail or folding the mesh over a taut smooth wire reduces tearing (Plates 3 and 4).
- An outward facing lip installed on the species side ensures that snakes and amphibians are unable to climb or jump over the fence (Figure 2; Plate 4)
- Tears can be mended with 18-gauge galvanized wire.
- See general best practices section below for additional details.



Plate 3. Example of a galvanized mesh fencing used for the long-term exclusion of snakes and turtles from the adjacent highway (photo credit: Megan Bonenfant).



Plate 4. Long-term to permanent exclusion fencing using galvanized mesh with over-hanging lip to prevent animals from climbing or jumping over (photo credit: Megan Bonenfant).

WOOD LATH SNOW FENCING

In certain circumstances, wood lath snow fencing can be effective at excluding turtles. This fencing is typically constructed from soft wood slats that have been woven together with 13-gauge wire and is then attached to steel fence posts which have been driven into the ground.

Wood lath fencing is cost effective and can easily be laid down during the winter to prevent damage. The durability of the material, however, is not meant for very long-term use (e.g. more than 3 years), unless regular maintenance occurs.

To use wood lath snow fencing:

- The fencing should be attached to heavy plastic or metal stakes using heavy-duty wire staples or tie-wire.
- The stakes are recommended to be placed at 2 to 3 m intervals and securely driven into the ground 30 cm or more.
- Wood lath snow fencing across streams, ditches or waterways should have case-specific modifications.
- Wood lath snow fencing lends itself well to being combined with other types of material to ensure complete exclusion.
- See general best practices section below for additional details.



Plate 5. Example of a wood lath snow fencing used to exclude turtles (photo credit: Karine Beriault).

EXCLUSION FENCING FOR GRAY RATSNAKE AND EASTERN FOXSNAKE

Gray Ratsnake and Eastern Foxsnake are the largest snakes in Ontario - reaching nearly 2 m in length. They are also excellent climbers. For this reason, fencing intended to exclude either of these species has additional recommended design specifications.

- The fence should be at least 2 m high.
- The material on the species side (Figure 2) should be smooth to prevent the snakes from climbing into the excluded area.
- Stakes should be on the activity side of the fence (Figure 2).
- Due to the increase in fence height, it is valuable to decrease the distance between posts or install diagonal braces.
- See general best practices section below for additional details.

CONCRETE, SHEET METAL & VINYL WALLS

Concrete, metal or vinyl walls can stand alone or be combined with woven wire or chain link fences. They are durable, require minimal maintenance and are effective in excluding target species from high risk areas and guiding them to crossing structures or other desired locations (Plates 6 and 7). This fence type is comprised of a continuous vertical face of concrete, metal or vinyl sheeting with no gaps. Concrete walls can be installed as either pre-cast sections or pour directly in place.



Plate 6. Stand-alone continuous concrete wall used to exclude salamander species installed as pre-cast forms (photo credit: Steven Roorda).



Plate 7. Pre-formed vinyl sheeting fence intended to exclude salamanders for a construction site (photo credit: Herpetosure Ltd.)

The wall height depends upon the target species, but they are usually between 45 and 60 cm tall and buried 25 cm. Concrete, metal or vinyl exclusion fencing is most appropriate for salamanders, skinks, small snakes, and small turtles. For large turtle species, a chain link fence can be installed directly on top of the concrete wall for complete exclusion.

HABITAT CONNECTIVITY

Habitat connectivity is the connectedness between patches of suitable habitat or the degree to which the landscape facilitates animal movement. Exclusion fencing installed along roads or other large projects can effectively reduce or eliminate habitat connectivity for animals. In these scenarios, exclusion fencing should be considered with eco-passages in order to maintain connectivity. Fencing in isolation should be viewed as a temporary method to reduce mortality until species movement can be restored. Where eco-passages are not feasible they should be identified for consideration with any future road work or development to improve connectivity.

During the installation of fencing with an eco-passage, it is important that the fencing sits flush with the passage to ensure that

there are no gaps where animals can squeeze through.



Plate 7. A wood turtle travelling through a dry eco-passage. Ecopassages such as this help to ensure the long-term connectivity of seasonal habitat for this and other reptile and amphibian species (photo credit: Amy Mui).

GENERAL BEST PRACTICES:

- To deter digging, bury the fence 10 cm down with an additional 10 cm horizontal lip (Figure 2).
- Backfill and compact soil along the entire length on both sides of the fence (Figure 2).
- Once the fence is installed, a survey should be done to ensure that no individuals have been trapped inside (speak with MNR for survey advice).
- Exclusion fencing intended to exclude snakes should have the stakes installed on the activity side (opposite the normal requirement for sediment control fencing) to prevent snakes from using the stakes to maneuver over the fencing.
- For snakes and toads, the fence should have an overhanging lip on the species side (Figure 2).
- Fences should be inspected after spring thaw and at regular intervals throughout the active season, especially following heavy rain events. This is particularly important

for geotextile fences. Any damage that affects the integrity of the fence (e.g. tears, loose edges, collapses, etc.) should be fixed promptly.

- Tall or woody vegetation on the species side of the fence should be managed if there is a risk that it may enable the animals to climb over. This is most important during spring and fall. Proceed cautiously to not harm animals protected plant species during vegetation removal.
- When installing an eco-passage, fencing or exclusion walls should be used as a guiding system to direct animals to passage openings.
- Natural screens such as trees or shrubs can help to reduce road access and can be combined with fencing to provide protection of individuals from predation.
- Install fences with a turn-around at the ends furthest from the wetland habitat and at any access areas to assist in redirecting animals away from any fence openings (Figure 1).
- Curving the ends of the fencing inward (i.e. away from the road or construction site) may help to reduce access to these locations. The ends may also be tied off to natural features on the landscape such as trees or rock cuts.

