Public Works and Government Services Canada

Requisition No. EZ899-150742/A

SPECIFICATIONS

For

Muncho Lake Roadside Stabilization Retaining Walls,
Alaska Highway, BC

Project No. R.017173.030 July 2014

APPROVED BY:

Alaska Hwy Program Manager, EASS — Date: July 18-2014

Construction Safety Coordinator — Date: 2014/07/15

TENDER:

Project Manager — Date: July 18-2014

Real Property Services Branch, Professional and Technical Services, Pacific Region
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DIVISION 32 – EXTERIOR IMPROVEMENTS

DIVISION 35 – MISCELLANEOUS

LIST OF CONTRACT DRAWINGS (BOUND SEPARATELY)

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1	Cover Page	C000	1
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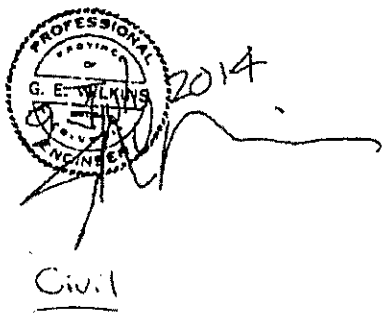
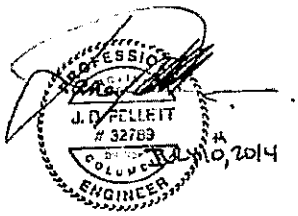


Civil



Geotechnical

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B	Environmental Protection Plan (EPP) – Checklist.
C	Responsibility Checklist For Authorizations/Approvals/Notifications/Permitting
D	Relevant Environmental Publications
E	Misc. Site Photos *(Please Note: The miscellaneous site photos are provided for the Contractor's general information only. PWGSC takes no responsibility for the completeness or any misrepresentation by the Contractor of the site conditions based on the photos provided. Site conditions may have changed since the photos were taken. It is the Contractors responsibility to visit the site and confirm all existing site conditions.)*

REFERENCE DOCUMENTATION

Standards and Best Practices for Instream Works, British Columbia Ministry of Land and Air Protection Ecosystem Standards and Planning Biodiversity Branch – March 2004.

Available online at:

http://www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf

Land Development Guidelines for the Protection of Aquatic Habitat, Fisheries and Oceans – September 1993.

Available online at:

http://www.dfo-mpo.gc.ca/Library/165353.pdf

PART 1 – GENERAL

1.1 Section Includes

.1 Specification Precedence.

.2 Work Covered by Contract Documents.

.3 Codes.

.4 Contractor's Use of Site.

.5 Owner Supplied Materials.

.6 Work Completion.

.7 Special Precautions.

.8 Sequence of Work.

.9 Survey.

1.2 Specification Precedence

.1 The Division 1 Sections of these Specifications take precedence over the other sections of the Specifications.

.2 If conflict arises between an item in these Specifications and an item found in one of the Reference Documents (Appendices), the Specifications shall govern.

1.3 Work Covered by Contract Documents

.1 The project includes construction of three Retaining Walls. The retaining walls are located at approximately Km 701.6 / Km 701.9 / Km 703.1 on the Alaska Highway adjacent to Muncho Lake.

For reference, Dawson Creek is at Km 0, Fort St. John is at approximately Km 75 and Fort Nelson is at approximately Km 455, Watson Lake is at approximately Km 986 on the Alaska Highway.

.2 The work under this contract generally comprises of the following but is not limited to:

.1 Supply and maintain all traffic control for the duration of the works including the installation and removal of temporary concrete barriers, privacy fence, signage, flagging, and gravel shouldering (where required to ensure min 5 m wide temporary traffic lane).

.2 Excavation and offsite disposal of existing BST and existing highway embankment / road gravels to facilitate construction of the Retaining Walls and

Gabion Mats.

.3 Removal, transport offsite, and stockpile the existing riprap not suitable for re-use within the limits of the work. Stockpile riprap suitable for re-use on site.

.4 Removal and disposal of existing gabions (as indicated for removal) within the limits of the proposed Retaining Wall and Gabion Mats. Temporary stockpiling of the existing gabion fill materials (for later re-use).

.5 Supply and install of a wired-mesh faced mechanically stabilized earth (MSE) Retaining Wall including but not limited to the retaining wall system, Retaining Wall Nonwoven Geotextile, Facing Stone, Geogrid, and all other components.

.6 Supply and install of Gabion Mats including:

.1 Temporary stockpiling of existing gabion fill material for re-use as Gabion Mat Rock Fill.

.2 Sort / screen, transport, and install of the gabion mat rock fill.

.7 Manufacture (if applicable), load, transport, placement, and compaction of Retaining Wall backfill (Structural Fill and Riprap) materials.

.8 Transport, placement, compaction, and grading of Granular Base Course (comprising 19 mm Minus Base Course materials) in preparation for the reinstatement of BST by others.

.9 Environmental protection and monitoring.

.10 Work complete by Change Order (if required).

.11 Quality Management.

1.4 Codes

.1 Meet or exceed requirements of:

.1 Contract Documents;

.2 Specified standards, applicable legislation, codes, and referenced documents; and,

.3 Other codes of Local, Provincial, or Federal application (in the case of conflict or discrepancy, the more stringent requirements shall apply).

.2 Perform all work within Muncho Lake in accordance with the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) Section 9 Approval for Instream Work (to be provided during tender period), and the contract requirements.

1.5 Contractor's Use of Site

.1 Restrict work to within the limits shown on the drawings and described in these contract specifications.

.2 Any additional areas required by the Contractor outside the lands owned by the Departmental Representative and designated for use on this project, shall be the Contractor's responsibility to organize. Any costs associated with the use of these additional lands shall be the Contractor's responsibility.

.3 Assume full responsibility for protection and safekeeping of products under this contract.

1.6 Owner Supplied Materials

.1 PWGSC is providing the Contractor access to the 19 mm Minus Base Course material which has been previously manufactured and stockpiled at PWGSC's Km 712 Pit for use by the Contractor (see Section 31 05 16 – Aggregates).

.2 PWGSC is providing the Contractor access to the "as is" pit run and 19 mm Minus Base Course material stockpiled in the Km 712 Pit for the screening / manufacture by the contractor into Structural Fill (see Section 31 05 16 – Aggregates).

.3 PWGSC is providing rock for use by the Contractor as Facing Stone and Gabion Mat Rock Fill (see Section 31 05 16 – Aggregates). The Contractor may choose to extract rock from the following sources for these materials as follows:

.1 Km 712 Pit: existing stockpile (limited quantities are available) of rock in various sizes. The Contractor will be responsible for sorting through the stockpiled rock and selecting the appropriate rock which achieves the required gradation.

.2 Wood Creek Quarry (Km 650): existing stockpile of previously blasted rock in various sizes. The Contractor will be responsible for sorting through the stockpiled rock and selecting the appropriate rock which achieves the required gradation.

.3 Km 712 Pit: existing pit run material. The contractor will be responsible for the screening / manufacture of the pit run materials and selecting rock which achieves the required gradation.

.4 PWGSC is providing the Contractor access to the previously blasted and stockpiled rock at the Wood Creek Quarry (Km 650) for use by the Contractor as Riprap (see Section 31 05 16 – Aggregates). The Contractor will be responsible for sorting through the stockpiled rock and selecting the appropriate rock which achieves the required gradation.

.5 PWGSC is providing the Contractor with access to the precast concrete barriers stockpiled at the Liard River Maintenance Yard for use by the contractor for the duration of the work (see Section 01 35 14 – Traffic Control).

1.7 Access to Owner Gravel Pits and Maintenance Yards

.1 The Contractor may choose to use PWGSC's gravel pits and maintenance yards as detailed elsewhere within the specifications for the purposes of extraction / manufacture of granular materials. When using PWGSC's gravel pits, the Contractor shall be aware of the following:

.1 Other Contractors may be working in the gravel pits and maintenance yards completing similar or different types of work. Coordination with these other Contractors may be required.

.2 Laydown areas for equipment and stockpiles may be restricted due to other works ongoing or the existing size of the gravel pits and maintenance yards.

.3 The security of equipment parked and material manufactured and stockpiled in the gravel pit and maintenance yard along with the safety of the contractors personnel remains the Contractors responsibility.

PART 2 – EXECUTION

2.1 Work Completion

.1 Preparation of required submittals to commence immediately upon receipt of notice to proceed.

.2 Commence onsite work on or following September 2, 2014.

.3 Achieve Substantial Performance by October 17, 2014.

.4 Achieve Completion by October 24, 2014.

.5 The work within Muncho Lake in shall be completed within the dates indicated on the MFLNRO Section 9 Approval for Instream Work". Approval to complete works within Muncho Lake outside of these dates can only be provided by MFLNRO. It will be the Contractor's responsibility to apply for and receive these additional approvals should it be

required.

.6 Works may need to be delayed or temporally shut down during periods of higher water levels in Muncho Lake or adverse weather conditions. The work within Muncho Lake may be delayed or temporally shut down by the following processes:

.1 The Contractor with approval from the Departmental Representative shall suspend work should the lake water level or weather conditions adversely affect the Contractors ability to achieve the contract specifications for quality of work.

.2 The Contractor's Environmental Monitor with approval from the Departmental Representative may suspend work should they feel it is not be possible to achieve the environmental requirements due to the lake water level or adverse weather conditions.

.3 The Departmental Representative in conjunction with MFLNRO may suspend work should they feel that it is not possible to achieve the environmental requirements or the contract specifications for quality of work due to the lake water level or adverse weather conditions.

.7 Regardless of who suspends the work, the Contractor will be responsible for maintaining the site and protecting the works throughout the suspension period.

.8 The Contractor shall account for the possibility of not being able to complete work due to high water levels or adverse weather conditions in the construction schedule and in the unit prices. No payment for temporary work stoppages due to high water levels in Muncho Lake or adverse weather conditions will be made.

.9 Prepare and submit a construction schedule (per Section 01 32 16) adhering to the dates indicated in this section. Extensions in the schedule beyond the Substantial Performance and Completion dates will not be allowed due to the approaching winter conditions.

2.2 Special Precautions

.1 The Contractor's attention is drawn to the possibility of impacting utilities, etc., within the limits of work. The Contractor shall confirm the locations of all such utilities. All costs for utility locates shall be incidental to the work. The Contractor shall notify the Departmental Representative should utilities be located in areas other than those shown on the drawings, and await instructions from the Departmental

Representative before proceeding with work in the vicinity of such encountered services and utilities.

.2 Existing structures (ex. gabions), utilities, chip seal surface (BST), and all others structures, services, piping or equipment within the limits of work shall be properly protected from any injury or damage, direct or indirect. Any damage that is caused as a result of the operations of the Contractor shall be repaired and made good at the Contractor's expense to the satisfaction of the Departmental Representative.

2.3 Sequence of Work

.1 Unless pre-approved by the Departmental Representative, the sequencing of the work shall be per the Construction Sequencing details shown on the Contract Drawings.

2.4 Survey

.1 Complete survey layout for all aspects of construction and payment (see Section 01 29 00 – Payment Procedures) using project survey control (elevations) and dimensions as shown on Contract Drawings. Survey methods and equipment shall be per industry standards approved by the Departmental Representative.

.2 Report any discrepancies between project survey control and Contract Drawings to the Departmental Representative as soon as they are discovered. Should a discrepancy be found, await written approval from the Departmental Representative prior to proceeding.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Definitions.

.2 Measurement and Payment Procedures.

1.2 Definitions

.1 Mobilization and Demobilization: Consists of preparatory work and operations, including but not limited to:

.1 Preparation and acceptance of submittals (Construction Schedule, Traffic Management Plan, Quality Management Plan, Environmental Protection Plan, and any other submittals required prior to starting work).

.2 Work and costs incurred necessary for the movement of personnel, equipment, supplies and incidentals to/from the work site.

.3 Work and cost incurred in the establishment and operation of offices, camps, and other facilities necessary to undertake the work.

.4 Work and costs incurred in the completion of cleanup and project completion.

.5 All other work and costs incurred in the successful completion of mobilization and demobilization.

1.3 Measurement and Payment Procedures

.1 Payment for Mobilization and Demobilization will be made on the basis of the Price per Unit Bid for Mobilization / Demobilization in the Bid and Acceptance Form. The Price per Unit Bid shall include all costs associated with the items of work listed in 1.2 Definition above.

.2 Payment for this item will be made at the Lump Sum price and will be scheduled as follows:

.1 50% at the beginning of construction (to a maximum of 5% of the total Tender Price) after the Contractor required submittals (including Construction Schedule, Traffic Management Plan, Quality Management Plan, Environmental Protection Plan, and any other submittals required prior to starting work) have been submitted for approval, accepted, and work onsite has commenced to the satisfaction of the Departmental Representative.

.2 The remainder once the project has achieved "Completion" and the site has been cleaned to the

satisfaction of the Departmental Representative.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Basis of Payment.

.2 Survey.

1.2 Basis of Payment

.1 Basis of payment shall be per the Measurement and Payment Procedures in the applicable specification section. Where not specified, basis of payment for all work included in these specifications or contract drawings not specifically mentioned is considered incidental to other work and is part of the Total Contract Amount. No additional payment will be made for incidental work.

.2 Payment for work shall be made per the Price per Unit as shown in the Unit Price Table.

.3 For unit price items in the Bid and Acceptance Form, progress payments shall be made based on the quantities of work in place (prior to excavation or following placement and compaction), compacted (if required), surveyed, and accepted by the Departmental Representative in the field. Provide survey data at each stage for each unit price item to the Departmental Representative prior to payment for approval.

.4 For lump sum items in the Bid and Acceptance Form, progress payments shall be made based on the percent of work completed and accepted by the Departmental Representative at the time of the monthly progress payment (Excluding Mobilization and Demobilization which is paid per 1.3 of Section 01 25 20).

.5 The contractor must support any claims for products purchased, manufactured, or delivered to the place of work but not yet incorporated into work. The support for such claims must include such evidence as may be required by the Departmental Representative to establish value and the percentage of the work completed.

.6 Any work called for in the specifications or shown on the drawings but not specifically mentioned as an item for which payment will be made, will be considered incidental to the items of work listed. No additional payment will be made for this incidental work.

.7 All equipment, materials, and labour necessary to complete any item of work shall be included in the cost of that work.

.8 Materials shall be excavated or placed within the specified

tolerances of the design lines and grades shown on the contract drawings but not uniformly high or low. Materials excavated or placed outside the specified tolerances will not be measured for payment unless pre-approved by the Departmental Representative.

.9 Measurement for Payment will be at the Departmental Representative's discretion using one or more of the following methods:

.1 Based upon the survey data collected by the Contractor – when the materials have been excavated or placed within the specified tolerances of the design lines and grades shown on the contract drawings but not uniformly high or low.

.2 Based upon the survey data collected by the Contractor – when the Contractor's or Departmental Representatives survey data indicates that less materials were excavated or placed than called for by the design lines and grades on the contract drawings.

.3 By the design grade / design drawing neat lines – when the Contractor's or Departmental Representatives survey data indicates that materials were excavated or placed outside / beyond the specified tolerances of the design lines and grades on the contract drawings.

1.3 Survey

.1 Surveys / measurements shall be undertaken by the Contractor to verify quantities for payment purposes. Survey shall be considered incidental to the work and not measured for payment.

.2 Survey / measurements collected shall be of sufficient density to fully characterize the work. Method of survey / measurements is subject to prior approval of the Departmental Representative. At a minimum the Contractor shall survey / measure the boundaries of all payment types.

.3 Survey / measurement data shall be collected at an accuracy of +/-0.05 m.

.4 Details of the survey / measurements used by the contractor to determine the quantities shall be provided to the Departmental Representative for review.

.5 Surveys / measurements may be subject to verification by the Departmental Representative. In case of discrepancy, the Departmental Representative's survey / measurements will govern.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Construction Organization and Start-Up.

.2 On-Site Documents.

.3 Schedules.

.4 Construction Progress Meetings.

.5 Submittals.

.6 Close-Out Procedures.

1.2 Construction Organization and Start-up

.1 Within seven days after award of the Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representatives, senior representatives of the Contractor, major subcontractors, field inspectors, and supervisors will be in attendance.

.3 Establish a time and location for meeting and notify parties concerned a minimum of five days before the meeting.

.4 The agenda is to include but is not limited to the following:

.1 Appointment of the official representative of participants in the work.

.2 Schedule of work, progress scheduling in accordance with Section 01 32 16 – Construction Progress Schedules – Bar (Gantt) Chart.

.3 If applicable, schedule of submission of Shop Drawings, etc. in accordance with Section 01 33 00 – Submittal Procedures.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, and fences.

.5 Delivery schedule of specified equipment in accordance with Section 01 32 16 – Construction Progress Schedules – Bar (Gantt) Chart.

.6 Site security in accordance with Section 01 52 00 – Construction Facilities.

.7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted,

time extensions, overtime, and administrative requirements.

.8 Record drawings in accordance with Section 01 78 00 – Closeout Submittals.

.9 Take-over procedures, acceptance, and warranties in accordance with Section 01 77 00 – Closeout Procedures.

.10 Monthly progress claims, administrative procedures, photographs, and holdbacks.

.11 Appointment of inspection and testing agencies or firms in accordance with Section 01 45 00 – Quality Management.

.12 Insurances and transcript of policies.

.13 Maintenance in accordance with Section 01 78 00 – Closeout Submittals.

.5 Comply with the Departmental Representative's allocation of mobilization areas of site for field offices and sheds, access, traffic, and parking facilities.

.6 Coordinate field engineering and layout work with the Departmental Representative.

1.3 On-Site Documents

.1 Maintain at job site, one copy each of the following:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Reviewed Shop Drawings (if applicable).

.5 Change orders.

.6 Other modifications to Contract.

.7 Field test reports.

.8 Copy of approved work schedule.

.9 Manufacturer's installation and application instructions (if applicable).

.10 All permits (MFLNRO and DFO or other as required by the Contractor).

1.4 Schedules

.1 Submit preliminary construction progress schedule in accordance with Section 01 32 16 – Construction Progress Schedules – Bar (Gantt) Chart to the Departmental Representative.

.2 After review by Departmental Representative, revise project schedule to comply with comments given.

.3 During progress of work, revise and resubmit as directed by Departmental Representative.

1.5 Construction Progress Meetings

.1 During the course of work and two weeks prior to project completion, schedule progress meetings as directed by Departmental Representative.

.2 Contractor, major subcontractors involved in work and Departmental Representative are to be in attendance.

.3 Notify parties in writing minimum five days prior to meetings.

.4 Provide physical space and make arrangements for meetings.

.5 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three days after meeting.

.6 Agenda to include following:

.1 Review and 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 Review of off-site fabrication delivery schedules (if applicable).

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for effect on construction schedule and on completion date.

.12 Other business.

1.6 Submittals

.1 If applicable, submit Shop Drawings, product data and samples in accordance with Section 01 33 00 – Submittal Procedures for review for compliance with Contract Documents, field dimensions and clearances, compatibility and available space, and for relation to work of other contracts. If requested, after receipt of Departmental Representative comments, revise and resubmit.

.2 Submit requests for payment for review, and for transmittal to Departmental Representative.

.3 Submit requests for interpretation of Contract Documents, and obtain instructions through Departmental Representative.

.4 Process substitutions through Departmental Representative.

.5 Process change orders through Departmental Representative.

.6 Deliver closeout submittals for review and preliminary inspections, for transmittal to Departmental Representative.

1.7 Closeout Procedures

.1 Notify Departmental Representative when work is considered ready for Substantial Performance.

.2 Accompany Departmental Representative on preliminary inspection to determine items listed for completion or correction.

.3 Comply with Departmental Representative's instructions for correction of items of work listed in executed certificate of Substantial Performance.