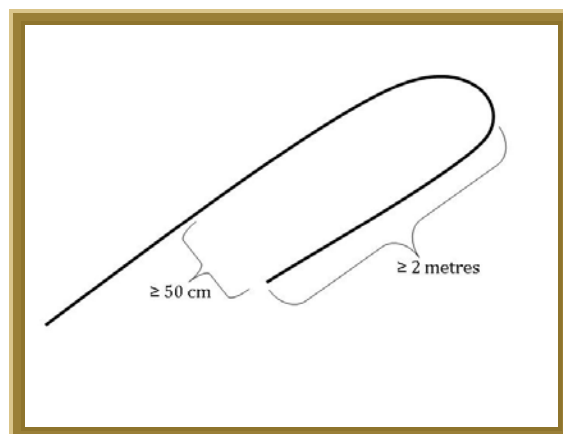


Figure 1. Diagram of the ends of the fence designed to curve inward in order to direct animals away from the area of exclusion.

WATER MOVEMENT & DRAINAGE

- In areas where surface water run-off may erode a soil-based backfill, consider using rocks or sand bags. Ensure these materials cannot be used by animals to climb over the fence.
- Where possible, minimize the number of water crossings: when necessary, it should occur where flow is minimal.
- Fence posts in waterways or areas prone to seasonal flooding should be driven rather than dug – unless following established best practices.
- Fencing should be placed above the high water mark anticipated for high water events such as spring freshet or periods of heavy or continuous rainfall.

TOPOGRAPHY:

- Fence posts should be closer together in undulating topography.
- Fences installed on slopes have a different effective height depending upon whether the animal will be approaching from the up or down slope. The fence height can be adjusted accordingly.

Improvements or questions regarding exclusion fencing can be brought to the local MNR Species at Risk Biologist or other MNR staff.

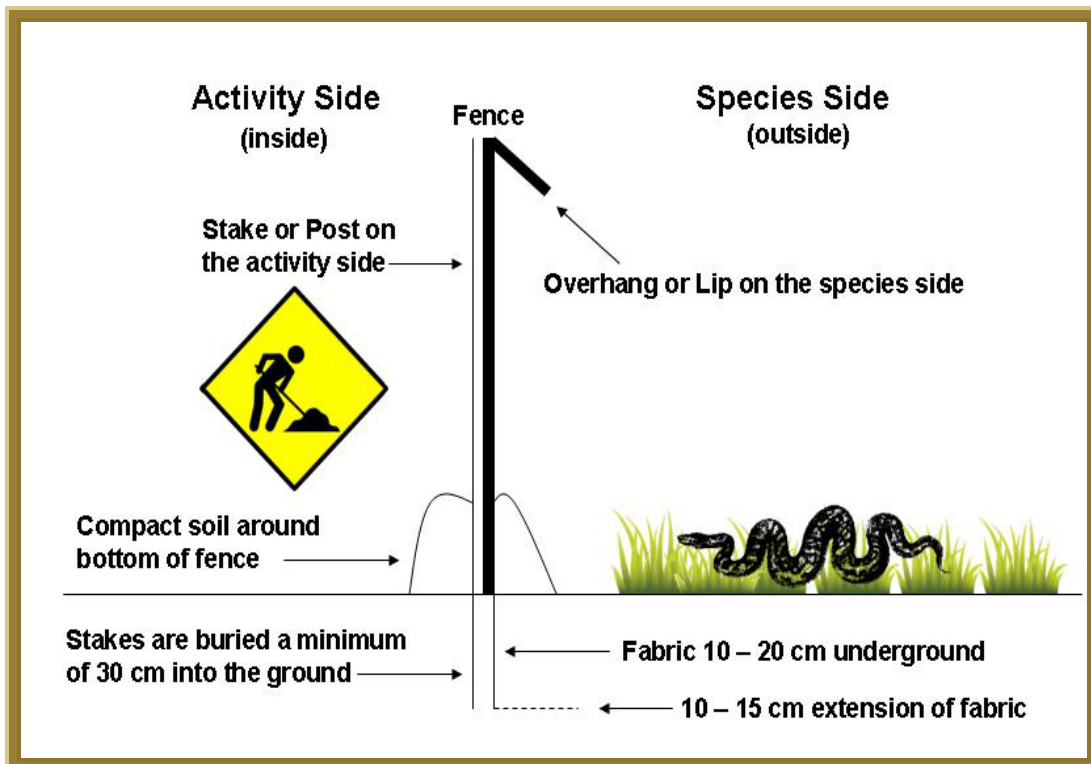


Figure 1. A side view of a basic exclusion fence including an overhang or flexible lip to deter animals from climbing or jumping over the fence. Placement of the stake on the Activity Side or on the inside of excluded area is also illustrated. This is particularly important for snake species which may use the stakes to maneuver over the fence.

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Queensland Department of Transport and Roads, 2010. Fauna Sensitive Road Design Manual, Volume 2: Preferred Practices. Chapter 9, Case Studies, Connecting Queensland, Road and Delivery Performance Division, Queensland Government, 134 pp.

Sarell, M, 2006. Living in Nature Series: How to Snake-proof you House and Yard. South Okanagan-Similkameen Stewardship

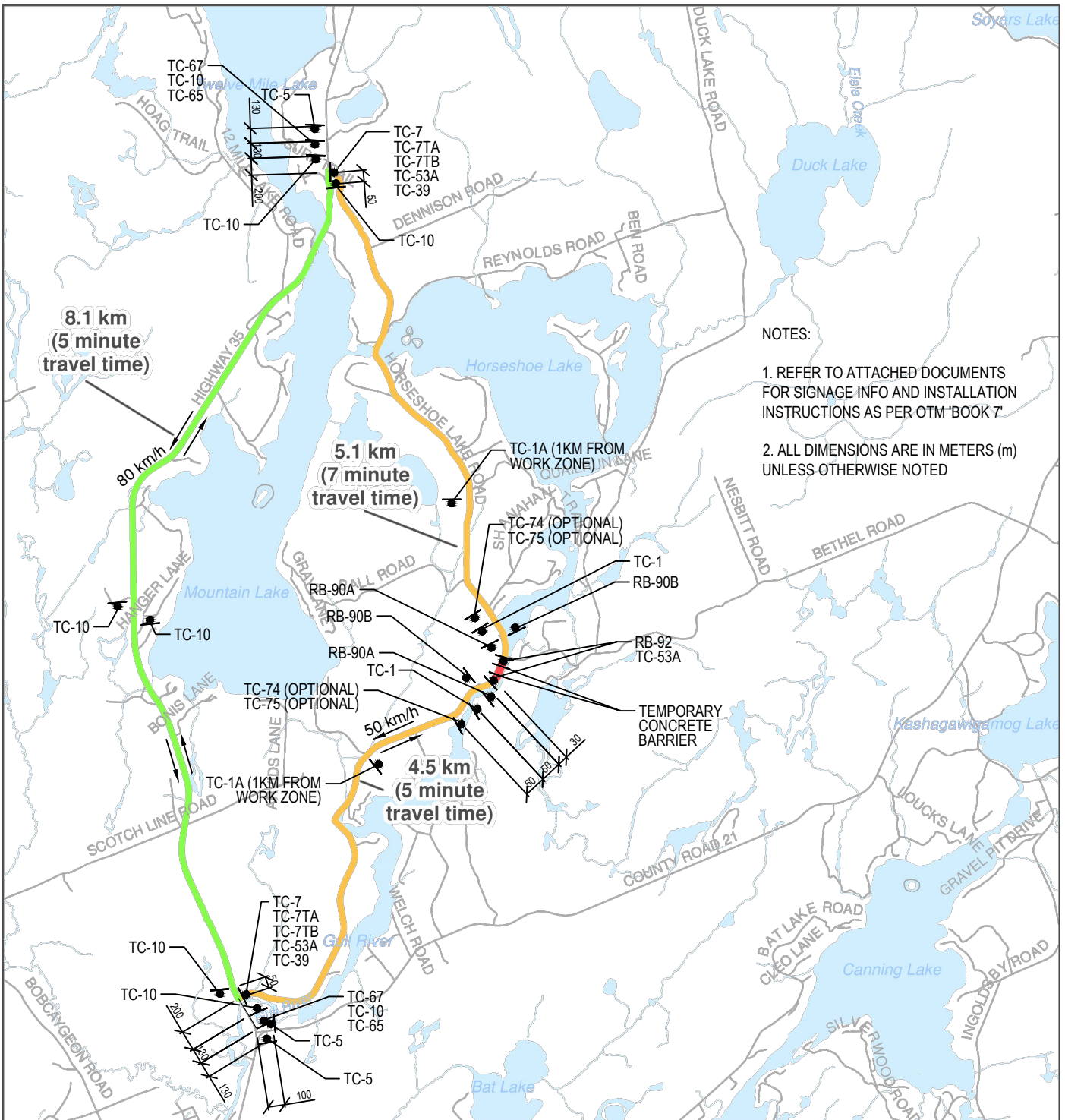
Program. The Land Conservancy of BC, Penticton, BC. 8 pp.

TWP Incorporated, Galvanized Mesh for Snake Control. Accessed July 2012, Available at: <http://www.twpinc.com>.

For additional information:

Visit the species at risk website at
ontario.ca/speciesatrisk
Contact your MNR district office
Contact the Natural Resources
Information Centre
1-800-667-1940
TTY 1-866-686-6072
mnr.nric.mnr@ontario.ca
ontario.ca/mnr

APPENDIX D
Proposed Horseshoe Lake Road
Detour Plan



- NOTES:
- REFER TO ATTACHED DOCUMENTS FOR SIGNAGE INFO AND INSTALLATION INSTRUCTIONS AS PER OTM 'BOOK 7'
 - ALL DIMENSIONS ARE IN METERS (m) UNLESS OTHERWISE NOTED

- LEGEND**
- ROAD CLOSURE
 - LOCAL TRAFFIC ONLY
 - DETOUR

**Total Detour
17.7 km
(17 minute travel time)**



Data Source: Ministry of Natural Resources, Ontario Base Mapping, March 2014.

PROPOSED ROAD DETOUR PLAN

HORSESHOE LAKE ROAD

DATE: MAY 2016	SCALE: 1:50000
PROJECT: 121-15275-51	FILE NO.:121-15275-51 F1



FIGURE
1

APPENDIX E

Recommended Contents of Environmental Management Plan

Recommended Contents of Environmental Management Plans (EMP)



5.0 ENVIRONMENTAL MANAGEMENT PLANS

The Contractor is required to prepare and submit to PCA a site-specific EMP detailing all proposed methods, strategies, structures, facilities, equipment and systems critical to environmental protection; all proposed environmental protection and mitigation measures, monitoring and follow-up activities; all relevant standards and guidelines; and, all performance criteria applicable to the project. The Contractor's EMP must be prepared by a Qualified Professional(s), signed and submitted to PCA, for review and acceptance prior to mobilization to site and the commencement of work. An accepted EMP (accepted by PCA) is required prior to the release of the Historic Canals Regulations Permit issued to the Contractor.

An EMP is a project-specific and site-specific document. The site-specific EMP shall serve as a reference document for all project personnel, so that they are aware of their responsibilities and what is expected of them concerning environmental protection. The requirements included in the EMP will apply to any person, Contractor or subcontractor involved in the project. It is intended to be a "living" document that may require amendments as the project advances from design through construction. These amendments must follow the submittal and acceptance process to PCA, prior to any changes.

For example, a dam commissioning plan may be conceptual during initial stages of construction, but would become highly specific prior to commissioning activities being undertaken. Failure to fully disclose all construction works and activities and phasing, or failure to prepare an acceptable in the EMP may result in project delay.

5.1 Overall EMP Requirements

The over-arching EMP document shall include a description of:

- The purpose and scope of the EMP;
- A project overview;
- A construction plan and schedules;
- The roles and responsibilities of the environmental management team;
- Environmental awareness, training and competency commitments;
- General communications and record keeping commitments;
- Environmental incident reporting procedures;
- Environmental monitoring and adaptive management summary; and
- EMP review and revision procedures.

As necessary, the over-arching EMP document should refer to relevant component plans (see Table 3) and other documents at higher or lower levels in the Contractor's management system. Higher level documents may describe environmental management policies and processes. Lower level documents may describe general procedures, specific operational procedures, activity specific work-procedures and work instructions, equipment manuals, environmental protection procedures.