.4 Notify Departmental Representative of instructions for completion of items of work determined in Departmental Representative's final inspection.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Progress schedule.

.2 Schedule format.

.3 Submission of schedules.

.4 Critical path scheduling.

1.2 Project Schedule

.1 Develop detailed Project Schedule derived from Master Plan in accordance with the project completion date found in Section 01 11 10 – Summary of Work.

.2 Ensure detailed Project Schedule includes as a minimum all relevant milestone activity types as follows:

.1 Project Award.

.2 Receipt of Necessary Permits.

.3 Submittal Schedule:

.1 Contractor chain of command including Sub-Consultants and Departmental Representative.

.2 Prime Contractor / co-ordination with others Contractors Plan.

.3 Work Plan.

.4 Environmental Protection Plan.

.5 Traffic Management Plan.

.6 Site Access / Detour Plan.

.7 Emergency Response Protocol.

.8 Site Specific Health and Safety Plan, including MSDS sheets.

.9 Material Purchase Plan.

.10 Survey Plan.

.11 Quality Management Plan.

.12 If applicable, Shop Drawings, product date,

and samples.

.4 Mobilization.

.5 Work activities by segment / locations.

.6 Interim inspections.

.7 Site Clean-up / De-mobilization.

.8 Project Substantial Completion and Project Completion dates.

.3 Indicate dates for submitting, review time, resubmission time, and last date for meeting fabrication schedule.

.4 Include dates when reviewed submittals will be required from the Departmental Representative.

1.3 Schedule Format

.1 Prepare schedule in form of a horizontal Gant bar chart.

.2 Provide a separate bar for each major item of work or operation.

.3 Split horizontally for projected and actual performance.

.4 Provide horizontal time scale identifying first work day of each week.

.5 Format for listings: the chronological order of start of each item of work.

.6 Identification of listings by systems description.

1.4 Submission of Schedules

.1 Submit initial format of schedules within 15 days after award of Contract.

.2 Submit schedules in electronic format via PWGSC's cloud-based OPROMA system (login details to be provided by Departmental Representative at time of submission following contract award). Provide schedules in PDF format and native file format if requested by the Departmental Representative.

.3 If requested submit two hard copies to be retained by the Departmental Representative.

.4 The Departmental Representative will review the schedule and return any comments within ten days after receipt.

.5 Resubmit finalized schedule within seven days after return of review copy.

.6 Submit revised progress schedule with each application for payment.

.7 Distribute copies of revised schedule to:

.1 Job site office.

.2 Subcontractors.

.3 Other concerned parties.

.8 Instruct recipients to report to Contractor within ten days any problems anticipated by timetable shown in the schedule.

1.5 Critical Path Scheduling

.1 Include complete sequence of construction activities.

.2 Include dates for commencement and completion of each major element of construction.

.3 Show projected percentage of completion of each item as of the first day of the month.

.4 Indicate progress of each activity to date of submission schedule.

.5 Show changes occurring since previous submission of schedule:

.1 Major changes in scope.

.2 Activities modified since previous submission.

.3 Revised projections of progress and completion.

.4 Other identifiable changes.

.6 Provide a narrative report to define:

.1 Problem areas, anticipated delays, and impact on schedule.

.2 Corrective action recommended and its effect.

.3 Effect of changes on schedules of other Prime Contractor's.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 General requirements.

.2 Shop drawings and product data.

.3 Samples.

1.2 General Requirements

.1 Submit to the Departmental Representative submittals listed for review. Submit with reasonable promptness and in an orderly sequence so as to not cause delay in work. Failure to submit in ample time is not considered sufficient reason for an extension of contract Substantial Completion Date, and no claim for extension by reason of such default will be allowed.

.2 Unless specified otherwise or requested by the Departmental Representative, submittals shall be submitted to the Departmental Representative in electronic format via PWGSC's cloud-based OPROMA system (login details to be provided by Departmental Representative at time of submission following contract award).

.3 Submittal reviews by the Departmental Representative will be completed within two weeks of the receipt of the submittal. Upon completion of the submittal reviews by the Departmental Representative, comments and or acceptance of the submittals will be given. Upon review by the Departmental Representative, should comments be provided, the Contractor shall revise the submittal as required and re-submit the submittal back to the Departmental Representative for review within one week. The submittals will not be accepted until all comments from all reviews have been addressed to the satisfaction of the Departmental Representative.

.4 Work affected by a submittal shall not proceed until the submittal is completed, reviewed, and accepted by the Departmental Representative.

.5 If applicable, present Shop Drawings, product data, samples, and mock-ups in SI Metric units.

.6 Where items or information is not produced in SI Metric units, converted values are acceptable.

.7 Review submittals prior to submission to the Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with the requirements of work and Contract Documents.

Submittals not stamped, signed, dated, and identified as to a specific project will be returned without being examined and shall be considered rejected.

.8 Notify the Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents and stating reasons for deviations.

.9 Prior to any submission, verify field measurements and affected adjacent work included on the submission are coordinated.

.10 Contractor's responsibility for errors and omissions in submission is not relieved by the Departmental Representative's review of submittals.

.11 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

.12 Keep one reviewed copy of each submission on-site.

1.3 Shop Drawings and Product Data

.1 The term "Shop Drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data that are to be provided by the Contractor to illustrate details of a portion of work.

.2 Indicate materials, methods of construction, and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of work or as indicated elsewhere in the specifications. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of the section under which adjacent items will be supplied and installed. Indicate cross-references to design drawings and specifications.

.3 Adjustments made on Shop Drawings by the Departmental Representative are not intended to change the Contract Price. If adjustments affect the value of work, state such in writing to the Departmental Representative prior to proceeding with work.

.4 Make changes in Shop Drawings as the Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify the Departmental Representative in writing of any revisions other than those requested.

.5 Accompany submissions with a transmittal letter, in

duplicate, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Identification and quantity of each Shop Drawing, product data, and sample.

.5 Other pertinent data.

.6 Submissions shall 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 the 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 Single line and schematic diagrams.

.9 Relationship to adjacent work.

.7 After the Departmental Representative's review and acceptance, distribute copies.

.8 Submit in electronic format via PWGSC's cloud-based OPROMA system a copy of the Shop Drawing for each requested within the specification sections. Submit hard copies as requested by the Departmental Representative.

.9 Submit electronic copies of product data sheets or brochures for requirements requested in Specification Sections and as requested by the Departmental Representative where Shop Drawings will not be prepared due to standardized manufacture of product.

.10 Delete information not applicable to project.

.11 Supplement standard information to provide details applicable to the project.

.12 If upon review by the Departmental Representative no errors or omissions are discovered or if only minor corrections are made, copies will be returned, and fabrication and installation of work may proceed. If Shop Drawings are rejected, noted copy will be returned and resubmission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of work may proceed.

.13 The review of Shop Drawings by the Departmental Representative is for the sole purpose of ascertaining conformance with general concept. This review shall not mean that the Departmental Representative approves the detail design inherent in Shop Drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in Shop Drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of the foregoing, the 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 coordination of work of all sub-trades.

1.4 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.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Measurement and Payment Procedures.

.2 References.

.3 Definitions.

.4 Traffic Management Plan.

.5 Protection of Public Traffic.

.6 Informational and Warning Devices.

.7 Control of Public Traffic.

.8 Operational Requirements.

1.2 Measurement and Payment Procedures

.1 Payment for the cost of Traffic Control will be made on the basis of the Price per Unit Bid for Traffic Control in the Bid and Acceptance Form. The Price per Unit Bid shall include the completion of the Traffic Management Plan, signage, temporary concrete barriers and privacy fence, gravel shouldering (where required), traffic flaggers, automated traffic control devices, and all other items necessary for the successful completion of the task.

.2 Measurement for Payment for completion of the Traffic Control will be made by Lump Sum based on the work percentage of the work completed and accepted by the Departmental Representative.

1.3 References

.1 British Columbia Ministry of Transportation and Highways:

.1 Traffic Control Manual for Work on Roadways (latest edition)

.2 Traffic Management Guidelines for Work on Roadways (latest edition)

.3 Electrical and Traffic Engineering Manual (latest edition and all current technical bulletins)

.4 Supplement to TAC Geometric Design Guide (latest edition)

.2 Transportation Association Canada:

.1 Geometric Design Guide for Canadian Roads (latest edition)

.3 Province of British Columbia:

.1 Workers Compensation Act Part 3 – Occupational Health and Safety

.2 Occupational Health and Safety Regulation

1.4 Definitions

.1 Delay – The total additional time for vehicles to pass through the limits of work in addition to the time it would typically take for a vehicle to pass through the limits of work at the posted speed limit prior to construction. The total additional time includes the time for a vehicle to come to a stop position behind a queue of vehicles and then start moving again following a long queue of vehicles and move through the limits of construction. Should single lane traffic be used in multiple retaining wall locations at the same time, traffic shall only be stop in one location, i.e. once traffic is allowed to move, the traffic control shall be coordinated to allow vehicles to pass through all retaining wall locations without stoppage. The maximum allowable delay on this project is defined below in Section 1.8.3 – Control of Public Traffic (10 min).

.2 Limits of Work – For the purposes of defining delay, the limits of work for this project are defined as 100 m to the north of the most northerly Retaining Wall location and 100 m to the south of the most southerly Retaining Wall location included in the contract documents.

1.5 Traffic Management Plan

.1 Provide for review and acceptance a Traffic Management Plan to the Departmental Representative. The Traffic Management Plan shall provide a complete and unambiguous plan of the traffic accommodation strategies proposed for use during the work. The Traffic Management Plan will be fully integrated with the Contactor's plan and schedule for carrying out the work, shall be developed in accordance with the standards defined in the latest versions of all reference documents listed in 1.3 – References above, and shall conform with the requirements of Section 01 35 14 – Traffic Control.

.2 The Traffic Management Plan shall be submitted to the Departmental Representative for review and acceptance at least 10 days prior to the start of any work affecting traffic flows. The Departmental Representative will review the Traffic Management Plan (first submission and if required subsequent re-submissions) within seven days of submission. Upon review of the plan the Departmental Representative will either:

.1 Reject the plan and provide comments outlining required changes or details of additional information needed. Following completion of edits, re-submit the plan for review.

.2 Accept the plan.

If the plan is rejected, the Contractor shall make edits and re-submit the plan for review and acceptance. Any review or comments requested by the Departmental Representative does not in any way relive the Contractor of any of their responsibilities for ensuring safe and appropriate traffic management. No work that affects the flow of traffic will be permitted until the Traffic Management Plan has been accepted by the Departmental Representative.

.3 The Contractor shall allow time in the schedule for the reviews, and subsequent edits / re-submission.

1.6 Protection of Public Traffic

.1 Comply with current requirements of Acts, Regulations, and By-Laws for regulation of traffic or use of roadways upon or over which it is necessary to carry out work or haul materials or equipment.

.2 When working on travelled highway:

.1 Position equipment to present a minimum of interference and hazard to the travelling public.

.2 Keep equipment units as close together as working conditions permit and preferably on the same side of the travelled highway.

.3 Do not leave equipment on the travelled way overnight.

.3 Do not close any lanes of road or highway without consulting the Departmental Representative. Before re-routing traffic, erect suitable signs and devices in accordance with instructions contained in the accepted Traffic Management Plan and Traffic Control Manual for Work on Roadways.

.4 Provide and maintain reasonable access to property in the vicinity of work and in other areas as indicated.

.5 Protect passing vehicles from damage caused by extraneous materials from construction activities at the site.

1.7 Informational and Warning

.1 Provide, erect, and maintain signs, flashing warning lights,

Devices

and other devices required to indicate construction activities and other temporary and unusual conditions resulting from project work that requires road user response as specified in the Traffic Control Manual for Work on Roadways (latest edition, distributed by the Province of British Columbia, Ministry of Transportation and Highways).

.2 Supply signs, delineators, barricades, traffic cones, and miscellaneous warning devices in accordance with the Traffic Control Manual for Work on Roadways in effect at the place of work.

.3 Place signs and other devices in locations recommended in the Traffic Control Manual for Work on Roadways.

.4 Meet with the Departmental Representative prior to commencement of work to prepare a list of signs and other devices required for the project. If the situation on-site changes, revise the list and review it with the Departmental Representative.

.5 Continually maintain traffic control devices in use by:

.1 Checking signs daily for legibility, damage, suitability, and location. Clean, repair, or replace to ensure clarity and reflectance.

.2 Removing or covering signs that do not apply to conditions existing from day to day.

.6 Provide Type D traffic cones as specified in the Traffic Control Manual for Work on Roadways.

.7 Ensure that the necessary traffic cones and signs are in place prior to interference with traffic on existing roadways.

1.8 Control of Public Traffic

.1 Provide traffic control in accordance with the standards defined in the latest versions of all reference documents listed above in Section 1.3 – References and the requirements of these contract documents.

.2 Flag persons:

.1 Provide trained, competent flag persons with proof of certification from a recognized training program on traffic control procedures through construction zones.

.2 Provide flag persons with proper equipment and clothing in accordance with the standards defined in the latest versions of all reference documents listed

above in Section 1.3 – References.

.3 Flag persons are required in the following situations:

.1 When public traffic is required to pass working vehicles or equipment that blocks all or part of travelled roadway.

.2 When it is necessary to institute a one-way traffic system through the construction area or other blockage where traffic volumes are heavy, approach speeds are high, and traffic signal system is not in use.

.3 When temporary protection is required while other traffic control devices are being erected or taken down.

.4 For emergency protection when other traffic control devices are not readily available.

.5 In situations where complete protection for workers, working equipment, and public traffic is not provided by other traffic control devices.

.6 When construction traffic is crossing roadway.

.3 The maximum allowable delay to any individual motorist travelling through the project limits as a result of the Contractor's operations will be 10 minutes.

.4 Where the highway carrying two-way traffic is to be restricted to one lane alternating traffic for construction purposes, provide continuous (24 hrs per day) traffic control using flag persons (1 flagger at each end of the work zone). Outside of non-working hours the contractor may choose to control the single lane alternating traffic using portable traffic lights at each end of each work area (i.e. traffic lights must be installed at Area 1, Area 2, and Area 3 when under construction). The portable traffic lights shall meet the requirements of the standards defined in the latest versions of all reference documents listed above in Section 1.3 – References, be pre-approved by the Departmental Representative, and adjusted and regularly maintained during the period of restriction to ensure the timing of light changes are appropriate for the traffic volumes.

.5 Remove one lane alternating traffic lane restrictions as soon

as completion of the work allows.

.6 Changes to traffic control operation are to be reviewed and accepted by Departmental Representative.

.7 Safely control traffic through unique or varied construction situations.

.8 For the duration of the onsite construction, install precast concrete barriers (min 690 mm in height, with bull-nose and transition barriers on each end) (or pre-approved equivalent) with a 1 m high privacy fence on top of the concrete barriers. The precast concrete barriers shall be placed in a straight and orderly line achieving the minimum offset distances indicated on the contract drawings (outside edge a minimum 1.0 m from edge of excavation) and the lengths shown on the contract drawings (lengths may be extended should the contractor choose). Secure the 1 m high privacy fence to the top surface of concrete barriers. Precast concrete barriers (excluding the 1 m high privacy fence) shall be supplied as follows:

.1 Owner supplied from the Liard Maintenance Yard (Km 762). Contractor responsible for all aspects of the pick-up, transfer, and layout of the precast concrete barrier at the project site. At the completion of the project the contractor will be responsible for returning the precast concrete barrier to the Liard Maintenance Yard and stacking the barriers in a location and fashion pre-approved by the Departmental Representative. Any barriers damaged by the contractor beyond reasonable wear and tear as determined by the Departmental Representative shall by replaced by the contractor at no cost to the Departmental Representative.

.2 From other sources should the contractor choose. Should the contractor elect to supply all or part of the precast concrete barrier, the precast concrete barrier shall confirm with the requirements of the BC MoT 2009 Standard Specifications for Highway Construction, see Section 941 – Precast Reinforced Concrete Barriers, but do not need to be new.

1.9 Operational Requirements

.1 Maintain existing conditions for traffic throughout the period of contract except that, when required for construction under contract and when measures have been taken as specified herein and reviewed by Departmental Representative to protect and control public traffic. Existing conditions for traffic may be restricted as follows:

.1 Single lane (min 5.0 m lane width (max 3% cross fall) plus min 1.0 m shoulder adjacent to excavation with concrete barrier) with alternating traffic during completion of the retaining wall work, placement of barriers, installation of signage, delivery of equipment, and materials, or others works as pre-approved by the Departmental Representative. Speed limit reduced to 30 km/h during these times.

.2 Speed limit reduced to a min of 50 km/h with two way unimpeded traffic at all times during construction.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 References.

.2 Workers' compensation coverage.

.3 Compliance with regulations.

.4 Submittals.

.5 Responsibility.

.6 Health and safety coordinator.

.7 General

.8 Project / site conditions.

.9 Regulatory requirements.

.10 Work permits.

.11 Filing of notice.

.12 Health and safety plan.

.13 Emergency procedures.

.14 Hazardous products.

.15 Overloading.

.16 Fire safety requirements.

.17 Unforeseen hazards.

.18 Posted documents.

.19 Meetings.

.20 Correction of non-compliance.

1.2 References

.1 Government of Canada:

.1 Canada Labour Code - Part II

.2 Canada Occupational Health and Safety Regulations.

.2 National Building Code of Canada (NBC):

.1 Part 8, Safety Measures at Construction and Demolition Sites.

.3 Canadian Standards Association (CSA) as amended:

.1 CSA Z797-2009 Code of Practice for Access Scaffold

.2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes

.3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures

.4 Fire Protection Engineering Services, HRSDC:

.1 FCC No. 301, Standard for Construction Operations.

.2 FCC No. 302, Standard for Welding and Cutting.

.5 American National Standards Institute (ANSI):

.1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.

.6 Province of British Columbia:

.1 Workers Compensation Act Part 3-Occupational Health and Safety.

.2 Occupational Health and Safety Regulation

1.3 Workers' Compensation Coverage

.1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.

.2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

1.4 Compliance with Regulations

.1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.

.2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform

the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

1.5 Submittals

.1 Submit to Departmental Representative submittals listed for review in accordance with Section 01 33 00 – Submittal Procedures.

.2 Work affected by submittal shall not proceed until review is complete.

.3 Submit the following:

.1 Health and Safety Plan.

.2 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.

.3 Copies of incident and accident reports.

.4 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.

.5 Emergency Procedures.

.4 The Departmental Representative will review the Contractor's site-specific project Health and Safety Plan and emergency procedures, and provide comments to the Contractor within 10 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.

.5 Medical surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of work, and submit additional certifications for any new site personnel to Departmental Representative.

.6 Submission of the Health and Safety Plan, and any revised version, to the Departmental Representative are for information and reference purposes only. It shall not:

.1 Be construed to imply approval by the Departmental Representative.

.2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.

.3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

1.6 Responsibility

.1 Be responsible for health and safety of persons on-site, safety of property on-site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable Federal, Provincial, Territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

.3 The protection of persons off-site and the environment such that they may be affected by the conduct of the work.

1.7 Health and Safety Coordinator

.1 Employ and assign to work, a competent and authorized representative as Health and Safety Coordinator. The Health and Safety Coordinator shall:

.1 Be responsible for completing all health and safety training, and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.

.2 Be responsible for implementing, daily enforcing, and monitoring the site-specific Health and Safety Plan.

.3 Be on-site during execution of critical elements of the work or as required by the Contractor.

.4 Have a minimum of two years site related working experience specific to activities associated with Construction.

.5 Have working knowledge of occupational safety and health regulations.

.6 Attend construction progress meetings as required or as requested by the Departmental Representative.

1.8 General

.1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.

.2 Ensure that non-authorized persons are not allowed to

circulate in designated construction areas of the work site.

.1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.