5.1.1 Purpose and Scope of the EMP

The site-specific EMP shall include statements that describe its purpose and the scope:

- The purpose statements should demonstrate how the Contractor understands the relationship between the EMP, the legal requirements applicable to the Project, and the work to be completed.
- The specific Project works and activities to which the EMP will be applied, including any particular limitations such as Property boundaries (spatial scope); time (temporal scope); or limitations with respect to particular works or activities.

5.1.2 Project Overview

The site-specific EMP shall provide an overview of the project that includes:

- A description of the overall Project and its objectives;
- A location map that references the project location in relation to area municipality(ies), communities, transportation network and other local features (e.g., Provincial parks, conservation areas, etc.);
- A detailed Project site map that provides:
 - Property boundaries for all locations on which Project activities will be undertaken (including any leased properties),
 - Site entrance locations,
 - Locations of all PCA's assets,
 - Key environmental, socio-economic and culturally significant features², and
 - Site contours and expected drainage patterns.

5.1.3 Construction Plan and Schedules

The site-specific EMP shall provide a construction plan and schedules that include:

- A detailed description of all physical works, activities to be undertaken and materials to be used;
- A listing and rationale for any “high-risk” construction activities;
- An overall Project or construction schedule;
- Detailed supporting schedules and/or information that provides the following:
 - time periods / seasons identified as sensitive for environmental reasons (i.e., timing windows for fish, migratory bird nesting, Species at Risk, fire season, winter, etc.),
 - times where noise may be a nuisance to local residents or at a specialized land use (e.g., such as a hospital, school, retirement home) or when construction may create any parking, access and/or traffic problems,

² Key environmental, socio-economic and culturally significant features can be obtained from the Environmental Impact Assessment documentation prepared for the Project.



- the duration of specific physical works and activities (e.g., vegetation clearing, topsoil stripping, coffer dam installation and removal, concrete works, site restoration),
- timing of “high-risk” construction activities, key mitigation measures, including timing regarding the installation of key structures, facilities, equipment and systems critical to environmental protection,
- timing of any special studies or the submission of further EMP component plans,
- the Contractor’s site surveillance schedule by their Qualified Professional(s), linked to “high risk” construction activities, and
- a consultation schedule (if applicable).

5.1.4 Roles and Responsibilities of the Environmental Management Team

A site-specific EMP shall include a description of the organizational structure for the planned work or activities which clearly explains:

- Environmental management team members and their roles;
- Their relationship of each team member to each other;
- Their relationship to PCA personnel; and
- The contact information and position of the person(s) responsible for preparing the EMP and of the key persons responsible for implementing it.

Identifying the position(s) responsible for the EMP includes indicating who within the Contractor’s organization has responsibility and authority for its implementation, ongoing maintenance, performance monitoring and continuous improvement. The EMP shall describe, at an operational level, how the environmental management team and personnel will implement the EMP on a day-to-day basis. Reporting relationships and structures are most easily understood when represented in organization charts. The Contractor is encouraged to use organization charts to explain these relationships.

It is required for the Contractor to hire Qualified Professionals that can provide services thought the life of the project, particularly for monitoring of “high risk” construction activities.

5.1.5 Environmental Awareness, Training and Competency

The site-specific EMP shall refer to the policies, plans and procedures for communicating Project specific environmental protection matters within the Contractor’s organization and to Sub-Contractors entering the worksite. Task specific training will be provided to all Sub-Contractors or suppliers (e.g., Refueling standards and guidelines should be communicated to the supplier entering the site).

The EMP should also summarize and/or reference how environmental awareness training will be provided for all construction personnel, and should summarize and/or reference the procedures to ensure that personnel in environmentally critical roles are qualified and competent. This includes requirements for both training and competency assessments. Records of training must be given to PCA.



5.1.6 General Communications and Record Keeping

A communications protocol is required as part of the site-specific EMP. The EMP shall describe and/or reference:

- The environmental management team members that are authorized to communicate with PCA.
- The communication methods to be used to allow PCA to receive updates throughout the project to reflect changes in project scope, construction methods, scheduling, site conditions, and weather-related contingency measures. PCA must be informed of any proposed changes that may require an amendment to the EIA and/or EMP.
- The procedures for the reporting of all environmental incidents to the PCA Project Manager (or designate) for the investigation of all such incidents to find the underlying or root causes, and for the identifying of remedial actions to prevent future recurrence of the incident or similar incidents in the future.
- The types of records that are to be maintained to demonstrate environmental protection and compliance with the EMP and where to find these records for auditing purposes.

5.1.7 Environmental Incident Reporting

The site-specific EMP shall describe the reporting procedures for environmental incidents. At a minimum, the procedure would include commitments to:

- Report all environmental incidents to PCA's Environmental Authority and the Departmental Representative and any other regulatory authority if required by statute to be reported.
- Provide a written environmental incident investigation report that includes appropriate photo documentation and describes the:
 - Nature of the incident;
 - Approximate magnitude and duration of the incident;
 - Areas, resources or habitats affected;
 - Results of any sample analysis taken in conjunction with the incident (e.g., water samples);
 - Root cause(s) of the incident;
 - Immediate actions taken on-site to mitigate adverse environmental effects;
 - Recommended preventive and corrective actions to control or limit the activity or circumstances causing the incident, including a time frame for implementation;
 - Communications held with the Contractor's employees, PCA's Environmental Authority, the Departmental Representative and other regulatory agencies (if applicable).
- All environmental incidents shall be reported as soon as reasonably possible. Spills must be reported within 24 hours (see Refueling and Spill Management – ESG-13-C).

5.1.8 Environmental Monitoring and Adaptive Management Summary

Each site-specific EMP component plan shall include a description of monitoring and reporting requirements relevant to the specific component plan contents. These component plans shall:



- Define project and site-specific objectives (e.g., performance / compliance monitoring, effectiveness monitoring);
- List the applicable legislative and regulatory requirements;
- Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines;
- Describe the scope of environmental monitoring, including:
 - Monitoring objectives,
 - Location(s) to be monitored,
 - Parameters to be monitored,
 - Methods, and
 - Duration and frequency of monitoring;
- Equipment to be used and its maintenance/calibration schedule;
- Describe reporting requirements (e.g., event reports, monthly reports, annual reports); and
- Provide cross-references to other component plans.

These monitoring plans and approaches to adaptive management shall be summarized within the over-arching EMP document.

Adaptive management is a planned and systematic process for continuously improving environmental management practices by learning about their outcomes. Adaptive management provides flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project. Adaptive management approaches shall be specific to relevant component plans and shall discuss (where appropriate) the following:

- Identification of key indicators that may serve as a gauge of ecological conditions within the area of the project;
- Identification of action thresholds to be used to indicate when environmental performance is approaching and/or below an acceptable level and requires corrective management action.
- Identification of testable predictions or hypotheses to provide a basis for understanding why change might be occurring in the environment and how to select adaptive management measures based on those conclusions.
- Identification of adaptive management options to demonstrate that there are a range of available options to adapt and manage the project should a mitigation measure not function as intended. These options should be technically and economically feasible.
- Conditions that would trigger the need for a revisions to the EMP and/or Historic Canals Regulations Permit.

Further guidance regarding adaptive management is available from the Canadian Environmental Assessment Agency (2009)³.

³ Canadian Environmental Assessment Agency, 2009. Operational Policy Statement- Adaptive Management Measures under the *Canadian Environmental Assessment Act*. Catalogue No.: 978-1-100-12062-1, ISBN: En106-83/2009E-PDF. Available on-line at: https://www.ceaa-acee.gc.ca/Content/5/0/1/50139251-2FE4-4873-B6A1-A190C103333D/Adaptive_Management_Measures_under_the_CEEA.pdf



5.1.9 EMP Review and Revision

The EMP shall specify the procedures for the review and revision of the EMP during Project implementation and have a version control procedure. At a minimum, the site-specific EMP shall be reviewed by the Contractor to determine if an amendment or a major revision is warranted:

- At least once every six (6) months or on a seasonal basis;
- As a result of changes in the project or changes in the anticipated environmental effects of the project;
- After corrective actions have been taken in response to an environmental incident;
- after an adaptive management measure has been proposed by either the Contractor or PCA;
- After a material revision of the EMP has been proposed by either the Contractor or PCA. A material revision is one which would be relevant to the question of whether an adverse environmental effect is more likely to occur, or become more adverse, and be significant;
- After a material revision of the EMP is proposed that changes a commitment such as:
 - a reduction or increase of monitoring or reporting requirements; or
 - making a specification less stringent or more stringent.

Any proposed amendment or revision shall be provided to PCA by the Contractor in writing for acceptance prior to action. Amendments and revisions shall be tracked in accordance with an accepted version control procedure.

PCA may choose to modify its EIA and the Historic Canals Regulations Permit issued to the Contractor on the basis of the proposed amendment or EMP revision.

5.1.10 Component Plan Requirements

Where relevant, the following component plans are to be included in a site-specific EMP. Each component plan will be based on a set of project-specific and site specific objectives. A key requirement of each component plan will be a table that summarizes applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines. The information included in this ESG Document should be used to the extent possible and applicable to the Project. However, the component plans should not be limited to these measures. Contractors will need to augment these standards and guidelines with other measures that are unique to the Project or necessary to address the full range of anticipated Project effects. If there is insufficient detail for a component plan then there should be clear reference as to when the plan will be provided. Work will not commence until PCA acceptance of all relevant component plans.



Component Plan	Primary Objectives
Dust and Air Quality Management	<ul style="list-style-type: none"> To minimize potential effects and disruption to residents, businesses, community facilities, recreational and tourist activities
Noise, Vibration and Ambient Light Management	<ul style="list-style-type: none"> To minimize potential effects and disruption to residents, businesses, community facilities, recreational and tourist activities
Transportation Management	<ul style="list-style-type: none"> To minimize disruption to traffic patterns and access to property.
Blasting	<ul style="list-style-type: none"> To identify blasting procedures and timing, including safety, use, storage, and transportation of explosives.
Demolition	<ul style="list-style-type: none"> To identify demolition procedures and timing.
Site Dewatering and Wastewater	<ul style="list-style-type: none"> To control water takings from watercourses, waterbodies or from the ground from entering the construction site. To prevent contaminated water resulting from the dewatering process and wastewater management from being discharged into the environment. To isolate clean off-site water from contaminated construction water and to minimize the volume contaminated water.
Surface Water Management, Erosion and Sediment Control	<ul style="list-style-type: none"> To control and mandate surface water from off-site and within the project area; To minimize the amount of erosion on-site. To control the amount of sedimentation occurring on-site. To minimize the deposition of deleterious substances to surface waters and minimize sediment input to surface waters.
Dredging and Sediment Removal	<ul style="list-style-type: none"> To identify the dredging and sediment removal procedures, including storage, transport and disposal of dredged materials. To minimize disturbance and protect aquatic and terrestrial resources.
Vegetation Protection	<ul style="list-style-type: none"> To minimize and phase disturbance and protect existing native vegetation
Wildlife Protection and Management	<ul style="list-style-type: none"> To minimize disturbance to wildlife and hazards associated with wildlife.
Aquatic Resources Management	<ul style="list-style-type: none"> To minimize disturbance and protect aquatic resources, including sensitive species and their habitat.
Species at Risk Protection	<ul style="list-style-type: none"> To minimize disturbance and protect aquatic and terrestrial Species at Risk and their habitat.
Invasive Species Management	<ul style="list-style-type: none"> To control the spread of existing invasive plant infestations and prevent new infestations from establishing in the Project area.