.2 Secure site during non-work at night time or provide security guard as deemed necessary to protect site against entry.

1.9 Project / Site Conditions

.1 Work at the site will, at a minimum, involve contact with:

.1 Utilities.

.2 General public (including large transport trucks) and PWGSC maintenance personnel travelling the highway.

.3 Local wildlife.

.4 Unpredictable and adverse weather conditions.

1.10 Regulatory Requirements

.1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.

.2 In event of conflict between any provisions of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.11 Work Permits

.1 Obtain specialty permit(s) related to project before start of work.

1.12 Filing of Notice

.1 The Contractor is to complete and submit an Advance Notice of Project as required by the Worker's Compensation Board and any other authority in effect at the place or work.

.2 Provide copies of all notices to the Departmental Representative.

1.13 Health and Safety Plan

.1 Conduct a site-specific hazard assessment based on review of Contract Documents, required work, and project site. Identify any known and potential health risks and safety hazards.

.2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not

limited to, the following:

.1 Primary requirements:

.1 Contractor's safety policy.

.2 Identification of applicable compliance obligations.

.3 Definition of responsibilities for project safety/organization chart for project.

.4 General safety rules for project.

.5 Job-specific safe work procedures.

.6 Inspection policy and procedures.

.7 Incident reporting and investigation policy and procedures.

.8 Occupational Health and Safety Committee/Representative procedures.

.9 Occupational Health and Safety meetings.

.10 Occupational Health and Safety communications and record keeping procedures.

.2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.

.3 List hazardous materials to be brought on-site as required by work.

.4 Indicate Engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.

.5 Identify personal protective equipment (PPE) to be used by workers.

.6 Identify personnel and alternates responsible for site safety and health.

.7 Identify personnel training requirements and training plan, including site orientation for new

workers.

.3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.

.4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review of Health and Safety Plan by Public Works and Government Services Canada (PWGSC) shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract Documents.

1.14 Emergency Procedures

.1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:

.1 Designated personnel from own company.

.2 Regulatory agencies applicable to work and as per legislated regulations.

.3 Local emergency resources.

.4 Departmental Representative.

.2 Include the following provisions in the emergency procedures:

.1 Notify workers and the first-aid attendant, of the nature and location of the emergency.

.2 Evacuate all workers safely.

.3 Check and confirm the safe evacuation of all workers.

.4 Notify the fire department or other emergency responders.

.5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.

.6 Notify Departmental Representative.

.3 Provide written rescue/evacuation procedures as required for, but not limited to:

.1 Work at high angles.

.2 Work in confined spaces or where there is a risk of entrapment.

.3 Work with hazardous substances.

.4 Underground work.

.5 Work on, over, under and adjacent to water.

.6 Workplaces where there are persons who require physical assistance to be moved.

.4 Design and mark emergency exit routes to provide quick and unimpeded exit.

.5 Emergency drills must be held at least once each year for all projects lasting longer than one year. The purpose of these drills is to ensure awareness and effectiveness of emergency exit routes and procedures. A record of the drills must be kept by the Contractor.

.6 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.

1.15 Hazardous Products

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canadian Labour Code.

.2 Where use of hazardous and toxic products cannot be avoided:

.1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00 – Submittal Procedures.

.2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left the building.

.3 Provide adequate means of ventilation acceptable

to the Departmental Representative and suitable for the hazard.

1.16 Overloading

.1 Ensure no part of the work is subject to a load which will endanger its safety or will cause permanent deformation.

1.17 Fire Safety Requirements

.1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.18 Unforeseen Hazards

.1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and advise the Departmental Representative verbally and in writing.

.2 Should contaminated site conditions be encountered when completing the work, refer to GC4.4 – Contaminated Site Conditions for procedures which the Contractor shall undertake.

1.19 Posted Documents

.1 Post legible versions of the following documents on-site:

.1 Health and Safety Plan.

.2 Sequence of work.

.3 Emergency procedures.

.4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshaling station, and the emergency transportation provisions.

.5 Notice of Project.

.6 Floor plans or site plans.

.7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.

.8 Workplace Hazardous Materials Information System (WHMIS) documents.

.9 Material Safety Data Sheets (MSDS).

.10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.

.2 Post all Material Safety Data Sheets (MSDS) on-site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.

.3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction-site shelter provided for workers and equipment, or as approved by the Departmental Representative.

1.20 Meetings

.1 Attend health and safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.

1.21 Correction of Non-compliance

.1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.

.3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Definitions.

.2 References.

.3 Regulatory Overview.

.4 Submittals.

.5 Environmental Effects Evaluation.

.6 Site Access and Parking.

.7 Protection of Work Limits.

.8 Erosion Control.

.9 Pollution Control.

.10 Equipment Maintenance, Fuelling, and Operation.

.11 Operation of Equipment.

.12 Managing of Invasive Plan Vegetation.

.13 Fire Prevention and Control.

.14 Wildlife.

.15 Relics and Antiquities.

.16 Waste Materials Storage and Removal.

.17 Wastewater Discharge Criteria.

.18 Camp Wastewater Discharge Criteria.

.19 Drainage.

.20 Site Clearing, Plant Protection, and Nesting Bird Protection.

.21 Environmental Protection Supplies.

.22 Notification.

.23 Environmental Monitoring.

1.2 Definitions

.1 Environmental Pollution and Damage: 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 humankind; or degrade the environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

.3 Wetted Perimeter: area of stream where water is currently running or pooled.

.4 In-stream Work: any work performed below the high water mark, either within or above the Wetted Perimeter of any Fisheries Sensitive Zone.

.5 Fisheries Sensitive Zone: in-stream aquatic habitats and out of stream habitat features such as side channels, wetlands, and riparian areas.

.6 Invasive plants: are any alien plant species that have the potential to pose undesirable or detrimental impacts on humans, animals or ecosystems. Invasive plants have the capacity to establish quickly and easily on both disturbed and un-disturbed sites, and can cause widespread negative economic, social and environmental impacts.

.7 Noxious weeds: are invasive plants that have been designated under the BC Weed Control Act. This legislation imposes a duty on all land occupiers to control a set list of identified invasive plants.
www.agf.gov.bc.ca/cropprot/noxious.htm

1.3 References

.1 Standards and Best Practices for Instream Works, British Columbia Ministry of Land and Air Protection Ecosystem Standards and Planning Biodiversity Branch – March 2004 (Appendix B).

.2 Land Development Guidelines for the Protection of Aquatic Habitat, Fisheries and Oceans – September 1993 (Appendix C).

.3 Environmental Protection Plan (EPP) – Checklist (Appendix D)

.4 Responsibility Checklist For Authorizations /Approvals /

Notifications / Permitting (Appendix E)

.5 Relevant Environmental Publications (Appendix F)

.6 PWGSC Environmental Effects Evaluation (Provided during tender period)

.7 MFLNRO Section 9 Approval for Instream Work (Provided during tender period)

1.4 Regulatory Overview

.1 Comply with all applicable environmental laws, regulations and requirements of Federal, Provincial, and other regional authorities, and acquire and comply with such permits, approvals and authorizations as may be required.

.2 Comply with and be subject to those permits and approvals obtained from the Departmental Representative to conduct the Work.

.3 Pay specific attention to the provincial BC Land Use Permit, Water License and Quarry Permit.

.4 Pay specific attention to the Migratory Birds Convention Act, as amended in 1994.

.5 Pay specific attention to the provincial BC guidelines under Peace Region Least Risk Timing Windows: Biological Rational (2009).

.6 Pay specific attention to provincial BC MOE guidelines in Standards and Best Practices for Instream Works (2004).

1.5 Submittals

.1 The Contractor is required to prepare an Environmental Protection Plan (EPP). The EPP should include all relevant environmental impacts/issues at the site as indicated by the completion of the EPP Checklist (Appendix D). Review of the PWGSC Environmental Effects Evaluation (EEE), (to be provided during the tender period) will assist in completing this document. Prior to commencing construction activities or delivery of materials to site, submit the EPP (See Appendix D for Checklist) for review and approval by the Departmental Representative. The EPP will require the Contractor to carefully think through the entire project, including identifying what activities as works will be occurring, both generally and at specific sites, and by what methods. The Environmental Protection Plan shall be completed by a P.Biol or RPBio, or other qualified professional, and shall, at a minimum include the following:

.1 The specifics of a detailed monitoring program (to

be completed by the contractor). This includes details and rational concerning sampling locations, timing, duration, and methods, and identification of the person(s) who will be carrying out the monitoring program.

.2 The process and protocol for ensuring that supervisors and individual staff employed by the Contractor are very clear on which environmental standards need to be achieved, how they will be achieved, and establishing how the Contractor will ensure that this is successfully occurring.

.3 Erosion, drainage, and sediment control plan which identifies 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 the requirements of the applicable MOE Approval or Notification for instream work or under MOE guidelines, and all other applicable regulations including the requirements of these specifications.

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

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

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

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

.8 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with

Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.9 Outline the avoidance and mitigate measures which the Contractor will undertake and implement to ensure compliance with the environmental regulations applicable to the project (which may include requirements provided in MOE Approval or Notifications for Instream Work, NWPA Approval for Instream Work, DFO Fisheries Act requirements etc.) and these contract specifications.

.10 The procedures for stopping the work and implementing changes to the construction methods should the Contractor not be achieving the environmental requirements as outlined in these specifications.

.11 The procedures for stopping work should the Contractor encounter archaeological anomalies or human remains.

.2 All submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.5 Environmental Effects Evaluation

.1 Execution of the work is subject to the provisions within the Environmental Effects Evaluation (EEE) completed by a PWGSC Environmental Services Representative for the project.

.2 Pursuant to the expectations of the EEE, EPPs are the next step to achieve the desired results of minimal adverse environmental effect, as the project is constructed.

.3 Failure to comply with or observe environmental protection measures as identified in these specifications may result in the work being suspended pending rectification of the problems.

1.6 Site Access and Parking

.1 The Contractor shall review both short and long access requirements with the Departmental Representative, both at the start-up and on an on-going basis. In consultation with the Departmental Representative, the contractor shall formulate an agreement for worker transportation to and from the work site and where workers shall park their private vehicles. Generally, personal vehicles shall be parked the maximum practical distance from any watercourse. If less than a distance of 10 m, the location shall be pre-approved by the Departmental Representative.

.2 The Contractor shall ensure that the environment beyond the work limits is not negatively impacted or damaged by workers' vehicles or construction machinery and shall instruct workers so that the "footprint" of the project is kept within defined boundaries.

1.7 Protection of Work Limits

.1 The Contractor shall include in the Environmental Protection Plan (EPP) details on the work limits, how these shall be marked and what procedures will be employed to ensure trespass outside these limits does not occur, to the satisfaction of the Departmental Representative.

1.8 Erosion Control

.1 Erosion control measures that prevent sediment from entering any waterway, water body or wetland in the vicinity of the construction site are a critical element of the project and shall be implemented by the Contractor.

.2 If necessary, on-site sediment control measures shall be constructed and functional prior to initiating activities associated with the construction activities. The Contractor shall prepare an Erosion Control Plan, to be part of the EPP, to the satisfaction of the Departmental Representative.

.3 The regular monitoring and maintenance of all erosion control measures shall be the responsibility of the Contractor. If the design of the control measures is not functioning effectively they are to be repaired. The Departmental Representative will monitor the Contractor's erosion control performance.

.4 Erosion control measures must be in compliance with both Federal and Provincial legislation where required. Contractors should be referencing the provincial MOE Standards and Best Practices for Instream Works (2004).

1.9 Pollution Control

.1 The Contractor shall prevent any deleterious and objectionable materials from entering streams, rivers, wetlands, water bodies or watercourses that would result in damage to aquatic and riparian habitat. Hazardous or toxic products shall be stored no closer than 100 metres to any surface water.

.2. A Spill Response Plan will be prepared as part of the EPP and shall detail the containment and storage, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products, to the satisfaction of the Departmental Representative, and in accordance with all applicable federal and provincial legislation. The EPP shall include a list of

products and materials to be used or brought to the construction site that are considered or defined as hazardous or toxic to the environment. Such products include, but are not limited to, waterproofing agents, grout, cement, concrete finishing agents, hot poured rubber membrane materials, asphalt cement and sand blasting agents.

.3 The containment, storage, security, handling, use, unique spill response requirements and disposal of empty containers, surplus product or waste generated in the use of any hazardous or toxic products shall be in accordance with all applicable federal and provincial legislation. Hazardous products shall be stored no closer than 100 metres from any surface water.

.4 An impervious berm shall be constructed around fuel tanks and any other potential spill area. The berms shall be capable of holding 110% of tank storage volumes and shall be to the satisfaction of the Departmental Representative. Measures such as collection/drip trays and berms lined with occlusive material such as plastic and a layer of sand, and double lined fuel tanks can prevent spills into the environment.

.5 The Contractor shall prevent blowing dust and debris by covering and/or providing dust control for temporary roads and on-site work such as rock drilling and blasting by methods that are approved by the Departmental Representative.

.6 The Contractor shall provide spill kits, to the satisfaction of the Departmental Representative, at re-fuelling, lubrication and repair locations that will be capable of dealing with 110% of the largest potential spill and shall be maintained in good working order on the construction site. The Contractor and site staff shall be informed of the location of the spill response kit(s) and be trained in its use.

.7 Timely and effective actions shall be taken to stop, contain and clean-up all spills as long as the site is safe to enter. The Departmental Representative shall be notified immediately of any spill as well as the provincial authorities. Basic instructions and phone numbers shall be part of the Contractor's EPP.

.8 In the event of a major spill, the Contractor shall prioritize the clean up and all other work shall be stopped, where appropriate, and personnel devoted to spill containment and clean up.

.9 The costs involved in a major spill incident (control, clean up, disposal of contaminants, and site remediation to pre-spill conditions), shall be the responsibility of the Contractor. The site will be inspected to ensure completion to the pre-spill condition to the satisfaction of the Departmental Representative.

1.10 Equipment Maintenance, Fueling and Operation

.1 The Contractor shall ensure that all soil, seeds and any debris attached to construction equipment to be used on the project site shall be removed (e.g. power washing) outside before delivery to the work site.

.2 Equipment fuelling sites will be identified by the Contractor to the satisfaction of the Departmental Representative. Except for chain saws, any fuelling closer than 100 metres to any surface water (streams, wetlands, water bodies or watercourses) shall require discussion with the Departmental Representative. Regardless of fuelling location, personnel shall maintain a presence during refueling with immediate attention to the fuelling operations.

.3 Diesel and gasoline delivery vehicles, including bulk tankers shall be not be parked within 100 metres from any surface water unless actively being used for refueling. Immediately following refueling bulk tankers shall be moved to a location 100 m or greater from any surface water. Gravity fed fuel systems are not allowed. Manual or electric pump delivery systems shall be used.

.4 Mobile fuel containers (e.g. slip tanks, small fuel carboys) shall remain in the service vehicle at all times. Protection and containment of approved fuel storage sites is addressed in 1.9.4 of Pollution Control.

.5 Equipment use on the project shall be fuelled with E10, and low sulphur diesel fuels where available, and shall conform to local emission requirements. The Contractor is to ensure that unnecessary idling of the vehicles is avoided.

.6 Oil changes, lubricant changes, greasing and machinery repairs shall be performed at locations satisfactory to the Departmental Representative. Waste lubrication product (e.g. oil filters, used containers, used oil, etc.) shall be secured in sill-proof containers and properly recycled or disposed of at an approved facility, No waste petroleum, lubricant products or related materials are to be discarded, buried or disposed of in borrow pits, turnouts, picnic areas, viewpoints, etc. or anywhere within the work area.

.7 The Contractor shall ensure that all equipment is inspected

daily for fluid/fuel leaks and maintained in good working condition.

.8 Fuel containers and lubricant products shall be stored only in secure locations to the satisfaction of the Departmental Representative. Fuel tanks or other potential deleterious substance containers shall be secured to ensure they are tamperproof and cannot be drained by vandals when left overnight. Alternatively, the Contractor may hire a security person employed to prevent vandalism.

1.11 Operation of Equipment

.1 Equipment movements shall be restricted to the "footprint" of the construction area. The work limits shall be identified by stake and ribbon or other methods to the satisfaction of the Departmental Representative. No machinery will enter, work in or cross over streams, rivers, wetlands, waterbodies or watercourse, nor damage aquatic and riparian habitat or trees and plant communities. Where construction activities require working close to surface water, the Contractor is required to describe measures to be employed to ensure fugitive materials (e.g. rocks, soil, branches) and especially deleterious substances (e.g. chemicals) does not enter any surface water areas.

.2 The Contractor shall instruct workers to prevent pushing, placement, raveling, storage or stockpiling of any materials (e.g. slash, rock, fill or top soils) in the trees bordering the right-of-way or into surface water.

.3 When, in the opinion of PWGSC, negligence on the part of the Contractor results in damage or destruction of vegetation, or other environmental or aesthetic features beyond the designated work area, the Contractor shall be responsible, at his or her expense, for complete restoration including the replacement of trees, shrubs, topsoil, grass, etc. to the satisfaction of the Departmental Representative.

.4 Restrict vehicle movements to the work limits.

.5 Workers vehicles are to remain within the construction footprint.

1.12 Managing Invasive Plant Vegetation

.1 Keep equipment clean and avoid parking, turning around or staging equipment in known invasive species infested areas, or mow prior to use.

.2 Wash equipment prior to mobilization to site.

.3 Minimize unnecessary disturbance of roadside aggregates or soil, and retain desirable roadside vegetation whenever

possible.

.4 Where possible, begin mowing or brushing in "invasive plant free" areas and end in infested areas.

.5 Where possible, use only clean fill material from an "invasive plant free" source.

.6 Whenever possible, re-seed with grass mixtures that are free of weeds, locally adapted, non-invasive, and quick to establish. Spread seed in the early spring or late fall to ensure successful establishment.

1.13 Fire Prevention and Control

.1 A fire extinguisher shall be carried and available for use on each machine and at locations within the quarry in the event of fire. Basic fire fighting equipment is recommended (e.g. a water truck; minimum 500 imperial gallons with 500 feet of fire hose and a pump capable of producing 45 psi water pressure at the nozzle, three shovels, two Pulaski's, and two five gallon backpack pumps) shall be maintained at the construction site at a location known and easily accessible to all Contractors' staff. Contactor's staff shall receive basic training in early response to wildfire events during the "environmental briefing".

.2 Construction equipment shall be operated in a manner and with all original manufacturers' safety devices to prevent ignition of flammable materials in the area.

.3 Care shall be taken while smoking on the construction site to ensure that the accidental ignition of any flammable material is prevented.

.4 In case of fire, the Contractor or worker shall take immediate action to extinguish the fire provided it is safe to do so. The Departmental Representative shall be notified of any fire immediately as well as the applicable Provincial Authorities. Basic instruction and phone numbers will be provided on-site by the Contractor and will be discussed in the project start-up meeting.

.5 Fires or burning of waste materials is not permitted.

.6 Where fires or burning is permitted, prevent staining or smoke damage to structures, materials or vegetation which is to be preserved. Restore, clean and return to new condition stained or damaged Work.

.7 Provide supervision, attendance and fire protection measures

as directed.

.8 Obtain all required permits from the province.

1.14 Wildlife

.1 Avoid or terminate activities on site that attract or disturb wildlife and vacate the area and stay away from bears, cougars, wolves, elk or moose that display aggressive behavior or persistent intrusion. Extra care to control materials that might attract wildlife (e.g. lunches and food scraps) must be exercised at all times.

.2 Notify the Departmental Representative immediately about dens, litters, nests. Carcasses (road kills), bear activity or encounters on or around the site or crew accommodations. Other wildlife related encounters are to be reported within 24 hours.