Component Plan	Primary Objectives
Waste Management	<ul style="list-style-type: none"> • To minimize the generation and need for disposal of hazardous and non-hazardous wastes. • To minimize risks to worker and public health and safety.
Hazardous Materials Management	<ul style="list-style-type: none"> • To identify the procedures for the transportation, storage and safe use of hazardous materials on-site.
Fuel Management	<ul style="list-style-type: none"> • To minimize the risk of accidents and malfunctions • To minimize risks to worker and public health and safety.
Spills Prevention and Emergency Response	<ul style="list-style-type: none"> • To minimize the risk of accidents and malfunctions. • To minimize risks to worker and public health and safety. • To minimize disturbance and protect aquatic and terrestrial resources. • To effectively respond to spills and other emergencies on-site.
Dam and/or Bypass Channel Commissioning	<ul style="list-style-type: none"> • To sets out the process, expectations and the methodology for successful commissioning of a dam. • To minimize the amount of sediment disturbance/transport and aquatic environments during
Site Restoration	<ul style="list-style-type: none"> • To minimize risks to worker and public health and safety; • To minimize long-term effects on aquatic and terrestrial resources. • To restore site aesthetics and minimize disruption to residents, businesses, community facilities, recreational and tourist activities.

Table 3 provides PCA’s key requirements for each component plan. Table 4 provides links to the potentially applicable standards and guidelines included in [Part 2](#) of this ESG Document that may assist in the preparation of each component plan.



Table 3: EMP Component Plans and Key Requirements

EMP Component Plan	Key Requirements
Dust and Air Quality Management	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Describe the key sources of dust and air emissions (e.g., equipment, works and activities) associated with the Project. • Identify the locations and provide a description of sensitive receptors. • List the key methods, strategies, structures, facilities, equipment and systems critical to dust and air quality management. • Describe approach to construction site winterization and/or winter operations. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Describe the approach to adaptive management. • Describe monitoring and reporting requirements.
Noise, Vibration and Ambient Light Management	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Describe the key sources of noise, vibration and light (e.g., equipment, works and activities) associated with the Project. • Identify the locations and provide a description of sensitive receptors. • List the key methods, strategies, structures, facilities, equipment and systems critical to noise, vibration and ambient light management. • Describe approach to construction site winterization and/or winter operations. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Describe the approach to adaptive management. • Describe monitoring and reporting requirements.



EMP Component Plan	Key Requirements
Transportation Management	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • List relevant federal, provincial or municipal standards and guidelines related to transportation infrastructure to be affected. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe approach to construction site winterization and/or winter operations. • Describe the routes to provide safe and efficient movement of vehicles. • Describe timing of road or bridge closures and detour routes. • Location and capacity of parking for staff and construction vehicles. • List policies for the movement of dangerous goods, oversized and regular loads. • List policies for movement of heavy loads on roadways with load restrictions. • Describe the communication protocols with provincial and municipal government and local police services. • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Describe the approach to adaptive management. • Describe monitoring and reporting requirements.
Blasting	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. <ul style="list-style-type: none"> ○ All blasting activities in or near water are required to follow the “Guidelines for the use of Explosives In or Near Canadian Fisheries Waters” (DFO 1998) to reduce particle velocities and pressure changes created by underwater explosives that can result in fish injuries and mortality. • Specify blasters name, company, copy of license, and statement of qualifications. • Describe the magazine type and locations for explosives and detonating caps (if on-site). • Describe typical rock type and geology structure (solid, layered, or fractured). • Specify the locations for blasting and volumes of materials to be removed. • For each location provide the following information: <ul style="list-style-type: none"> ○ Proposed limits for Peak Particle Velocity; ○ Explosive type, product name and size, weight per unit, and density; ○ Delay type, sequence, and delay; ○ Use of non-electrical initiation systems for all blasting operations; ○ Stemming material and tamping method;



EMP Component Plan	Key Requirements
	<ul style="list-style-type: none"> ○ Hole depth, diameter, and pattern; ○ Explosive depth, distribution, and maximum charge and weight per delay; ○ Number of holes per delay; ○ Dates and hours of conducting blasting; ○ Distance and orientation to nearest aboveground and underground structures; ○ Measures for the Protection of aboveground and underground structures. ● Describe the procedures for: <ul style="list-style-type: none"> ○ Storing, handling, transporting, loading, and firing explosives; ○ Fire prevention; ○ Inspections after each blast; ○ Misfires, fly rock, and noise prevention; ○ Stray current accidental-detonation prevention; ○ Signs and flagmen. ● Describe warning signals prior to each blast and notification prior to blasting. ● Plans for disposal of waste blasting material. Procedures for monitoring and reporting on blasting operations. ● Describe approach to construction site winterization and/or winter operations. ● Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection.
Demolition	<p>This component plan shall:</p> <ul style="list-style-type: none"> ● Define project and site-specific objectives. ● List the applicable legislative and regulatory requirements. ● List and describe the buildings and structures to be demolished. ● Provide time schedule for demolition works. ● For each building and structure to be demolished provide the following information: <ul style="list-style-type: none"> ○ Historical and/or heritage status; ○ Presence / absence of Species at Risk (e.g., bats); ○ Demolition waste types and volumes; ○ Presence and volumes of hazardous materials; ● Describe the procedures for: <ul style="list-style-type: none"> ○ Installation and removal of coffer dams; ○ Noise abatement; ○ Fugitive dust control; ○ Treatment of discharge waters; ○ Demolition waste management; ○ Hazardous materials management.



EMP Component Plan	Key Requirements
	<ul style="list-style-type: none"> • Describe the approach to adaptive management (e.g., contingency plan in case of any emergency situation). • Describe approach to construction site winterization and/or winter operations. • Provide cross-references to other component plans. • Describe monitoring and reporting requirements.
Dewatering and Wastewater	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. <ul style="list-style-type: none"> ○ Confirm the need for a Provincial permit to take water (PTTW) in accordance with the <i>Ontario Water Resources Act</i> (OWRA) and the Water Taking Regulation (O. Reg. 387/04) a regulation under the <i>Act</i>. Section 34 of the OWRA requires anyone taking more than a total of 50,000 litres of water in a day, with some exceptions, to obtain a Permit from a Director appointed by the Minister for the purposes of Section 34. The following water takings related to construction site dewatering and road construction may be eligible for registration in the Environmental Activity and Sector Registry (EASR): <ul style="list-style-type: none"> ▪ Surface water takings related to specific road construction purposes; and ▪ Ground water and/or storm water takings of more than 50,000 L/day but less than 400,000 L/day for the purposes of construction site dewatering. • Describe the purpose of dewatering, sources and amount of water taking / removal required. • Describe the proposed dewatering and wastewater management methods, strategies, equipment and materials to be used, including any controls (that is, settling tank, turbidity curtain, etc.) and method of effluent discharge. • Provide at time schedule for dewatering works and activities. • Specify the anticipated dewatering flow rate and total dewatering duration. • Specify the anticipated wastewater volumes. • Specify water quality discharge criteria. <ul style="list-style-type: none"> ○ If dewatering conducted in a contaminated area, engineering specifications for dewatering effluent treatment and details for an analytical monitoring program to ensure that effluent will meet water quality discharge criteria. ○ If wastewater is to be discharged, engineering specifications for treated effluent and details for an analytical monitoring program to ensure that effluent will meet water quality discharge criteria. • Specify the point(s) of discharge. • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Describe the approach to adaptive management (e.g., contingency plan in case of any emergency situation). • Describe approach to construction site winterization and/or winter operations.



EMP Component Plan	Key Requirements
	<ul style="list-style-type: none"> • Provide cross-references to other component plans. • Describe monitoring and reporting requirements.
Surface Water, Erosion and Sediment Management	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Describe the key sources of emissions or discharges to surface waters (e.g., equipment, works and activities) associated with the Project. • Identify the key point and non-point sources of contaminants (e.g., equipment, material storage areas or stockpiles, waste management facilities, vehicle and equipment maintenance facilities). • Identify need for alternative equipment, material storage or stockpile locations off-site. • Provide at time schedule for in-water works. • Describe the soil types found on-site and their constraints with respect to: <ul style="list-style-type: none"> ○ surface water management; ○ erosion control; and ○ sediment control. • Describe the surface water drainage patterns on the project site as well as coming on to the site and areas sensitive to erosion and sedimentation during each phase of the work. • List the key methods, strategies, structures, facilities, equipment and systems critical to: <ul style="list-style-type: none"> ○ surface water management; ○ erosion control; and ○ sediment control. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe approach to construction site winterization and/or winter operations for all structures, facilities, equipment and systems critical to: <ul style="list-style-type: none"> ○ surface water management; ○ erosion control; and ○ sediment control. • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Describe the approach to adaptive management. • Describe monitoring and reporting requirements.



EMP Component Plan	Key Requirements
Dredging and Sediment Removal	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Identify the locations and volumes of dredged materials. • Identify locations for storage and/or disposal of dredged materials. • Provide time schedule for in-water works. • Identify the locations and provide a description of sensitive aquatic species and their habitat in vicinity of the dredging and sediment removal operations • List the key methods, strategies, structures, facilities, equipment and systems for dredging and sediment removal. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe approach to construction site winterization and/or winter operations. • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Describe the approach to adaptive management. • Describe monitoring and reporting requirements. • Provide cross-references to other component plans.
Vegetation Protection	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Describe the key Project works and activities with the potential to adversely affect native vegetation. • Provide a time schedule for vegetation removal and/or ground disturbing activities. • Identify the locations and provide descriptions of areas to be disturbed and areas to be left undisturbed, including sensitive features (e.g., wetlands, woodlands, grasslands, valley lands, areas with Species at Risk). • List the key methods, strategies, structures, facilities, equipment and systems critical to vegetation protection. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe approach to construction site winterization and/or winter operations. • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Describe the approach to adaptive management. • Describe monitoring and reporting requirements. • Provide cross-references to other component plans.



EMP Component Plan	Key Requirements
Wildlife Protection	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Describe the key Project works and activities with the potential to adversely affect wildlife. • Identify the locations and provide descriptions of any areas to be disturbed and areas to be left undisturbed, including sensitive features (e.g., Bat roosts, snake hibernacula, wildlife dens, bird nests, wildlife crossing areas, salt licks). Describe exclusionary measures (if required). • List the key methods, strategies, structures, facilities, equipment and systems critical to wildlife protection. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe the approach to nuisance wildlife control. • Describe approach to construction site winterization and/or winter operations. • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Describe the approach to adaptive management. • Describe monitoring and reporting requirements. • Provide cross-references to other component plans.
Aquatic Resources Management	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Identify the locations and provide a description of in-water works. • Provide a time schedule for in-water works. • Identify the locations and provide a description of sensitive aquatic species and their habitat. • List the key methods, strategies, structures, facilities, equipment and systems critical to aquatic resources management. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe approach to construction site winterization and/or winter operations. • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Describe the approach to adaptive management. • Describe monitoring and reporting requirements. • Provide cross-references to other component plans.



EMP Component Plan	Key Requirements
Species at Risk Protection	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Provide a time schedule for vegetation clearing and in-water works. • Identify Species at Risk to be protected. • Identify the locations and provide a description of Species at Risk critical habitat or other habitat areas to be protected. • List the key methods, strategies, structures, facilities, equipment and systems critical to wildlife and aquatic resources management. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe approach to construction site winterization and/or winter operations. • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Describe the approach to adaptive management. • Describe monitoring and reporting requirements. • Provide cross-references to other component plans.
Invasive Species Management	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • List the invasive species of concern on the Project site (including area immediately surrounding the Project site). • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe the approach to adaptive management. • Describe monitoring and reporting requirements. • Provide cross-references to other component plans.



EMP Component Plan	Key Requirements
Waste Management	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Identify the locations and provide descriptions of waste storage, recycling and/or disposal facilities on-site. • Identify all off-site disposal facilities to be utilized and confirm their licensing status. • Describe site house-keeping procedures. • Describe the measures and procedures to minimize wildlife attraction to wastes. • Describe procedures for waste minimization, recycling, storage and disposal of hazardous and non-hazardous wastes, including wastes generated by: <ul style="list-style-type: none"> ○ vegetation removal; ○ earthworks (i.e., overburden stripping); ○ dredging and sediment removal. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document).
Hazardous Materials Management	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Identify the locations and provide descriptions of hazardous materials storage facilities on-site. • Identify all off-site disposal facilities to be utilized and confirm their licensing status. • Provide an inventory of hazardous materials that will be used on-site. • Provide MSDS for all hazardous materials in use or to be stored on-site. • Provide an inventory and location of spill equipment to be stored on-site. • List the personnel trained to handle hazardous materials. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe approach to construction site winterization and/or winter operations. • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Provide cross-references to other component plans.