1.15 Relics and Antiquities

.1 Artifacts, relics, antiquities, and items of historical interest such as cornerstones, commemorative plaques, inscribed tablets and any objects found on the work site that may be considered artifacts shall be reported to the Departmental Representative immediately. The Contractor and workers shall wait for instruction before proceeding with their work.

.2 All historical or archaeological objects found in the rock quarry are protected under federal and provincial Acts and regulations. The Contractor and workers shall protect any articles found and request direction from the Departmental Representative.

.3 Human remains must be reported immediately to the local RCMP.

1.16 Waste Materials Storage and Removal

.1 The Contractor and workers shall dispose of hazardous wastes in conformance with the applicable federal and provincial regulations and should be part of the EPP.

.2 All wastes originating from construction, trade, hazardous and domestic sources, shall not be mixed, but will be kept separate.

.3 Construction, trade, hazardous waste and domestic waste materials shall not be burned, buried, or discarded at the construction site. These wastes shall be contained and removed in a timely and approved manner by the Contractor and workers, and disposed of at an appropriate waste landfill site located outside the work area.

.4 A concerted effort shall be made by the Contractor and workers to reduce, reuse and recycle materials where possible.

	.5	Sanitary facilities, such as portable container toilets, shall be provided by the Contractor and maintained in a clean condition.
1.17 Wastewater Discharge Criteria	.1	Wash water, meltwater collection, rinse water resulting from the cleaning of fuel tanks and pipelines, contaminated groundwater, and/or any other liquid effluent stream will be released onto the ground at a location that is a minimum of 30 metres from natural drainage courses and 100 metres from fish bearing waters, and will conform to the discharge requirements set out in the provincial Water Act Permit:
	.2	Contractor must obtain approval from the provincial Water Act Officer prior to discharging any treated wastewater.
1.18 Camp Wastewater Discharge Criteria	.1	Camp wastewater will be released onto the ground at a location that is a minimum of 30 metres from natural drainage courses and 100 metres from fish bearing waters and conform to the discharge requirements set out in the provincial Water Act Permit.
	.2	If unable to meet the discharge criteria, provide additional storage and/or treatment necessary to meet criteria prior to discharge.
	.3	Treat all camp wastewater to conform to the discharge requirements set out in the Water Act Permit.
	.4	No direct discharge is allowed to wetland or surface waters.
	.5	Contractor must obtain approval from the Water Act Officer prior to discharging treated wastewater.
1.19 Drainage	.1	Provide temporary drainage and pumping as necessary to keep excavations and site free from water. Drainage plans shall be part of the EPP.
	.2	Do not pump water containing suspended materials into waterways, sewer or drainage systems.
	.3	Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements such as the provincial Water Act.
	.4	Provide an erosion and sediment control plan that identifies type and location of erosion and sediment controls to be 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.

.5 Submit an Erosion, Sediment and Drainage Control Plan to Departmental Representative for review and approval prior to commencing Work in fisheries sensitive areas or in areas that may affect fisheries sensitive areas and specifically address the protection of water bodies, water courses, and the following:

.1 Details of grading Work to prevent surface drainage into or out of Work areas.

.2 Details of erosion control works and materials to be used, including the deployment of silt fencing, floating silt curtains and containment booms during construction and excavation activities.

.3 Work Schedule including the sequence and duration of all related Work activities.

.4 The treatment of site runoff to prevent siltation of watercourses.

.5 Dewatering procedures for excavated materials including silt removal procedures prior to discharge.

.6 Stabilizing procedures during excavation.

.7 Maintenance of filters and sedimentation traps.

.6 Any dewatering activities will be released onto the ground at a location that is a minimum of 30 metres from natural drainage courses and 100 metres from fish bearing waters.

.7 Have on hand sufficient pumping equipment, machinery, and tankage in good working condition for ordinary emergencies, including power outage, and competent workers for operation of pumping equipment.

1.20 Site Clearing, Plant Protection, and Nesting Bird Protection

.1 Any clearing done during nesting season must have a bird survey completed first and approved by the Departmental Representative. Information on nesting seasons can be found in the Peace Region Least Risk Timing Windows: Biological Rational (2009) produced by the BC provincial government.

.2 Protect trees and plants on site and adjacent properties where indicated.

.3 Wrap in burlap, trees and shrubs adjacent to construction

Work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.

.4 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.5 Minimize stripping of topsoil and vegetation.

.6 Restrict tree removal to areas indicated or designated by Departmental Representative.

1.21 Environment Protection Supplies

.1 Comply with federal and provincial fisheries and environmental protection legislation, including preventing the loss or destruction of fish habitat, and minimizing the impact of sedimentation, siltation or otherwise causing a degradation in water quality.

.2 Provide a minimum of 30 m or more and as required of polypropylene silt fence (typical height of 0.9 m) and the necessary stakes for installation. This will be used as necessary to prevent sediment transport into water bodies.

.3 Provide a minimum of 50 lineal metres or more and as required of 200 mm diameter hydrophobic, sorbent booms. This will be used as necessary to prevent the migration of hydrocarbons.

.4 Supply, transport, install and maintain erosion, sediment and drainage controls necessary to complete the Work in accordance with the requirements of Departmental Representative.

.5 At the completion of construction, dispose of used silt fence off-site as non-Hazardous Waste. Dispose of used absorbent boom in accordance with Section 02 61 33 - Hazardous Materials.

.6 Unused Erosion, Sediment and Drainage Control supplies will remain the property of Departmental Representative until the completion of the Contract.

.7 Provide inventory of environmental protection supplies prior to mobilization.

1.22 Notification

.1 Departmental Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, etc.

.2 Contractor: after receipt of such notice, shall inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

.3 Departmental Representative will issue stop order of Work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

1.23 Environmental Monitoring

.1 At a minimum the environmental monitoring shall be completed by P.Biol, RPBio, or Qualified Environmental Professional (QEP). If a QEP completes the monitoring, the QEP must work under the direction of the P.Biol or RPBio who completes the Environmental Protection Plan.

.2 The monitoring program must be anticipatory and responsive to construction practices or environmental changes, reflecting the site specific conditions, level of sensitivity of the receiving environment, potential adverse effects, and level of environmental risk. Submitted documents regarding the proposed monitoring program should clearly identify how monitoring will adhere to this approach.

.3 The monitoring program shall satisfy all regulatory requirements and terms of these specifications. The onus is on the Contractor to monitor and ensure compliance, to identify arising problems, and to subsequently take responsibility and all necessary measures in response.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 References.

.2 Definitions.

.3 Responsibilities.

.4 General.

.5 Quality Management Plan.

.6 Quality Control Personnel.

.7 Testing by the Contractor.

.8 Monitoring by the Contractor.

.9 Non-conformance Reports.

.10 Departmental Representative Inspection and Audits.

1.2 References

.1 British Columbia MoT – 2009 Standard Specifications for Highway Construction.

1.3 Definitions

.1 Quality Control (QC): The process of checking specific product or services to be determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory product or service performance.

.2 Quality Assurance (QA): The process of ensuring that the Contractor's Quality Management Plan (QMP) (QC, non-conformances, etc.) are being followed. The results of the QA are provided as feedback to the Contractor. Where required the Contractor shall implement changes to the project based on the feedback received from the QA process.

.3 Quality Management Plan (QMP): The complete details of the contractors plans and processes to ensure quality on the project.

1.4 Responsibilities

.1 The quality management responsibilities for this project are as follows:

.1 Quality Control – The Contractors responsibility.

.2 Quality Assurance – The Departmental Representatives responsibility.

.3 Quality Management Plan – Prepared by the

Contractor.

1.5 General

.1 The Contractor shall be responsible for all Quality Control during the performance of the work. Quality Control work includes monitoring, inspecting and testing the means, methods, materials, workmanship, processes and products of all aspects of the work as necessary to ensure conformance with the Contract.

.2 The Contractor shall provide unrestricted access to all Quality Control operations and documentation produced by or on behalf of the Contractor and shall allow the Departmental Representative full access at any time during working hours.

.3 The Departmental Representative will review the Contractor's performance of the work and determine the acceptability of the work based on the Departmental Representatives Quality Assurance results and, where deemed appropriate by the Departmental Representative, supplemented by the Contractor's Quality Control results.

.4 Work failing to meet the conditions of the Contract shall be considered a non-conformance. A non-conformance report will then be issued by the Contractor. Non-conforming work shall be removed / replaced from the work.

.5 The Contractor shall not be entitled to payment for work that lacks the appropriate Quality Control documentation, verified by the Quality Control Manager, as required by the Contract.

.6 The Contractor shall implement a well-coordinated approach to all operations related to the work and will organize its team and operations in keeping with the goal of doing things right the first time.

1.6 Quality Management Plan

.1 The Contractor shall prepare a Quality Management Plan. The purpose of the plan is to ensure the performance of the work in accordance with Contract requirements.

.2 The Contractor's Quality Management Plan shall be submitted to the Departmental Representative for review and acceptance. The Departmental Representative will review the plan (first submission and if required all subsequent re-submissions) within 10 days of submission. Upon review of the plan the Departmental Representative will either:

.1 Accept the plan.

.2 Accept portions of the plan and provide comments outlining required changes or additional information

in other sections. Following completion of edits, re-submit the plan for review.

.3 Reject the plan and provide comments outlining required changes or additional information needed. Following completion of edits, re-submit the plan for review.

.3 The Contractor shall allow time in the schedule for the reviews, and subsequent edits / re-submission.

.4 No work shall be undertaken on any element of Project Work (including payments, incidental work, or submittals for review) for which the applicable portions of the Quality Management Plan have not been accepted by the Departmental Representative.

.5 The Quality Management Plan is required to cover the work in its entirety, including without limitation all materials the Contractor and Subcontractors are supplying, monitoring and testing of the construction, monitoring of the existing infrastructure, and all items and phases of construction on the Project. At a minimum this shall include:

.1 Testing and survey completed by the Contractor (e.g. compaction, aggregate gradation, and tolerances of the work completed).

.2 Survey procedures undertaken to monitor for movement in the existing gabions and highway road survey during construction.

.3 Procedures for all aspects of the project including but not limited to review of the work to determine conformance with the contractual requirements.

.4 The environmental monitoring and reporting procedures to assure that the work is being completed in compliance with the requirements of DFO Authorization for Instream Work and all other applicable regulations including the requirements of these specifications.

.5 The Quality Control Plan shall include samples of all forms to be filled in by the Quality Control Personnel. All forms shall be signed by the Quality Control Manager and submitted promptly to the Departmental Representative.

.6 Procedures for the review of the shop drawings prior

to submission to the Departmental Representative for approval.

.6 The Contractor shall appoint qualified, and experienced Quality Control Personnel (Quality Control Manager and Quality Control Staff), who are dedicated to quality matters and who will report regularly to the Contractor's management at a level which shall ensure that Quality Management requirements are not subordinated to manufacturing, construction or delivery.

.7 The Quality Management Plan will include the following information:

.1 The name of the Quality Control Manager and qualifications establishing a proven capability to provide the specific services required for the Project.

.2 The name of Quality Control testing agencies and their proven capability to provide the specific services required for the Project.

.3 A listing of Quality Control Staff (including names, qualifications and relevant experience) and their assigned roles and work scheduling in performing Quality Control duties.

.4 A list of testing equipment to be used for the work.

.8 The Quality Management Plan should describe how the Quality Control Personnel are allocated to Project requirements, the tasks assigned to each, and how their work will be coordinated.

.9 The Contractor shall ensure that all workers are familiar with the Quality Management Plan, its goals, and their role under it, as well as the Contract Specifications associated with the work they are to undertake.

1.7 Quality Control Personnel

.1 The Quality Control Personnel shall remain on site at all times the Contractor is performing work which must be tested or inspected in-process, and must be readily accessible and able to return when off-site.

.2 At a minimum the Quality Control Manager shall:

.1 Be empowered by the Contractor to resolve Quality Control matters.

.2 Direct and monitor Quality Control work completed

by Quality Control testing agencies and Quality Control Staff.

.3 Review, sign, and be responsible for all reports (material and testing results).

.4 Stop work when material, product, processes or submittals are deficient.

.5 Complete internal Non-conformance Reports (NCR's).

.6 Respond to NCR's issued by the Departmental Representative.

1.8 Testing By the Contractor

.1 Testing required to provide Quality Control to assure that the work strictly complies with the Contract requirements shall be completed by the Contractor and at a minimum include:

.1 All testing required to confirm aggregate gradation and compaction where specified.

.2 All testing specified in the Contract Documents.

.3 Any other testing required as a condition for deviation from the specified Contract procedures.

.2 The frequency of testing shall be outlined in the Quality Management Plan. At a minimum the Contractor shall achieve the most stringent Quality Control testing frequencies as follows:

.1 The specific frequencies defined elsewhere in these specifications.

.2 The minimum QC testing frequencies as defined in the table below.

Table: Minimum QC Testing Frequencies

Activity	Test / Inspection	Frequency
Supply – Structural Fill	Standard Direct Shear Test	As required to provide results from one test using the chosen material (mixture if required) achieves shear requirements. Note: Test not require if gradation test results indicate that 20% of the material is greater than 19 mm in diameter.

Supply – 19 mm Minus Base Course (Granular Base Course and Gravel Shouldering)	Gradation	3 tests evenly distributed over the duration of the project (only required should the contractor choose to supply the 19 mm material from other sources, rather than from the owner supplied material).
Supply – Structural Fill	Gradation	3 tests evenly distributed over the duration of the project
Sorting – Facing Stone, Gabion Mat Fill	Gradation	3 tests evenly distributed over the duration of the project
Site Tolerance – Structural Fill	Survey	Final lift and each lift coinciding with Geogrid course
Site Tolerance – Granular Base Course	Survey	Final lift
Compaction – Structural Fill	In-Place Density	3 per lift
Compaction – Granular Base Course	In-Place Density	3 per lift

.3 Quality Control Testing agencies, their inspectors, and their representatives are not authorized to revoke, alter, relax, enlarge or release any requirement of the Contract Documents, nor to approve or accept any part of the work.

.4 The Contractor shall complete testing in the following manner:

.1 Provide testing facilities and personnel for the tests and inform the Departmental Representative in advance to enable the Departmental Representative to witness the tests if so desired.

.2 Notify the Departmental Representative when sampling will be conducted.

.3 Within one day after completion of testing, submit test results to the Departmental Representative.

.4 Identify test reports with the name and address of the organization performing all tests, and the date of the tests.

1.9 Monitoring by the Contractor

.1 Monitoring of the existing gabions and highway roadway surface shall be completed by the contractor. The purpose of this monitoring is to quantify any movement in the infrastructure as a result of the construction activities and allow for corrective action should it be required.

.2 The method, frequency, and locations of monitoring shall be outlined in the Quality Management Plan. At a minimum the,

method, frequency, and locations of the monitoring shall achieve the most stringent of the following:

.1 The specific frequencies and locations defined elsewhere in these specifications.

.2 The monitoring locations and frequencies as defined in the table below.

Table: Minimum Monitoring Locations and Frequencies

Infrastructure	Monitoring Method	Monitoring Location	Frequency
Existing Highway Driving Surface	Survey of Elevations	5 point locations evenly distributed around the outside limits of each excavation (min 1 m offset from edge of excavation)	Once per day until the backfill and compaction of the excavation is complete
Existing Gabions	Survey of Elevations and Offset from CL	One point location every 5 m of gabion length	Once per every row of retaining wall system units installed, or every 457 mm of retaining wall height installed.

1.10 Non-Conformance Reports

.1 The Contractor shall and the Departmental Representative may review the work to determine conformance with the contract requirements.

.2 Should the Contractor's Quality Control reporting indicate that the work is not in conformance, the Quality Control Manager shall issue an internal Non-Conformance Report (NCR) to the Contractor, with a copy to the Departmental Representative, including a response time.

The Contractor shall then respond to the Quality Control Manager, with a copy to the Departmental Representative, with respect to the NCR, within the specified time, with proposed resolutions and corrective actions. The Contractor and/or the Quality Control Manager may consult with the Departmental Representative on the resolutions but is not required to do so. Payment for the work for which the NCR has been issued may be withheld until the NCR issue is resolved.

.3 Should the Departmental Representative Quality Assurance reporting indicate that the work is not in conformance, the Departmental Representative will issue to the Contractor a NCR, including a response time.

The Contractor shall then respond to that NCR, within the

specified time, with proposed resolutions and corrective actions. The Departmental Representative will accept or reject the proposed resolution and corrective action proposal.

Quality Assurance testing and inspection may be performed by the Departmental Representative to determine if the corrective action has provided an acceptable product. Acceptance and rejection will continue until the Departmental Representative determines that a quality product has been achieved.

Payment for the work for which the NCR has been issued may be withheld until the NCR issue is resolved.

.4 If in the opinion of the Departmental Representative it is not expedient to correct non-conforming work or work not performed in accordance with Contract Documents, the Departmental Representative may deduct from the Contract Price the difference in value between work performed and that called for by Contract Documents, the amount of which shall be determined by the Departmental Representative.

1.11 Departmental Representative Inspection and Audits

.1 The Departmental Representative may perform quality assurance audits as desired. Such audits will not relax the responsibility of the Contractor to perform work in accordance with Contract Documents.

.2 Allow the Departmental Representative access to work. If part of the work is in preparation at locations other than the place of work, allow access to such work whenever it is in progress.

.3 If Contractor covers, or permits to be covered, work that has been designated for Quality Assurance testing, inspections, or approvals before such is made, uncover such work, have inspections or tests satisfactorily completed, and make good such work.

.4 Independent Inspection/Testing Agencies may be engaged by the Departmental Representative for the purpose of Quality Assurance inspection and/or testing portions of the work. Costs of such services will be borne by the Departmental Representative.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes	.1	Installation and removal.
	.2	Scaffolding.
	.3	Hoisting.
	.4	Site storage/loading.
	.5	Security.
	.6	Equipment, tool, and materials storage.
	.7	Sanitary facilities.
	.8	Construction signage.
	.9	Construction laydown area and office.
	.10	Power.
	.11	Communications.
	.12	Temporary heating, ventilation, and lighting.
	.13	Fire protection.
1.2 Installation and Removal	.1	Provide construction facilities in order to execute work expeditiously.
	.2	Remove from site all such work after use.
1.3 Scaffolding	.1	Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, and temporary stairs as necessary to carry out work.
1.4 Hoisting	.1	Provide, operate, and maintain hoists and cranes as necessary for moving of workers, materials, and equipment.
	.2	Hoists and cranes shall be operated by qualified operators.
1.5 Site Storage/Loading	.1	Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
	.2	Do not load or permit to load any part of work with a weight or force that will endanger the work or existing infrastructure.

1.6 Security	.1	Provide and pay for responsible security personnel as required.
1.7 Equipment, Tool, and Materials Storage	.1	If required by the Contractor provide and maintain, in a clean and orderly condition, lockable weather proof sheds for storage of tools, equipment and materials.
	.2	Locate materials not required to be stored in weatherproof sheds on-site in a manner to cause least interference with public.
1.8 Sanitary Facilities	.1	Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
	.2	Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
1.9 Construction Signage	.1	No other signs or advertisements, other than those required by Section 01 35 14 – Traffic Control, are permitted on-site.
1.10 Construction Laydown area and Office	.1	Confine construction laydown area and office to the locations identified below as approved by the Departmental Representative.
	.1	Within highway right of way, preferably on areas previously disturbed and off the traveled potion of the highway.
	.2	Other areas as pre-approved by the Departmental Representative.
1.11 Power	.1	Provide and pay for power as required for the completion of the works and operations of construction office.
1.12 Communications	.1	Provide and pay for telephone communications facilities on-site as required.
1.13 Temporary Heating, Ventilation, and Lighting	.1	Provide temporary heating, ventilation, and lighting as required during construction period to facilitate construction of the works.
1.14 Fire Protection	.1	Provide and maintain temporary fire protection equipment during performance of work.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Progressive cleanliness.

.2 Final cleaning.

1.2 Project Cleanliness

.1 Maintain work in a tidy condition, free from accumulation of waste products and debris.

.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by the Departmental Representative.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide wildlife resistant containers for collection of waste materials and debris.

.5 Dispose of waste materials and debris off-site.

1.3 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, debris, and materials used in construction. Re-instate the work site to a condition equal to or better than the site condition prior to construction and to the satisfaction of the Departmental Representative.

.3 Eliminate uneven areas and low spots and restore drainage patterns.

.4 Prior to final review, remove surplus products, tools, construction machinery, and equipment.

.5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.6 Inspect finishes and fitments and ensure specified workmanship and operation.

.7 Remove dirt and other disfiguration from exterior surfaces.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Inspection and declaration.

1.2 Inspection and Declaration

.1 Contractor's Inspection: Contractor and all subcontractors shall conduct an inspection of work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify the Departmental Representative in writing of satisfactory completion of the Contractor's Inspection and that corrections have been made.

.2 Request the Departmental Representative's Inspection.

.2 Departmental Representative's Inspection: The Departmental Representative and Contractor will perform inspection of work to identify obvious defects or deficiencies. Contractor shall correct work accordingly.

.3 Completion: Submit written certification that the following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Work is complete and ready for final inspection.

.4 Final Inspection: When the items noted above are completed, request final inspection of work by the Departmental Representative and Contractor. If work is deemed incomplete by the Departmental Representative, complete the outstanding items and request re-inspection.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Submissions.

.2 As-built drawings.

.3 Recording actual side conditions.

1.2 Submissions

.1 Submit submissions for Departmental Representative review. Following each review the submission will be returned with the Departmental Representative's comments. Revise and re-submit submission per the comments provided.

.2 Provide the following submissions to the Departmental Representative within two weeks of substantial performance:

.1 As-built drawing mark-ups.

.2 Shop drawing mark-ups.

1.3 As-Built Drawings

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

.2 Keep record documents available for inspection by the Departmental Representative.

.3 Submit one copy of Issued for Construction drawings and Shop Drawings (if applicable) which have been marked-up by the Contractor to reflect any changes in the construction.

1.4 Recording Actual Site Conditions

.1 The Departmental Representative will provide two sets of Issued for Construction (or Issued for Tender) drawings for use by the Contractor to record as-built conditions.

.2 Record information concurrently with construction progress on the Issued for Construction drawings. Do not conceal work until the required information is recorded.

.3 Legibly mark each item on the Issued for Construction drawings and Shop Drawings in red ink to record actual construction conditions and any changes made by addenda and change orders.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Definitions.

.2 Submittals.

.3 Storage and handling.

.4 Transportation.

.5 Materials.

.6 Disposal.

1.2 Definitions

.1 Dangerous Goods: Product, substance, or organism that is specifically listed or meets the hazard criteria established in Transportation of Dangerous Goods Regulations.

.2 Hazardous Material: Product, substance, or organism that is used for its original purpose and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.

.3 Hazardous Waste: Any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment, or disposal.

.4 Workplace Hazardous Materials Information System (WHMIS): A Canada-wide system designed to give employers and workers information about hazardous materials used in the workplace. Under WHMIS, information on hazardous materials is to be provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by a combination of federal and provincial laws.

1.3 Submittals

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit to the Departmental Representative a current Material Safety Data Sheet (MSDS) for each hazardous material required prior to bringing hazardous material on-site.

.3 Submit Hazardous Materials Management Plan to the Departmental Representative that identifies all hazardous materials, their use, their location, personal protective equipment requirements, and disposal arrangements.

1.4 Storage and Handling

.1 Abide by internal requirements for labeling and storage of

materials and wastes. If required coordinate storage of hazardous materials with the Departmental Representative.

.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 current National Fire Code of Canada requirements.

.4 Store all flammable and combustible liquids in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval.

.5 Transfer of flammable and combustible liquids is prohibited within buildings.

.6 Transfer of flammable and combustible liquids will not be carried out in the vicinity of open flames or any type of heat-producing devices.

.7 Flammable liquids having a flash point below 38°C, such as naptha or gasoline, will not be used as solvents or cleaning agents.

.8 Store flammable and combustible waste liquids for disposal in approved containers located in a safe, ventilated area. Keep quantities to a minimum.

.9 Observe smoking regulations at all times. Smoking is prohibited in any area where hazardous materials are stored, used, or handled.

.10 Abide by the following storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 L for liquids:

.1 Store hazardous materials and wastes in closed and sealed containers that are in good condition.

.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 not mixed.

.6 Store hazardous materials and wastes in a secure storage area with controlled access.

.7 Maintain a clear egress from storage area.

.8 Store hazardous materials and wastes in a manner and location which will prevent them from spilling into the environment.

.9 Have appropriate emergency spill response equipment available near the storage area, including personal protective equipment.

.10 Maintain an inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.

.11 Ensure personnel have been trained in accordance with WHMIS requirements.

.12 Report spills or accidents involving hazardous materials immediately to the Provincial Emergency Program 24 hour phone line at 1-800-663-3456, other local authority having jurisdiction, and the Departmental Representative. Submit a written spill report to the Departmental Representative within 24 hours of incident.

.13 Store and handle all hazardous materials away from any water course as outlined in Section 01 35 43 – Environmental Protection.

1.5 Transportation

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

.2 If exporting hazardous waste to another country, ensure compliance with federal Export and Import of Hazardous Waste Regulations.

PART 2 – PRODUCTS

2.1 Materials

.1 Only bring on-site the quantity of hazardous materials required to perform work.

.2 Maintain MSDS in proximity to where the materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

PART 3 – EXECUTION

3.1 Disposal

.1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines. Costs for disposal to be considered incidental to the work.

.2 Recycle hazardous wastes for which there is an approved, cost-effective recycling process available.

.3 Send hazardous wastes only 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 a timely fashion in accordance with applicable provincial regulations.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes	.1	Measurement and Payment Procedures
	.2	Definitions
	.3	Log Removal
	.4	Riprap Removal
	.5	Gabion Removal
1.2 Measurement and Payment Procedures	.1	Payment for removal of selected existing gabions and existing riprap will be made on the basis of the Price per Unit Bid for Selective Site Demolition in the Bid and Acceptance Form. The Price per Unit Bid shall include all costs for the removal, transport, disposal or stockpiling, and all other items necessary for successful completion of the work.
	.2	Measurement for Payment for Selective Site Demolition will be made by Lump Sum of the work completed and accepted by the Departmental Representative.
	.3	Measurement for Payment for Selective Site Demolition at Area 1 will not be made. Any Measurement for Payment for Selective Site Demolition at Area 1 will be considered incidental to the work.
1.3 Definitions	.1	Riprap: angular rock material with an average diameter equal to or greater than 200 mm.

PART 2 – PRODUCTS

	.1	Not Used

PART 3 – EXECUTION

3.1 Log Removal	.1	Upon acceptance of Environmental Protection Plan and implementation of any required erosion, drainage, and sediment control as specified in the Environmental Protection Plan, discuss with and gain approval from the Departmental Representative for the removal of existing loose / floating logs along the shoreline of Muncho Lake which impede the work. Relocate the logs to a shoreline location within 100 m north or 100 m south of the project site pre-approved by the Departmental Representative.
	.2	Logs which are buried within the highway embankment or tied to timber cribbing with wire rope are not be removed or disturbed by the Contractor.

3.2 Riprap Removal

.1 Upon acceptance of Environmental Protection Plan and implementation of any required erosion, drainage, and sediment control as specified in the Environmental Protection Plan, remove existing riprap within the limits of the works as shown on the contract drawings. Stockpile riprap suitable for re-use onsite.

.2 Transport riprap materials too large or unneeded as riprap to PWGSC's Km 698 Maintenance Yard and stockpile in a location pre-approved by the Departmental Representative.

3.3 Gabion Removal

.1 Upon acceptance of Environmental Protection Plan and implementation of any required erosion, drainage, and sediment control as specified in the Environmental Protection Plan, remove existing gabion baskets (gabions) and gabion fill materials designated for removal within the limits of the works as shown on the contract drawings.

.2 Use extreme care not to disturb or damage gabions designated to remain in place. Where required dismantle gabions designated for removal by cutting the gabion wire mesh using hand tools.

.3 Remove and temporarily stockpile (for later re-use in gabion mats) existing gabion rock fill removed from gabions designated for removal (see Section 31 05 16 – Aggregate Materials). Use care to ensure gabion mat rock fill does not fall into Muncho Lake during the removal process.

.4 To the Departmental Representatives satisfaction, repair with spenax fasteners and / or gabion lacing wire any damage to gabions designated to remain in place and ensure gabions are free of loose gabion wire mesh.

.5 Dispose of gabions designated for removal at an off-site disposal facility acceptable to the Departmental Representative.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Measurement and Payment Procedures.

.2 Structural Fill.

.3 19 mm Minus Base Course.

.4 Facing Stone.

.5 Gabion Mats Rock Fill.

.6 Sampling by the Departmental Representative.

.7 Handling and Transportation.

.8 Stockpilling.

.9 Cleaning.

1.2 Measurement and Payment Procedures

.1 Measurement and Payment for Aggregate Materials shall be incidental to the applicable work included in Section 31 14 11 – Gravel Shouldering, Section 31 23 33 – Excavation and Backfill, Section 31 36 19 – Gabion Mats, Section 32 32 34 – Retaining Wall, any other section as required by these specifications.

1.3 References

.1 British Columbia Ministry of Transportation and Infrastructure (BC MoT) – 2012 Standard Specifications for Highway Construction.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM C136 (latest edition), Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.2 ASTMD2487 (latest edition), Standard Practice for Classification of Soils for Engineering Purposes (United Soil Classification System).

PART 2 – PRODUCTS

2.1 Structural Fill

.1 Pit run material and previously manufactured and stockpiled 19 mm Minus Base Course material are available "as is" from PWGSC's Km 712 Pit for screening / manufacture by the contractor into Structural Fill Material. Alternatively the Contractor may choose to supply all or part of the aggregate from other sources. Should the Contractor elect to supply all or part of the aggregate from other sources, any

additional costs incurred will be incidental to the Unit Rate Bids for the different material types.

.2 The Contractor may visit the Km 712 Pit and take samples of the available materials to assist in defining the level of effort the Contractor will need to undertake to achieve gradation and compaction requirements or assist with any other concerns.

.3 The PWGSC supplied material shall be screened / manufactured by the contractor to ensure the material conforms with the following requirements:

.1 The material shall consist of hard durable particles free from clay lumps, frozen material, organic matter (max 1% by volume, max 2% fine organic material when tested in accordance with ASTM 02974) and other deleterious materials.

.2 When tested in accordance to ASTM C136, or latest issue, the material shall have a gradation conforming to the following gradation limits:

Structural Fill	
Sieve Designation (mm)	**Percent Passing by Weight**
100	100
0.425	0 - 60
0.075	0 - 5

.3 When tested in accordance to ASTM C136, or latest issue, the material gradation shall have a Coefficient of Uniformity (Cu) of 3 or greater and a Coefficient of Curvature (Cc) of between 1 and 3 as defined by ASTM D2487.

.4 Should more than 80% of the material be less than 19 mm in diameter, the material shall exhibit an angle of internal friction of not less than 34 degrees as determined by the Standard Direct Shear test (ASTM D 3080), on the portion of material passing a 2 mm sieve, utilizing a sample of material compacted to 95% of maximum dry density as per ASTM D698 at optimum moisture content.

.4 Should the contractor choose to supply all or part of the Structural Fill from other sources, the Structural Fill shall conform with the following requirements:

.1 The requirements for Structural Fill produced from the PWGSC supplied pit run material listed above in 2.1.3.

.2 The material shall be substantially free of shale or soft, poor quality particles. The material shall have a magnesium sulfate soundness (ASTM C88) loss of less than 30% after four cycles.

2.2 19 mm Minus Base Course

.1 Previously manufactured and stockpiled 19 mm Minus Base Course is available "as is" for use by the contractor as an aggregate source for Gravel Shouldering and Granular Base Course. The 19 mm Minus Base Course has been previously stockpiled at PWGSC's Km 712 Pit. Alternatively the Contractor may choose to supply all or part of the aggregate from other sources. Should the Contractor elect to supply all or part of the aggregate from other sources, any additional costs incurred will be incidental to the Unit Rate Bids for the different material types.

.2 The Contractor may visit the material stockpiled by PWGSC and take samples to assist in defining the level of effort the Contractor will need to undertake to achieve compaction requirements or assist with any other concerns.

.3 Should the contractor choose to supply all or part of the aggregate from other sources, the 19 mm Minus Base Course shall conform with the requirements of 25 mm WGB – Base Course as specified in the BC MoT 2012 Standard Specifications for Highway Construction, see Section 202 – Granular Surfacing, Base and Sub-bases.

2.3 Facing Stone

.1 Facing Stone shall be from the following sources:

.1 Previously stockpiled rock material at PWGSC's the Km 712 Pit or Wood Creek Quarry (Km 650), (See Section 01 11 10 – Summary of Work, 1.6 – Owner Supplied Materials). The rock material shall be sorted or screened by the Contractor into material achieving the Facing Stone requirements.

.2 Existing Pit Run Material from Km 712 Pit (See Section 01 11 10 – Summary of Work, 1.6 – Owner Supplied Materials). The Contractor will be responsible for screening / manufacture of the pit run material into material achieving the Facing Stone requirements.

.3 From other sources should the contractor choose.

Should the Contractor elect to supply all or part of the aggregate from other sources, any additional costs incurred will be incidental to the Unit Rate Bids for the different material types.

.2 The Contractor may visit the material stockpiled by PWGSC and take samples to assist in defining the level of effort the Contractor will need to undertake to sort / screen the material to achieve gradation requirements or assist with any other concerns.

.3 The Facing Stone shall conform with the following requirements:

.1 When tested in accordance to ASTM C136, or latest issue, the material shall have a gradation conforming to the following gradation limits:

Facing Stone	
Sieve Designation (mm)	**Percent Passing by Weight**
100	100
50	0 -10

.2 Stone consisting of hard durable particles free from clay lumps, frozen material and other deleterious materials, and free from splits, seams or defects likely to impair its soundness during handling.

.4 Should the Contractor elect to supply all or part of the Facing Stone from other sources, the material shall conform with the following requirements:

.1 The requirements for the Facing Stone produced from the PWGSC supplied rock material listed above in Section 2.3.3.

.2 Have a relative density: to ASTM C127, not less than 2.65.

2.4 Gabion Mat Rock Fill

.1 Gabion Mat Rock Fill shall be from the following sources:

.1 The rock fill removed and temporarily stockpiled from the existing gabions designated for removal from the site.

.2 Previously stockpiled rock material at PWGSC's the Km 712 Pit or Wood Creek Quarry (Km 650), (See Section 01 11 10 – Summary of Work, 1.6 –

Owner Supplied Materials). The rock material shall be sorted or screened by the Contractor into material achieving the Gabion Mat Rock Fill requirements.

.3 Existing Pit Run Material from Km 712 Pit (See Section 01 11 10 – Summary of Work, 1.6 – Owner Supplied Materials). The Contractor will be responsible for screening / manufacture of the pit run material into material achieving the Gabion Mat Rock Fill requirements.

.4 From other sources should the contractor choose. Should the Contractor elect to supply all or part of the aggregate from other sources, any additional costs incurred will be incidental to the Unit Rate Bids for the different material types.

.2 The Contractor may visit the material stockpiled by PWGSC and take samples to assist in defining the level of effort the Contractor will need to undertake to sort / screen the material to achieve gradation requirements or assist with any other concerns.

.3 The Gabion Mat Rock Fill shall conform with the following requirements:

.1 Stone consisting of hard durable particles free from clay lumps, frozen material and other deleterious materials, and free from splits, seams or defects likely to impair its soundness during handling or under action of water.

.2 When tested in accordance to ASTM C136, or latest issue, the material shall have a gradation conforming to the following gradation limits:

Gabion Mat Rock Fill	
Sieve Designation (mm)	**Percent Passing by Weight**
200	100
150	30 - 70
100	0

.3 Neither the breath or the thickness of any individual piece of material is to be less than one-third of its length. A maximum of 2.0 percent by weight of such pieces will be permitted.

.4 Should the Contractor elect to supply all or part of the Gabion Mat Rock Fill from other sources, the material shall conform with the requirements of:

.1 The requirements for the Gabion Mat Rock Fill produced from the PWGSC supplied rock material listed above in Section 2.4.3.

.2 Have a relative density: to ASTM C127, not less than 2.65.

2.5 Riprap

.1 Riprap shall be from the following sources:

.1 Riprap removed (suitable for reuse) and temporarily stockpiled from the site.

.2 Previously blasted rock material at PWGSC's Wood Creek Quarry (Km 650), (See Section 01 11 10 – Summary of Work, 1.6 – Owner Supplied Materials). The rock material shall be sorted or screened by the Contractor into material achieving the Riprap requirements.

.3 From other sources should the Contractor choose. Should the Contractor elect to supply all or part of the aggregate from other sources, any additional costs incurred will be incidental to the Unit Rate Bids for the different material types.

.2 The Contractor may visit the material stockpiled by PWGSC and take samples to assist in defining the level of effort the Contractor will need to undertake to sort / screen the material to achieve gradation requirements or assist with any other concerns.

.3 The Riprap shall conform with the following requirements:

.1 Crushed / blasted angular stone consisting of hard durable particles free from clay lumps, frozen material and other deleterious materials, and free from splits, seams or defects likely to impair its soundness during handling or under action of water.

.2 When tested in accordance to ASTM C136, or latest issue, the material shall have a gradation conforming to the following gradation limits:

Riprap

Sieve Designation (mm)	Percent Passing by Weight
600	100
400	20 - 50
200	0

.3 Neither the breath or the thickness of any individual piece of material is to be less than one-third of its length. A maximum of 2.0 percent by weight of such pieces will be permitted.

.4 Should the Contractor elect to supply all or part of the Riprap from other sources, the material shall conform with the requirements of:

.1 The requirements for the Riprap listed above in Section 2.5.3.

.2 Have a relative density: to ASTM C127, not less than 2.65.

PART 3 – EXECUTION

3.1 QA Sampling by the Departmental Representative

.1 Provide Departmental Representative with access to source and processed material for sampling during production.

.2 Install sampling facilities at discharge end of production conveyor, to allow Departmental Representative to obtain representative samples of items being produced. Stop conveyor belt when directed by Departmental Representative to permit full cross section sampling.

.3 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

.4 Aggregates that do not meet specified tolerances for intended use are subject to rejection by the Departmental Representative as part of the QA process.

3.2 Handling and Transportation

.1 Avoid segregation, contamination, and degradation of aggregate during handling and transporting.

.2 Load limit restrictions will be in accordance with British Columbia Highway Traffic Act pertaining to registered weight limits and vehicle size.

.3 Repair and maintain stockpile / laydown areas as necessary to a condition equal to or better than when work began.

3.3 Stockpiling

.1 Stockpile aggregates in locations approved by Departmental Representative and not closer than 1.5 m from the edge of the excavation slopes. Do not stockpile on completed pavement surfaces.

.2 Stockpile aggregates in sufficient quantities to meet project schedules.

.3 Stockpile 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 crushed gravel base not less than 100 mm in depth to prevent contamination of aggregate. Do not incorporate compacted base of pile into work.

.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative.

.7 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpiles as required to prevent segregation.

.8 Do not cone piles or spill material over edges of piles.

.9 Do not use conveying stackers.

.10 Prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.4 Cleaning

.1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.2 Leave any unused aggregates in neat compact stockpiles in locations directed by Departmental Representative.