EMP Component Plan	Key Requirements
Fuel Management	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Identify the locations and provide descriptions of facilities for fuel transfer and storage. • Describe the fuel handling, transfer and storage procedures. • Provide equipment refueling plans. • Provide an inventory and location of spill equipment to be stored on-site. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe approach to construction site winterization and/or winter operations. • Describe the maintenance program for all structures, facilities, equipment and systems critical to environmental protection. • Provide cross-references to other component plans.
Spills Prevention and Emergency Response	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific objectives. • List the applicable legislative and regulatory requirements. • Describe the on-site roles and responsibilities for spills and emergency response. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document) with respect to spills prevention and emergency response procedures, including procedures for: <ul style="list-style-type: none"> ○ reporting a spill; ○ stopping the spill if possible; ○ containing the spill; ○ protecting the area of the spill; and ○ removing the material to an approved location for storage or disposal. • Describe monitoring and reporting requirements. • Provide cross-references to other component plans.



EMP Component Plan	Key Requirements
Dam / By-pass Channel Commissioning	<p>This component plan shall:</p> <ul style="list-style-type: none"> • Define project and site-specific dam / by-pass channel commissioning objectives. • List the applicable legislative and regulatory requirements. • Describe the structures, systems or operations to be commissioned. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe pre-commissioning activities for each structure, system or operation (e.g., inspections, site/structure preparation, performance or operational testing). • Describe commissioning activities and schedules for each structure, system or operation. • Describe the approach to adaptive management (e.g., contingency plan in case of any emergency situation). • Describe monitoring and reporting requirements. • Provide cross-references to other component plans.
Site Restoration	<p>This component plan shall:</p> <ul style="list-style-type: none"> • List the applicable legislative and regulatory requirements. • Provide a time schedule for site restoration works. • Identify areas to be restored and their respective restoration objectives • Describe the restoration methods, vegetation to be used, etc. • Tabulate applicable EIA commitments, terms and conditions of approval and relevant environmental standards and guidelines (Refer to <u>Part 2</u> of this ESG Document). • Describe approach to construction site winterization and/or winter operations. • Describe the approach to adaptive management. • Describe monitoring and reporting requirements. • Provide cross-references to other component plans.

APPENDIX F
Temporary Sill
Concrete Testing Results



GHD Limited
 347 Pido Road, Unit 29
 Peterborough, Ontario K9J 6X7
 Tel: (705) 749-3317
 Fax: (705) 749-9248
 www.ghd.com
 QMS ISO 9001: 2008

DOCUMENT TRANSMITTAL

ADDRESS: Parks Canada
 P.O. Box 44030
 Kingston, ON K7L 0B4

DATE: April 5, 2018

OUR REF.: 11140254-01

ATTENTION: Kyle Jansson

FAX/EMAIL: kyle.jansson@pc.gc.ca

FROM: Eric Emery

NO. PAGES INCLUDING COVER PAGE: 2

Original by mail

RE: LABORATORY REPORTS
Horseshoe Lake Dam Reconstruction, 1902 Horseshoe Lake Road, Minden, ON

We enclose the following laboratory testing reports:

<u>Date of Sampling:</u> February 8, 2018	<u>Laboratory No.:</u> 52A-C	<u>Material Type:</u> 32MPa Concrete	<u>Test(s) Performed:</u> Compressive Strength
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Should you require any additional information, or have any questions please contact me at your convenience.

Yours very truly,


 Eric Emery
 Field Manager

DISTRIBUTION LIST

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Concrete Compressive Strength Test Report

Project no.: 11140254-01 Contractor: National Structures
 Client: Parks Canada Engineering
 Project: Horseshoe Lake Dam Reconstruction
 Location: Minden, ON

Date cylinders cast:	February 8, 2018	Size of sample:	20 L
Time mixer charged:	1:34 PM	Time cylinders cast:	2:50 PM
Specified slump:	80±20 mm	Measured slump:	85 mm
Temp. of concrete:	11.5 °C	Temp. of air:	-10.0 °C
Specified air content:	3-6 %	Measured air:	4.5 %
Water added on job:	L	Authorized by:	
Truck no:	63-01	Load no.:	1
Nominal agg size:	20 mm	Type of mold & size:	Plastic 152 x 304
Type of admixtures:		Ticket no.:	126987
Max. curing temp.:	°C	Min. curing temp.:	°C

Concrete supplier: Muskoka Ready Mix
 Location in the structure: Temporary Sill Extension
 Specified strength (Mpa) at 28 days: 32
 Cylinders cast by: W. Dewdney @ GHD

Lab No.	Date Cast	Date Received	Date Tested	Age of Test (Days)	Curing Condition	Average Diameter (mm)	Density (kg/m ³)	Type of Fracture	Cylinder Compressive Strength (MPa)
52A	8-Feb-18	8-Feb-18	14-Feb-18	6	L	102	2322	1	9.1
52B	8-Feb-18	8-Feb-18	8-Mar-18	28	L	102	2303	1	*13.3
52C	8-Feb-18	8-Feb-18	5-Apr-18	56	L	102	2315	1	*13.2

Curing condition: "L": Lab cured "FC": Field cured
 Type of fracture (As per CSA A23.2-9C)
 1. Cones on both ends 2. Cone on one end 3. Columnar vertical cracking
 4. Diagonal fracture 5. Side fracture at top/bottom 6. Similar to Type 5 with pointed end (s)

Comments: Results reviewed with site supervisor prior to leaving site.
 Cylinders stored in curing box on-site with min/max thermometer.
 (*) Denotes cylinder that does not meet the 28 day specified strength requirement.

Reviewed by (print name): Eric Emery
 Signature:
 Laboratory location: Peterborough, ON