.3 For temporary or permanent abandonment of aggregate source, restore source to conditions directed by Departmental Representative.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes	.1	Measurement and Payment Procedures.
	.2	References.
	.3	Materials.
	.4	Placement.
	.5	Maintenance.
1.2 Measurement and Payment Procedures	.1	Measurement and Payment for Gravel Shouldering shall be incidental to the applicable work included in Section 01 35 14 – Traffic Control and any other section as required by these specifications.
1.3 References	.1	American Society for Testing and Materials (ASTM)
		.1 ASTM D698 (latest edition), Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft^3 (600 kN-m/m^3)).

PART 2 – PRODUCTS

2.1 Materials	.1	Gravel Shouldering materials shall be 19 mm Minus Base Course material in accordance with Section 31 05 16 – Aggregates.

PART 3 – EXECUTION

3.1 Placement	.1	Place Gravel Shouldering to the lines and grades shown on the Contract Drawings (where required) to ensure a minimum of a 5 m wide temporary traffic lane (with a maximum 3% cross fall) and a 1 m wide shoulder (adjacent to the excavation, incudes width of concrete barrier) is available to traffic once the temporary traffic control measures (single lane alternating traffic) has been implemented.
	.2	Finished surfaces of Gravel Shouldering shall be within +/- 25 mm of the lines and grades shown in the Contract Drawings but not uniformly high or low.
	.3	Compact Gravel Shouldering to 95% maximum dry density in accordance with ASTM D698.
3.2 Maintenance	.1	Complete maintenance on all shouldering within the temporary traffic lane, including the grading, compaction,

and if required additional placement of 19 mm Minus Base Course material, to ensure gravel shouldering is free of potholes, washboard, high or low spots greater than +/- 25 mm, and maintains a maximum 3% cross fall for the duration of the temporary traffic control measures (single land alternating traffic).

3.3 Clean-up

.1 At the completion of the work following reinstatement of the two-way traffic, remove any of the placed gravel shouldering which adversely effects the drainage of surface run-off or gravel shouldering identified by the Departmental Representative as requiring removal. Excavate, transport, and place removed gravel shouldering material to PWGSC's Km 698 Maintenance Yard. All material disposed of at PWGSC's 698 Maintenance Yard shall be stockpiled within the disposal area pre-approved / marked by the Departmental Representative.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Measurement and Payment.

.2 References.

.3 Definitions.

.4 Structural Fill.

.5 Nonwoven Geotextile.

.6 Granular Base Course.

.7 Riprap.

.8 Excavation.

.9 Rock Excavation.

.10 Disposal of Excavated Material.

.11 Placement of Structural Fill.

.12 Placement of Granular Base Course.

.13 Placement of Riprap Associated Nonwoven Geotextile.

1.2 Measurement and Payment Procedures

.1 Measurement and Payment for Excavation and Backfill shall be incidental to the applicable work included in Section 32 32 34 – Retaining Wall.

1.3 References

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM D698 (latest edition), Test method for Laboratory Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft^3 (600 kN-m/m^3)).

.2 British Columbia MoT – 2009 Standard Specifications for Highway Construction.

1.4 Definitions

.1 Excavation: Includes highway embankment materials, boulders, or loose rock fragments that are smaller than 1.5 m^3 or materials which can be excavated with a 20 tonne or smaller excavator equipped with a rock bucket.

.2 Rock Excavation: Includes bedrock, boulders, or loose rock fragments larger than 1.5 m^3 and require blasting to

facilitate excavation with a 20 tonne or larger excavator equipped with a rock bucket.

PART 2 – PRODUCTS

2.1 Structural Fill

.1 Retaining Wall backfill shall be:

.1 All excavation areas 0.1 m above water level at the time of construction and higher: Structural Fill material in accordance with Section 31 05 16 – Aggregates.

.2 All excavation areas below water level to 0.1 m above water level at the time of construction: Gabion Mat Rock Fill in accordance with Section 31 05 16 – Aggregates, wrapped with Nonwoven Geotextile.

2.2 Nonwoven Geotextile

.1 The Nonwoven Geotextile shall be Nilex 4551 or pre-approved equivalent.

2.3 Granular Base Course

.1 Granular Base Course shall be 19 mm Minus Base Course material in accordance with Section 31 05 16 – Aggregates.

2.4 Riprap

.1 Riprap shall be in accordance with Section 31 05 16 – Aggregates.

PART 3 – EXECUTION

3.1 Monitoring

.1 Complete monitoring of the existing gabions and the highway driving surface as per the requirements of Section 01 45 00 – Quality Management and Section 31 23 33 – Excavation and Backfill throughout the excavation and backfill of the Retaining Wall.

.2 Provide the results of the monitoring to the Departmental Representative on a daily basis or per the frequency requested.

.3 Should the monitoring results show that movement in the existing gabions and or the highway driving surface, stop work, notify the Departmental Representative, and await further instructions from the Departmental Representative before proceeding.

3.2 Excavation

.1 Excavate BST and highway embankment to facilitate the construction of the gabion mats and Retaining Wall. Excavate to within +/- 50 mm of the lines and grades as indicated on the Contract Drawings but not uniformly high or low. Excavation not to exceed the maximum excavation

limits shown on the Contract Drawing.

.2 Complete the excavations in compliance with the Occupational Health and Safety Regulations applicable to the location of the work. Temporary cutslopes required for excavation are the responsibility of the Contractor. Any excavations deeper than 1.2 m shall be reviewed for slope safety by the Contractor to the satisfaction of the Departmental Representative prior to workers entering the excavation.

.3 Should precipitation be expected prior to backfill of the excavation, cover the excavation slopes with a layer of polyethylene sheeting securely tied to resist wind action. Direct surface runoff away from excavation using appropriate erosion control measures.

.4 Complete all work within Muncho Lake in accordance with the MFLNRO Section 9 Approval for Instream Work, and the EPP prepared for this work, see Section 01 35 43 – Environmental Protection for more details.

.5 If required, remove existing signage and posts within the limits of the work to facilitate the excavation.

.6 Use extreme care during excavation to prevent destabilizing the existing highway embankment slope. Stop work and immediately notify the Departmental Representative if materials such as timber cribbing, wire rope, corduroy / timber logs, or other unexpected materials are encountered.

.7 Notify and allow inspection of the full excavation by the Departmental Representative prior to the commencement and install of the Retaining Wall, Geogrid, and Structural Fill. If required by the Departmental Representative, complete additional excavation and backfill with Structural Fill and or Gabion Mat Rock Fill to the limits and depths directed (costs for additional excavation and fill to be paid via Change Order).

3.3 Rock Excavation

.1 Rock excavation is not anticipated on this project. The Contractor shall notify the Departmental Representative if rock excavation is required and await instructions from the Departmental Representative before proceeding with any rock excavation.

3.4 Disposal of Excavated Material

.1 BST and excavated road material forming the highway embankment shall be disposed of within the PWGSC's Km 698 Maintenance Yard or other disposal locations pre-approved by the Departmental Representative. All

excavated material disposed of at PWGSC's Km 698 Maintenance Yard shall be stockpiled within the disposal area pre-approved / marked by the Departmental Representative

3.5 Placement of Structural Fill

.1 Complete all work within Muncho Lake in accordance with the MFLNRO Section 9 Approval for Instream Work, and the EPP prepared for this work, see Section 01 35 43 – Environmental Protection for more details.

.2 Place Structural Fill materials on a properly shaped surface and properly placed Geogrid material per the lines and grades shown in the Contract Drawings and free from debris, snow and ice, organic material, or other deleterious material.

.3 Place Structural Fill in continuous horizontal layers with a maximum of 300 mm loose lift thickness. Compact each layer to 95% maximum dry density in accordance with ASTM D698. Following compaction ensure layer of Structural Fill is within +/- 25 mm of the lines and grades shown on the contract drawings. Place succeeding layer of Geogrid once Structural Fill is within design lines and grades and has achieved compaction requirements.

.4 Backfill of all excavation areas below water level to 0.1 m above water level (at the time of construction) with Gabion Mat Rock Fill material wrapped with Nonwoven Geotextile.

.5 Use care during placement of Structural Fill and use appropriately sized compaction equipment to ensure that the Retaining Wall does not deviate from design lines and grades during the backfill work. Prior to starting compaction, discuss with and gain approval from the Departmental Representative for the use of compaction equipment proposed by the contractor to complete the compaction work.

.6 In all instances the compaction of the Structural Fill shall conform with the following:

.1 Compaction within 0.9 m of the front face of the retaining wall shall be undertaken using a 400 lb. plate tamper compactor. Adjust lift thickness as required to ensure compaction requirements are achieved.

.2 Vibratory compaction shall not be used.

.3 The backfill material shall be compacted starting

from the front face of the retaining wall and then move in a direction towards the back limit of the excavation.

.7 The top finished surface of Structural Fill to be within +/- 20 mm of the lines and grades shown in the contract drawings but not uniformly high or low. Maintain finished surface in a condition conforming to this section until acceptance by the Departmental Representative.

3.6 Placement of Granular Base Course

.1 Place Granular Base Course to the lines and grades shown on the contract drawings and maintain free of contamination by other materials throughout the construction process.

.2 Use care during placement of Granular Base Course and use appropriately sized compaction equipment to ensure that Retaining Wall does not deviate from design lines and grades during the backfill work. Prior to starting compaction, discuss with and gain approval from the Departmental Representative for the use of compaction equipment proposed by the contractor to complete the compaction work.

.3 In all instances the compaction of the granular base course shall conform with the following:

.1 Compaction within 0.9 m of the front face of the retaining wall shall be compacted using a 400 lb. plate tamper compactor. Adjust lift thickness as required to ensure compaction requirements are achieved.

.2 Vibratory compaction shall not be used.

.3 The backfill material shall be compacted starting from the front face of the retaining wall and then move in a direction towards the back limit of the excavation.

.4 Grade finished surfaces of Granular Base to +/- 10 mm from the lines and grades shown in the contract drawings but not uniformly high or low.

.5 Compact Granular Base to 98% maximum dry density in accordance with ASTM D698.

.6 Replace to an equal or better condition the existing signage and posts removed to facilitate the excavation.

.7 To assist Departmental Representative scheduling of BST

installation by others, provide a minimum of 3 days' notice to Departmental Representative of anticipated date for completion of Granular Base Course.

3.7 Placement of Riprap

.1 Place Riprap within the full excavation (max 0.8 m thick) on the front side of the retaining and to the lines, grades, and thicknesses shown on the contract drawings. Maintain free of contamination by other materials throughout the construction process.

.2 Use care during placement of Riprap to ensure Riprap does not damage the facing of the Retaining Wall.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Measurement and Payment Procedures.

.2 References.

.3 Submittals.

.4 Gabion Mat Rock Fill.

.5 Gabion Mats.

.6 Gabion Lacing Wire.

.7 Spenax Fasteners.

.8 Placement and Install of Gabion Mats.

1.2 Measurement and Payment Procedures

.1 Payment for supply and installation of gabion mats will be made on the basis of the Price per Unit Bid for Gabion Mats in the Bid and Acceptance Form. The Price per Unit Bid shall include all costs for the:

.1 Supply / manufacture, loading / transport, installation of the gabion mats.

.2 Sorting / screening (manufacture if required), loading, transport, and placement of the Gabion Mat Rock Fill.

.3 All other items necessary for successful completion of the work.

.2 Measurement for Payment for completion of Gabion Mats will be made on the top area of gabion mats surveyed / measured in square metres, incorporated in the works and accepted by the Departmental Representative. Measurement of the area of the gabion mats will be made of the total top surface area of each row of gabion mats (typical thickness 0.3 m, some area thickness varies from between 0.3 m and 0.0 m) measured parallel with the top surface of the mats. The total top surface area will include gabion mats which have been modified to a reduced thickness.

1.3 References

.1 British Columbia MoT – 2009 Standard Specifications for Highway Construction.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A975, latest edition, Standard Specification for Double-Twisted Hexagonal Mesh Gabions and Revet Mattresses (Metallic-Coated Steel Wire or Metallic-Coated Steel Wire with Poly Vinyl Chloride (PVC) Coating).

.2 ASTM A641/A641M, latest edition, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

.3 ASTM A313/A313M, latest edition, Standard Specification for Stainless Steel Spring Wire.

.4 ASTM A764, latest edition, Standard Specification for Metallic Coated Carbon Steel Wire, Coated at Size and Drawn to Size for Mechanical Springs.

1.4 Submittals

.1 Prior to ordering materials, submit gabion mats product literature, manufacturer's instructions, and data sheets in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, physical size, finish and limitations. Proceed with ordering of materials only after Departmental Representative review and acceptance.

PART 2 – PRODUCTS

2.1 Gabion Mat Rock Fill

.1 Rock fill for gabion mats shall be Gabion Mat Rock Fill in accordance with Section 31 05 16 – Aggregates.

2.2 Gabion Mats

.1 The gabion mats shall be manufactured from 8 x 10 hexagonal double twisted wire mesh type as per ASTM A975 (galvanized) and conform to the following requirements.

.1 Manufactured with all components mechanically connected at the production facility. The base sides and ends of the gabion mats shall be woven into a single unit.

.2 Galvanized (zinc coated).

.3 Mesh wire diameter 3.05 mm.

.4 Selvedge wire diameter 3.9 mm.

.5 Mesh opening nominal dimension 83 mm.

.6 Minimum tensile strength of 42.3 kN/m.

.7 Diaphragms at a spacing of 1.0 m x 1.0 m.

2.3 Gabion Lacing Wire

.1 Gabion Lacing wire shall conform with the following requirements:

.1 Diameter 2.2 mm.

2.4 Spenax Fasteners

.1 Spenax Fasteners (overlapping fasteners) shall conform with the following requirements:

.1 Galvanized Fasteners, diameter 3.05 mm according to ASTM A313/A313M, type 302, Class 1.

.2 Tensile strength 1586 MPa – 1882 MPa in accordance with ASTM A764.

2.5 Nonwoven Geotextile

.1 The Nonwoven Geotextile shall be Nilex 4551 or pre-approved equivalent.

PART 3 – EXECUTION

3.1 Placement and Install of Gabion Mats

.1 Install of the Gabion Mats and associated components shall be per this section of the specifications and the manufactures written recommended installation procedures. Should an inconsistency between these requirements occur, the consult the Departmental Representative for further direction prior to proceeding.

.2 Shape gabion mats to the dimensions indicated on the contract drawings. Where required, reconstruct / cut the Gabion Mats to the shapes and thicknesses indicated on the contract drawings. Secure all cut ends, reconstructed areas of the gabions, and loose portions of the gabion mat wire with lacing wire (using a single and double loop tie every 150 mm) or Spenax Fasteners (nominal spacing 100 mm, maximum spacing 150 mm with 25 mm overlap after closure).

.3 Place Gabion Mats to the lines, grades, and shapes shown on the contract drawings and maintain free of contamination by other materials throughout the construction process.

.4 Install Gabion Mat Rock Fill ensuring that each Gabion Mat diaphragm is appropriately filled such that the surface of the gabion mat rock fill is within – 25 mm / + 50 mm of the lines and grades shown in the contract drawings but not uniformly high or low.

.5 Install Gabion Mat lid using Spenax Fasteners (nominal

spacing 100 mm, maximum spacing 150 mm with 25 mm overlap after closure) or Gabion Lacing Wire (single and double loop tie every 100 mm).

.6 Install Nonwoven Geotextile on the top and back faces of the gabion mats as shown on the contract drawings prior to placement of Structural Fill or Geogrid. Where multiple gabion mats rows are required, Nonwoven Geotextile is only required on the top row of gabion mats.

.7 Use care when placing Gabion Mat Rock Fill material such that the Gabion Mats or existing gabions are not damaged. Construction equipment is not permitted directly on the existing gabions or proposed gabion mats during construction.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes

.1 Measurement and Payment Procedures.

.2 Submittals.

.3 Retaining Wall.

.4 Facing Stone.

.5 Retaining Wall Nonwoven Geotextile.

.6 Geogrid.

.7 Install of Retaining Wall.

.8 Install of Geogrid.

1.2 Measurement and Payment Procedures

.1 Payment for the Retaining Wall will be made on the basis of the Price per Unit Bid for Retaining Wall in the Bid and Acceptance Form. The Price per Unit Bid shall include all costs for:

.1 The excavation and offsite disposal of BST and granular materials comprising the highway embankment.

.2 Supply, transport, and install of the wire-mesh faced mechanically stabilized earth Retaining Wall units, Retaining Wall Nonwoven Geotextile, Geogrid, and all other components required for the construction of the wall per the manufactures recommendations and design drawings.

.3 Sort / screen (manufacture if necessary), load, transport, and install of the Facing Stone within the backfill of the Retaining Wall.

.4 Screen / manufacture (if applicable) load, transport, backfill, and compact Structural Fill.

.5 Load, transport, place, grade, and compact the Granular Base Course (comprising 19 mm Minus Base Course).

.6 Sort / screen, load, transport, and place Riprap.

.7 Inspection during construction by a technical representative of the supplier of the wire-mesh faced mechanically stabilized earth Retaining Wall

units.

.8 All other items necessary for successful completion of the work.

.2 Measurement for Payment for the Retaining Wall (wire-mesh faced mechanically stabilized earth retaining wall units) will be made on the area of Retaining Wall surveyed / measured in square metres, incorporated in the works and accepted by the Departmental Representative. Measurement of the area of the Retaining Wall will be taken of the total front face of the new wall. Areas of overlap (nesting) of the wire-mesh faced mechanically stabilized earth retaining wall units forming the Retaining Wall will only be included in the measurement for the total front face area once (i.e. overlap areas will not be double counted).

1.3 Submittals

.1 Prior to ordering materials, submit Retaining Wall product literature, manufacturer's instructions, and data sheets in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, physical size, finish and limitations. Proceed with ordering of materials only after Departmental Representative review and acceptance.

PART 2 – PRODUCTS

2.1 Retaining Wall

.1 The Retaining Wall shall be a wired-mesh faced mechanically stabilized earth (MSE) retaining wall system such as SierraScape® Retaining Wall System (manufactured by Tensar International) or a pre-approved equivalent.

.2 Alternate retaining wall systems may be considered but must be pre-approved by the Departmental Representative. Should the Contractor propose an alternate retaining wall system it will be the Contractors responsibility to prove that the product is equivalent or better than the product listed above.

.3 Ensure that all components for the retaining wall system units come from single manufactured system.

2.2 Facing Stone

.1 Facing Stone shall be in accordance with Section 31 05 16 – Aggregates.

2.3 Retaining Wall Nonwoven Geotextile

.1 The Retaining Wall Nonwoven Geotextile shall be Nilex 4551 or pre-approved equivalent.

2.4 Geogrid

.1 The Geogrid shall be Tensar International Structural

Geogrid UX-1500MSE or pre-approved equivalent.

PART 3 – EXECUTION

3.1 Install of Retaining Wall

.1 Install of the Retaining Wall and associated components shall be per the manufactures written recommended installation procedures and this section of the specifications. Should an inconsistency between these requirements occur, the consult the Departmental Representative for further direction prior to proceeding.

.2 During the first two days of the wired-mesh faced mechanically stabilized earth (MSE) retaining wall system installation, facilitate the inspection of the work by a technical representative of the supplier to ensure compliance of the manufactures written recommended installation procedures. The technical representative shall be onsite for a minimum of two full working days with a minimum of two rows of mechanically stabilized earth (MSE) retaining wall system installation during this time. The costs for the inspection by the technical representative shall be assumed by the Contractor or supplier.

.3 Install the retaining wall system, Facing Stone, and Retaining Wall Nonwoven Geotextile per the lines and grades shown on the contract drawings.

.4 Cut ends or shorten the length of the bottom row of retaining wall system units to conform to the elevations of the existing gabions. Cut ends of retaining wall system units at the necessary angle to ensure all ends are butted end-to-end eliminating any horizontal gaps larger than 5 cm in the retaining wall system facing units.

.5 Where deviations to the horizontal alignment of the retaining wall system units are required, a bend in the retaining wall system unit shall be install by only cutting the bottom horizontal strut. Any cuts to the horizontal struts on the front face of the retaining wall system unit shall be pre-approved by Departmental Representative.

.6 Adjust depth of nesting of each row of retaining wall system units to ensure:

.1 The nesting depth does not exceed the maximum limits as defined on the contract drawings.

.2 The full retaining wall height as shown on the contract drawings (dimension on each individual cross section) is achieved.

.3 That when viewed from the front side, there are no vertical gaps over the complete front face of all the entire Retaining Wall.

.7 Backfill in front of the wall with Riprap and Structural Fill per Section 31 23 33 – Excavation and Backfill.

3.2 Install of Geogrid

.1 Install Geogrid with each row of retaining wall system units per the lines and grades shown on the contract drawings. Secure the Geogrid to the retaining wall system units per the Retaining Wall manufactures written recommended installation procedures.

.2 Ensure the final Geogrid elevation is within +/- 25 mm of the lines and grades shown in the contract drawings but not uniformly high or low following compaction of the Structural Fill.

.3 Place Geogrid with the strongest direction (multiple fibers) perpendicular to the Retaining Wall. Cut Geogrid without cutting across ribs (reinforced areas).

.4 Tension the Geogrid by hand until it is taut, free of wrinkles, and lying flat. Adjacent Geogrid rolls may be butted together side by side without overlap.

.5 Use pins, staples, or stakes to hold Geogrid in place and prevent wrinkles and/or slippage during placement and compaction of common fill.

.6 Do not operate equipment directly on the Geogrid. Damaged Geogrid may not be used unless approved by the Departmental Representative.

.7 Backfill behind the wall with Structural Fill per Section 31 23 33 – Excavation and Backfill.

.8 Complete monitoring of the existing gabions and the highway driving surface as per the requirements of Section 01 45 00 – Quality Management and Section 31 23 33 – Excavation and Backfill throughout the construction of the Retaining Wall.

END OF SECTION

PART 1 – GENERAL

1.1 Section Includes	.1	Environmental Requirements.
	.2	Site Clearing and Plant Protection.
	.3	Drainage.
1.2 References	.1	Standards and Best Practices for Instream Works, British Columbia Ministry of Land and Air Protection Ecosystem Standards and Planning Biodiversity Branch – March 2004 (Appendix B).
	.2	Land Development Guidelines for the Protection of Aquatic Habitat, Fisheries and Oceans – September 1993 (Appendix C).
	.3	MFLNRO Section 9 Approval for Instream Work.

PART 2 – PRODUCTS

	.1	Not used.

PART 3 – EXECUTION

3.1 Environmental Requirements	.1	Dumping excavated fill, waste material, or debris not shown on the Contract Drawings into the watercourse is prohibited.
3.2 Site Clearing and Plant Protection	.1	Conduct work to provide minimal disturbance to vegetated buffer zones. Protect trees and plants on-site and adjacent properties where indicated.
	.2	Maintain temporary erosion and pollution control features installed under this contract for the duration of the work. If requested by the Departmental Representative leave erosion and pollution control features in place at the conclusion of the work.
3.3 Drainage	.1	Pumping water containing suspended materials into watercourses is prohibited.

END OF SECTION

R.017173.030
Appendix A

A TETRA TECH COMPANY

OQM | Organizational Quality Management Program

June 5, 2014

ISSUED FOR USE
EBA FILE: V33103013

Public Works and Government Services Canada
641 – 800 Burrard Street
Vancouver, BC V6Z 2V8

Via Email: ken.morton@pwgsc-tpsgc.gc.ca

Attention: Ken Morton, P.Eng.
Program Manager

Dear Ken:

Subject: Geotechnical Site Investigation Data Report – Roadside Stabilization of Three Locations on the Alaska Highway Adjacent to Muncho Lake, BC

1.0 INTRODUCTION

Tetra Tech EBA Inc.[1] (EBA), is pleased to submit this letter report to Public Works and Government Services Canada (PWGSC) detailing the results of a geotechnical investigation and ground penetrating radar (GPR) survey for the Roadside Stabilization of Three Locations on the Alaska Highway Adjacent to Muncho Lake, BC.

The scope of this investigation was based on EBA's proposal provided to PWGSC by EBA on March 6, 2013.

PWGSC has undertaken this work as part of a larger project to widen three areas of the Alaska Highway adjacent to Muncho Lake where the left shoulder is considered to be of substandard width compared to ambient shoulder widths. The locations of these three areas are:

- Area 1 - Sta. 701+610 to Sta. 701+660
- Area 2 - Sta. 701+900 to Sta. 701+960
- Area 3 - Sta. 703+090 to Sta. 703+120

This letter report outlines the methodology and findings of the geotechnical investigation undertaken by EBA at the site between April 23 to 25, 2013 and the on highway GPR survey undertaken March 20, 2013. Included in the report is a brief discussion of the factual data obtained during the investigations at each of the three areas and a brief summary of the surficial geology of the project site.

Please note that throughout this report, the use of the terms "Right" or "Left" side of the highway is based on heading northward in the direction of increasing chainage.

[1] Please note that as of January 1, 2014, our legal operating name changed from EBA Engineering Consultants Ltd. to Tetra Tech EBA Inc.

EBA Engineering Consultants Ltd. operating as EBA, A Tetra Tech Company
Oceanic Plaza, 9th Floor, 1066 West Hastings Street
Vancouver, BC V6E 3X2 CANADA
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2.0 PROJECT LOCATION AND DESCRIPTION

All three areas investigated are within approximately 1.5 km of each other, on the east shore of Muncho Lake (Figure 1). The Alaska Highway is at an elevation of approximately 820 m and is 1.7 to 3 m above lake level. A bedrock ridge to the east of the highway extends up to an elevation of approximately 1050 m. The rock exposed in cuts consists of bedded limestone (dolomite). At some locations rockfall mesh has been installed. The slopes above the rock cut are steep and covered with sand and gravel with a glacial till veneer at some locations and overlain by a thin layer of topsoil.

On the east side of Muncho Lake there are several large coarse alluvial fan deposits which extend into the lake at larger stream locations.

Between the alluvial fans at Sta. 701+150 and Sta. 704+000, the shoulder on the right side of the highway is generally less than 2 m wide with steep rock cuts and talus slopes above. The left shoulder is of variable width and transitions to a steep slope (approx. 45 degrees) to the lake. At some locations this fill slope is retained with gabions.

According to Map 1343A, Tuchodi Lakes, BC by the Geological Survey of Canada (1972), the bedrock on the east side of Muncho Lake varies from Nonda Formation dark grey dolomite, sandstones and minor limestone at the south end of the lake to Muncho-McConnell Formation dolomite. Based on this mapping, all three areas of interest appear to be within the Muncho-McConnell Formation dolomite.

3.0 GEOTECHNICAL INVESTIGATION

Prior to undertaking the geotechnical investigation, EBA contacted BC One Call to confirm the presence and location of any underground utilities. BC One Call confirmed that a Northwestel fibre optic cable was present within the site boundaries. A Northwestel representative was on site prior to the start of drilling to locate their fibre optic cable. Boreholes were located a minimum of 2 m from the fibre optic cable.

The site investigation was undertaken between April 23 and 25, 2013. The investigation was undertaken with a rubber track mounted Boart Longyear DB320 Sonic Drill supplied by Mud Bay drilling of Surrey, BC. Standard Penetration Tests (SPT) were performed with an automatic MARL Technologies SPT hammer. The purpose of the SPT tests was to estimate the consistency, or density of the soil. Under ideal drilling conditions, sonic drills provide a continuous core of soil or rock.

The proposed work plan included the completion of six boreholes with the purpose of obtaining information on the soils making up the road structure, any underlying fill or natural soils, and depth to bedrock. As bedrock was encountered at a fairly shallow depth, five additional boreholes were advanced for a total of eleven boreholes. The additional holes were positioned to help delineate the ends of Areas 1 through 3. All boreholes were terminated in bedrock. The locations of each of these boreholes are shown in Figures 2 – 4.

The boreholes were located at the time of drilling with a combination of hand held GPS and measured distances from known landmarks. Table 1 summarizes the depths and locations of the boreholes.

Table 1: Summary of Boreholes and Sampling

Area	Borehole	Northing	Easting	Borehole Depth (m)	No. of SPT & Grab Samples	Comment
1	BH-101	6538494	340699	5.8	11	Southbound edge of pavement
	BH-102	6538498	340705	2.75	3	Northbound driving lane
	BH-103	6538485	340698	5.5	6	Southbound edge of pavement
	BH-104	6538516	340701	4.25	4	Southbound shoulder
2	BH-201	6538779	340704	7.9	13	Southbound shoulder
	BH-202	6538789	340713	2.9	6	Northbound shoulder
	BH-203	6538787	340708	3.8	5	Northbound driving lane
	BH-204	6538805	340695	4.25	4	Southbound edge of pavement
3	BH-301	6539901	340849	8.85	15	Southbound edge of pavement
	BH-302	6539903	340852	7.3	6	Southbound driving lane
	BH-303	6539914	340852	7.3	7	Southbound shoulder

Detailed borehole logs are provided in Appendix A.

Sonic core from BH-101 (0-2.7 m) BH-201 (0-4.3 m, 4.3–7.3 m) and BH-301 (0-2.7 m, 2.7-5.8 m, 5.8-8.8 m) were returned to EBA's laboratory in Coquitlam, BC. Other disturbed samples were retained for index tests such as moisture content, grain size distribution, and Atterberg Limits. The results of these tests are summarized on the borehole logs, attached in Appendix A.

4.0 GPR SURVEY

A GPR survey from Sta. 699+740 to Sta. 707+560 on the highway was undertaken on March 20, 2013. The GPR survey was completed using a shielded 100MHz GPR survey unit towed behind a vehicle advancing along the highway at a rate of approximately 10 km/h. The GPR soundings were acquired down the center of both the north and south bound travel lanes. A GPS unit was used to collect the position of each GPR sounding.

A digital version on CD of the full results of the GPR survey is provided in Appendix B. The GPR survey tracks and bedrock surface at each of the three areas of concern are provided in Figures 5 – 7.

In some instances the depth of bedrock found with the GPR survey varies from the depth of bedrock found from the geotechnical investigation. Many of these differences are the result of the borehole locations being positioned some distance from the GPR track. Other differences are likely the result of the complex material layering evident in the borehole records or subtle differences between weathered (incompetent) bedrock and competent bedrock. This complex layering and material types can make the identification of bedrock more difficult. A more detailed explanation of the techniques used to identify material surfaces from GPR data is provided for information in the following section. Despite these differences the overall larger trend (i.e. shallow vs. deep) is consistent from one driving lane to the other and from one station to the next.

4.1 Background on GPR Survey Techniques

GPR is a geophysical remote sensing method commonly used to rapidly and non-intrusively provide cross-sectional information about the subsurface. It is often used to detect and map competent bedrock, major stratigraphy, water tables, etc., although the depth accuracy of the technique typically worsens as the subsurface becomes more layered and complex. The technique relies on changes in various physical properties to produce reflections in the subsurface; these changes are typically due to interfaces between different layers, which may have differing component materials and/or water content. The interface between a dry sand and a saturated gravel, for instance, should be relatively easy to identify, while the interface between weathered (incompetent) bedrock and competent bedrock is a much more subtle change, and can be difficult to identify. Often, it is the water sitting on top of the relatively impermeable bedrock layer that is used to identify the top of bedrock, rather than the bedrock itself. In other cases, parallel sets of stratified bedrock layers can be identified in the GPR records, which can aid in the identification of bedrock. Both of these methods were used in this study.

5.0 SITE CONDITIONS

5.1 General

The soil stratigraphy generally consisted of asphalt, granular fill less up to 75 mm in size, coarse granular fill up to riprap size then weathered bedrock and competent bedrock. At two borehole locations on the lake side of the highway, large boulders (riprap) were noted underlying the road structure.

All three areas had fill slopes supported by gabion baskets. Areas 2 and 3 had logs tethered as wave breakers. At some locations the gabions have been covered with riprap.

The water level was approximately 2.5 m below the shoulder of the highway at all locations during drilling on April 23 to 25, 2013. During a follow-up site visit on May 22, 2013, the lake level was approximately to be 1.7 to 2.3 m below the shoulder of the highway.

5.2 Area 1- Sta. 701+610 to Sta. 701+660

Chip seal or Bituminous Surface Treatment (BST) thicknesses in Area 1 ranged from 100 mm to 150 mm. Layers of dark brown to black base course and what may be buried chip seal / BST were observed to depths of 2.9 m at BH-101.

Below the treated base course lies 0.5 m (BH-102) to 1.5 m (BH-101) of sandy gravel fill, underlain by weathered bedrock at BH-102. At BH-101 the gravel fill was underlain by cobbley boulder fill and gravel fill to 2.75 m. The weathered bedrock consisted of 1.0 m (BH-104) of gravel sized particles in the core barrel and 0 m (BH-101 and BH-102) to 2 m (BH-103) of cobbles and boulders. A thin layer of organic silt with some clay was observed at a depth of 2 to 2.1 m. This may be an extension of the lake bottom which predates road construction. At Area 1 unweathered bedrock was encountered at depths from 2 m (BH-102) to 4.3 m (BH-103).

5.3 Area 2 - Sta. 701+900 to Sta. 701+960

In Area 2, the chip seal / BST was 100 mm in boreholes located on the driving surface. The underlying thickness of gravel fill ranged from 0.3 m (BH-202) to 0.9 m (BH-204). The gravel fill was generally underlain by cobbley, boulder fill layered with predominantly gravel fill (weathered gravel) from 1.2 m (BH-202) to 2.5 m (BH-201), and cobbles and boulders from 0.9 m (BH-202) to 2.2 m (BH-203). Competent bedrock was found from 2 m (BH-202) to 6.4 m (BH-201).

5.4 Area 3 - 703+090 to Sta. 703+120

Area 3 had 100 mm of chip seal / BST, underlain by 1.5 m (BH-301) to 1.9 m (BH-302 and BH-303) of mainly gravel and sand fill, underlain at a depth of approximately 2 m by natural sandy gravel with silt to medium plastic clay. The depth to competent bedrock ranged from 5.8 m (BH-302 and BH-303) to 7.8 m (BH-301).

6.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of PWGSC and their agents. Tetra Tech EBA Inc. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than PWGSC or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's General Conditions provided in Appendix C of this report.

7.0 CLOSING

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Sincerely,
Tetra Tech EBA Inc.

Prepared by:

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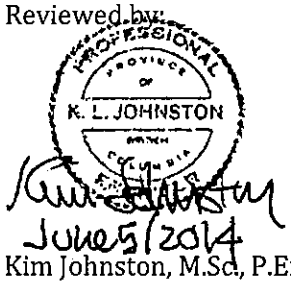
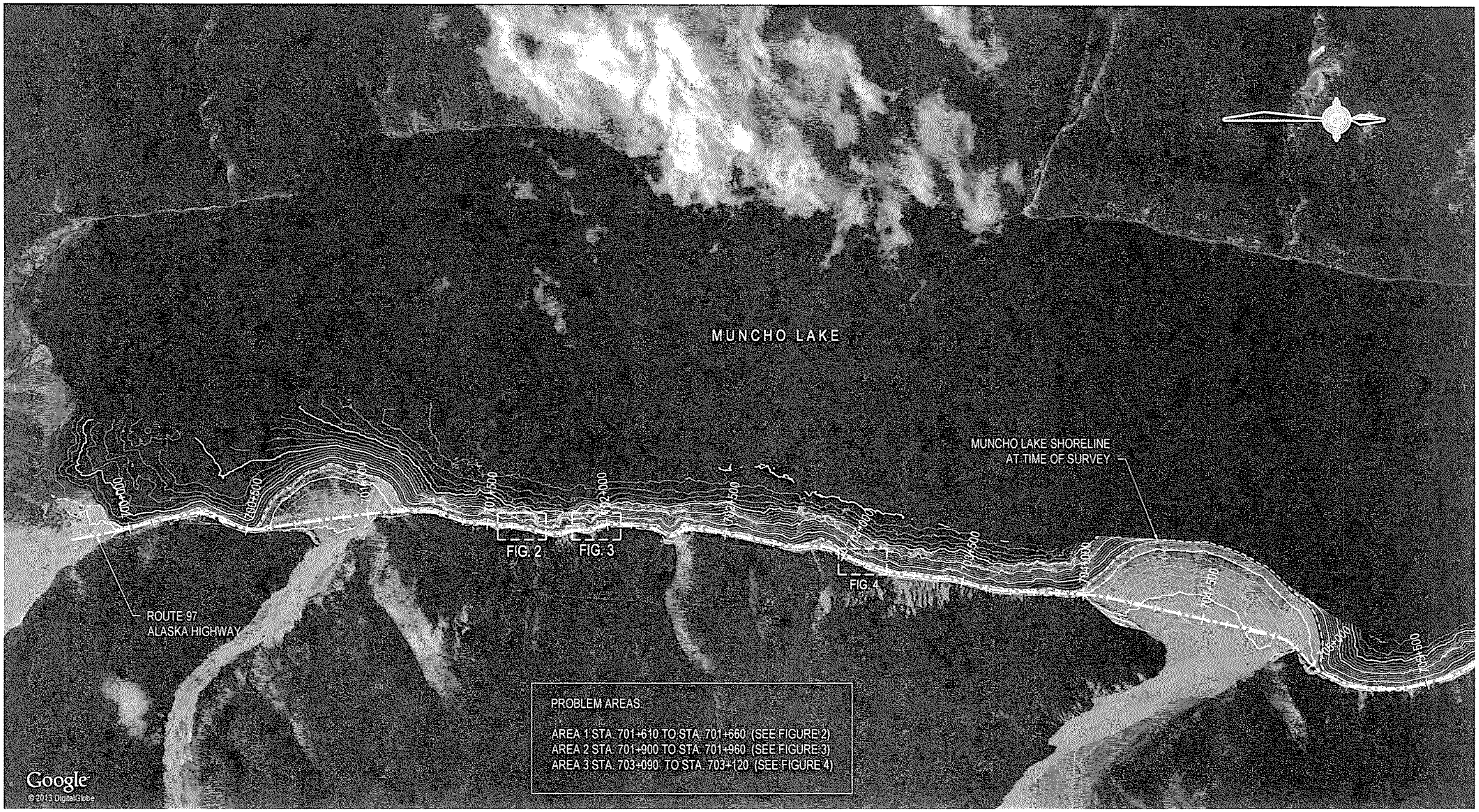
Reviewed by:



Kim Johnston, M.Sc., P.Eng.
Senior Geotechnical Engineer
Kim.johnston@tetratech.com

Attachments: Figures (7)
Appendix A - Borehole Logs
Appendix B - GPR Survey Data (on CD)
Appendix C - EBA's General Conditions

FIGURES



PROBLEM AREAS:

AREA 1 STA. 701+610 TO STA. 701+660 (SEE FIGURE 2)
AREA 2 STA. 701+900 TO STA. 701+960 (SEE FIGURE 3)
AREA 3 STA. 703+090 TO STA. 703+120 (SEE FIGURE 4)

LEGEND

SHORELINE AT TIME OF SURVEY
ALASKA HIGHWAY (ROUTE 97)

SCALE 1:15,000
100 0 100 300 600m

NOTES

1. BATHYMETRY AND CONTOUR DATA PROVIDED BY PWGSC. FIELD SURVEY CONDUCTED BY I.R. ROBERTSON, JUNE 2010.
2. CONTOURS SHOWN AT 25m MAJOR, 5m MINOR.
3. HORIZONTAL DATUM: UTM NAD 83 ZONE 10.
4. GOOGLE EARTH BACKGROUND IMAGE DOWNLOADED 07 JUNE. 2013

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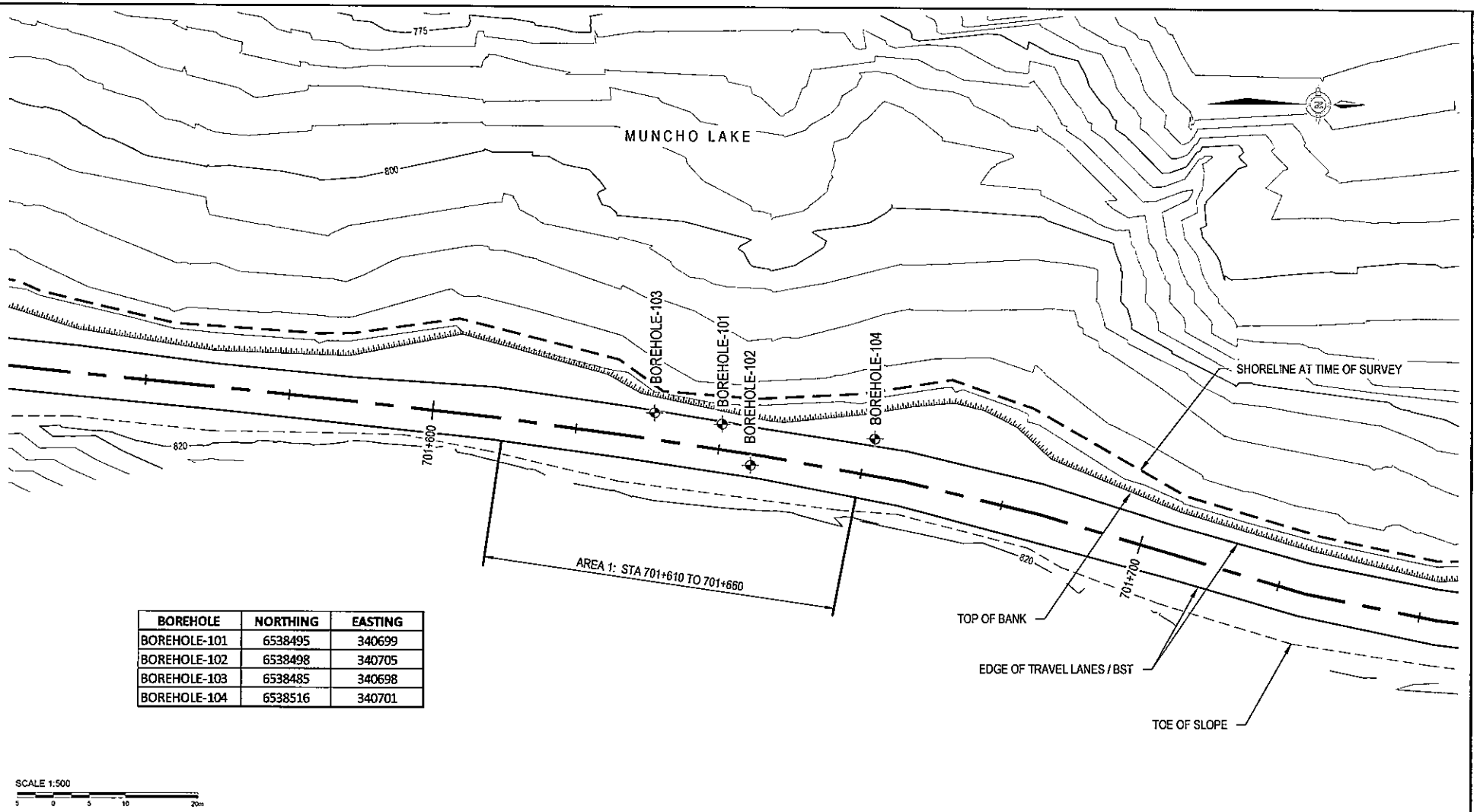
MUNCHO LAKE ROADSIDE STABILIZATION
GEOTECHNICAL DATA REPORT

GEOTECHNICAL INVESTIGATION: LOCATION PLAN

PROJECT NO.	DWN	CKD	REV
V33103013	AQH	AH	0
OFFICE	DATE		
VANC	JUNE 2014		

Figure 1



BOREHOLE	NORTHING	EASTING
BOREHOLE-101	6538495	340699
BOREHOLE-102	6538498	340705
BOREHOLE-103	6538485	340698
BOREHOLE-104	6538516	340701

SCALE 1:500

5 0 5 10 20m

LEGEND

- SHORELINE AT TIME OF SURVEY
- ALASKA HIGHWAY (ROUTE 97)
- EDGE OF TRAVEL LANE
- TOP OF BANK
- TOE OF SLOPE
- GEOTECHNICAL BOREHOLE BY EBA, APRIL, 2013

NOTES

1. BATHYMETRY AND CONTOUR DATA PROVIDED BY PWGSC. FIELD SURVEY CONDUCTED BY I.R. ROBERTSON, JUNE 2010.
2. CONTOURS SHOWN AT 25m MAJOR, 5m MINOR.
3. HORIZONTAL DATUM: UTM NAD 83 ZONE 10.

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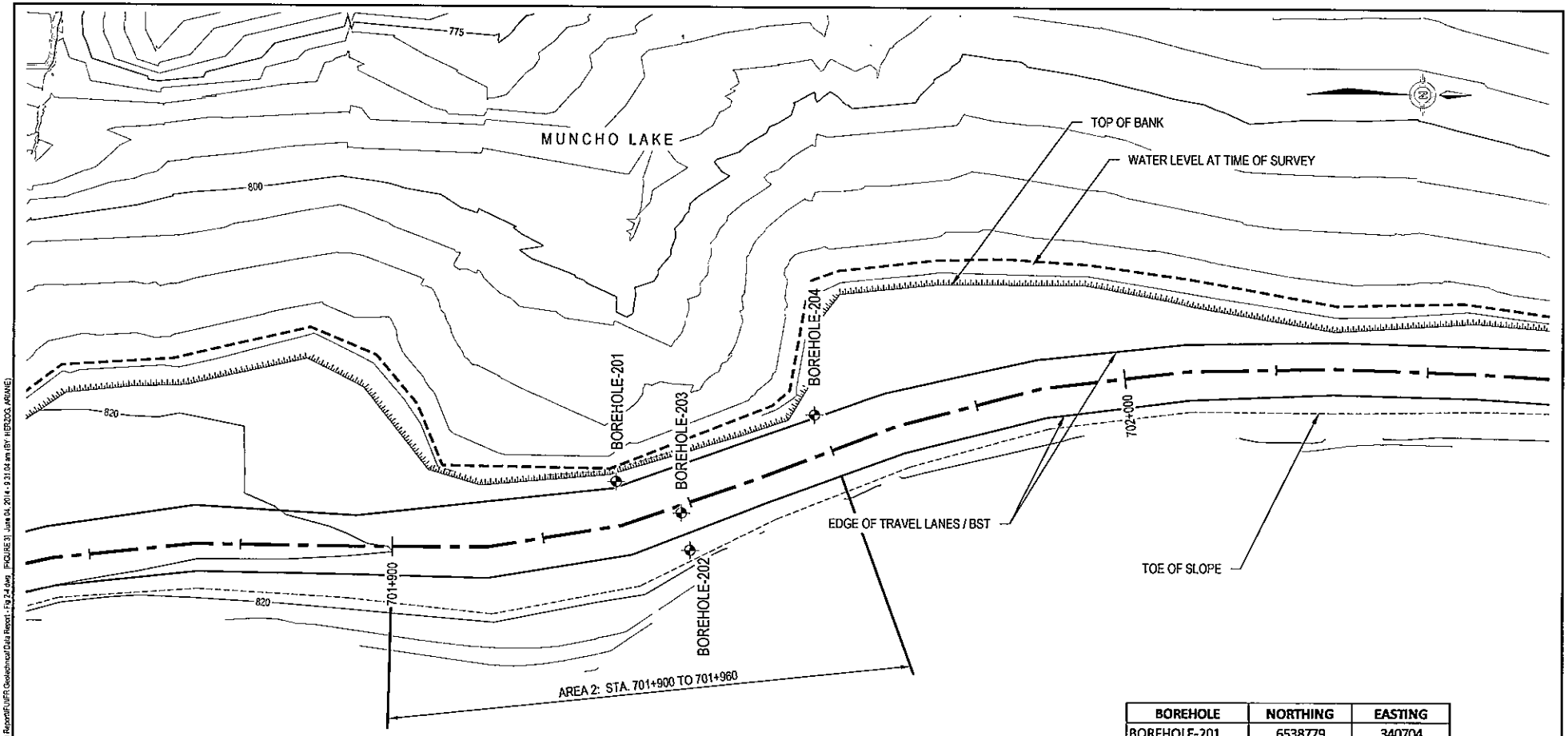
MUNCHO LAKE ROADSIDE STABILIZATION
GEOTECHNICAL DATA REPORT

GEOTECHNICAL INVESTIGATION:
AREA 1 - BOREHOLE LOCATION PLAN

PROJECT NO.	DWN	CKD	REV
V33103013	AOH	AH	0
OFFICE: VANC	DATE: JUNE 2014		

Figure 2

O:\Wellington\Transportation\V33\V33103013 - Muncho Lake\CAD\Geotechnical Data Report\[FIGURE 2] June 04, 2014 - 9:39:27 am (BY: HERZOG, ANNAE)



BOREHOLE	NORTHING	EASTING
BOREHOLE-201	6538779	340704
BOREHOLE-202	6538789	340713
BOREHOLE-203	6538787	340708
BOREHOLE-204	6538805	340695

SCALE 1:500

5 0 5 10 20m

LEGEND

- SHORELINE AT TIME OF SURVEY
- ALASKA HIGHWAY (ROUTE 97)
- EDGE OF TRAVEL LANE
- TOP OF BANK
- TOE OF SLOPE
- GEOTECHNICAL BOREHOLE BY EBA, APRIL, 2013

NOTES

1. BATHYMETRY AND CONTOUR DATA PROVIDED BY PWGSC. FIELD SURVEY CONDUCTED BY I.R. ROBERTSON, JUNE 2010.
2. CONTOURS SHOWN AT 25m MAJOR, 5m MINOR.
3. HORIZONTAL DATUM: UTM NAD 83 ZONE 10.

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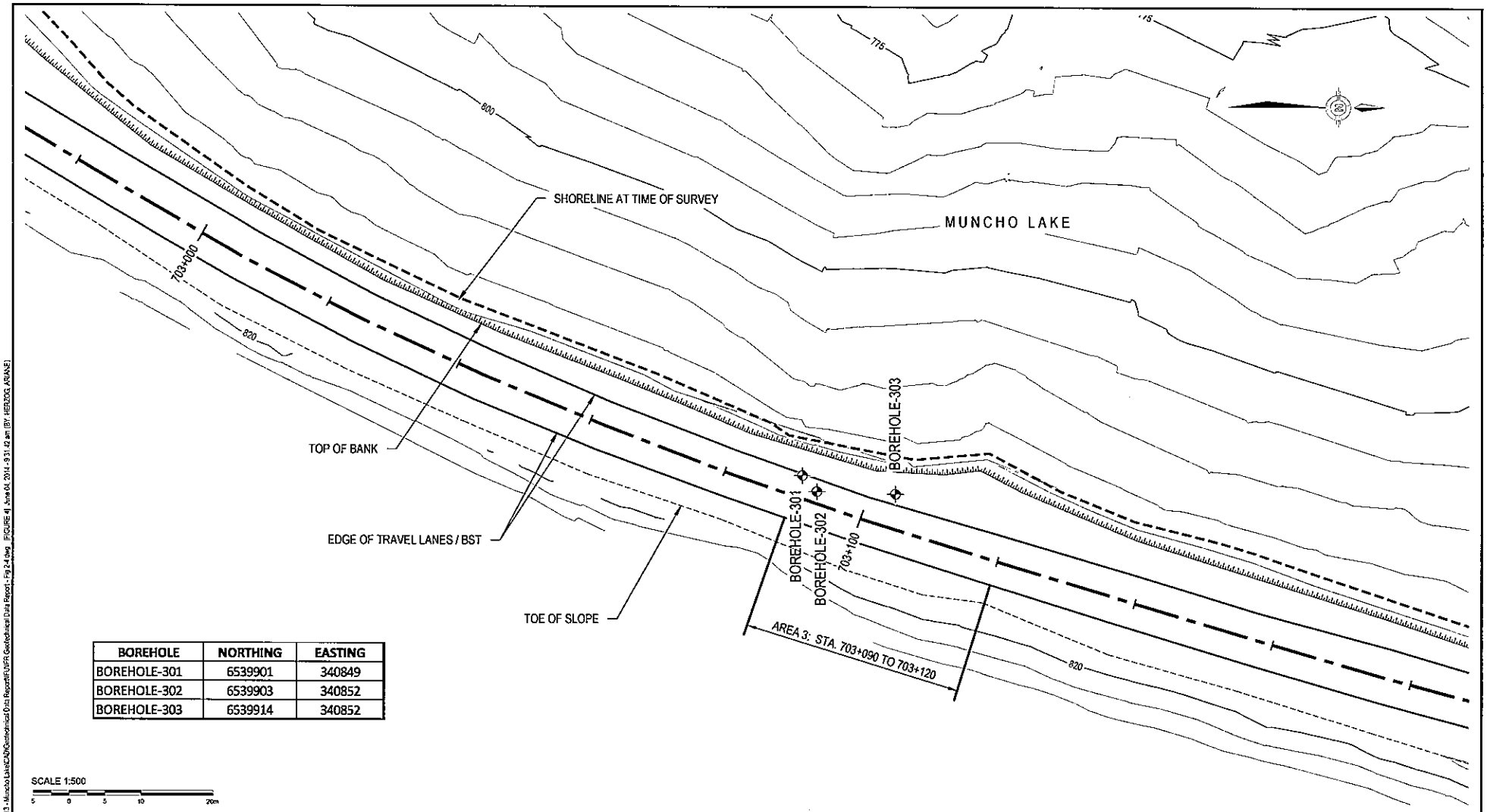
MUNCHO LAKE ROADSIDE STABILIZATION
GEOTECHNICAL DATA REPORT

GEOTECHNICAL INVESTIGATION:
AREA 2 - BOREHOLE LOCATION PLAN

PROJECT NO	DWN	CKD	REV
V33103013	AOH	AH	0
OFFICE: VANC	DATE: JUNE 2014		

Figure 3



BOREHOLE	NORTHING	EASTING
BOREHOLE-301	6539901	340849
BOREHOLE-302	6539903	340852
BOREHOLE-303	6539914	340852

SCALE 1:500

5 0 5 10 20m

LEGEND

- SHORELINE AT TIME OF SURVEY
- ALASKA HIGHWAY (ROUTE 97)
- EDGE OF TRAVEL LANE
- TOP OF BANK
- TOE OF SLOPE
- GEOTECHNICAL BOREHOLE BY EBA, APRIL, 2013

NOTES

1. BATHYMETRY AND CONTOUR DATA PROVIDED BY PWGSC. FIELD SURVEY CONDUCTED BY I.R. ROBERTSON, JUNE 2010.
2. CONTOURS SHOWN AT 25m MAJOR, 5m MINOR.
3. HORIZONTAL DATUM: UTM NAD 83 ZONE 10.

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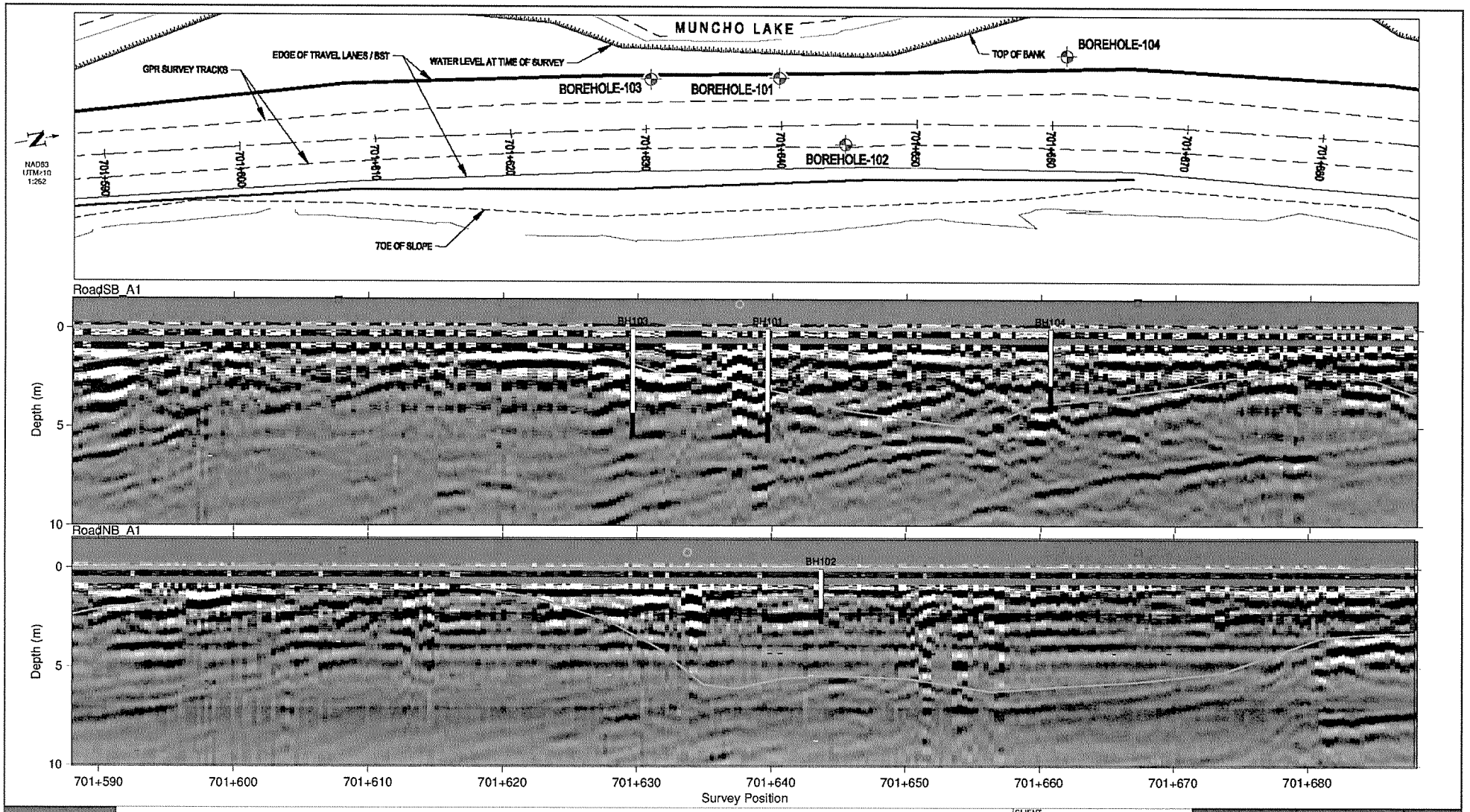
MUNCHO LAKE ROADSIDE STABILIZATION
GEOTECHNICAL DATA REPORT

GEOTECHNICAL INVESTIGATION:
AREA 3 - BOREHOLE LOCATION PLAN

PROJECT NO.	DWN	CKD	REV
V33103013	AOH	AH	0
OFFICE: VANC	DATE: JUNE 2014		

Figure 4



LEGEND

- GPR Tracks
- Ground Surface
- Bedrock Surface
- Problem Area
- Culvert
- Possible Object

BOREHOLE LEGEND

- BEDROCK
- OVERBURDEN

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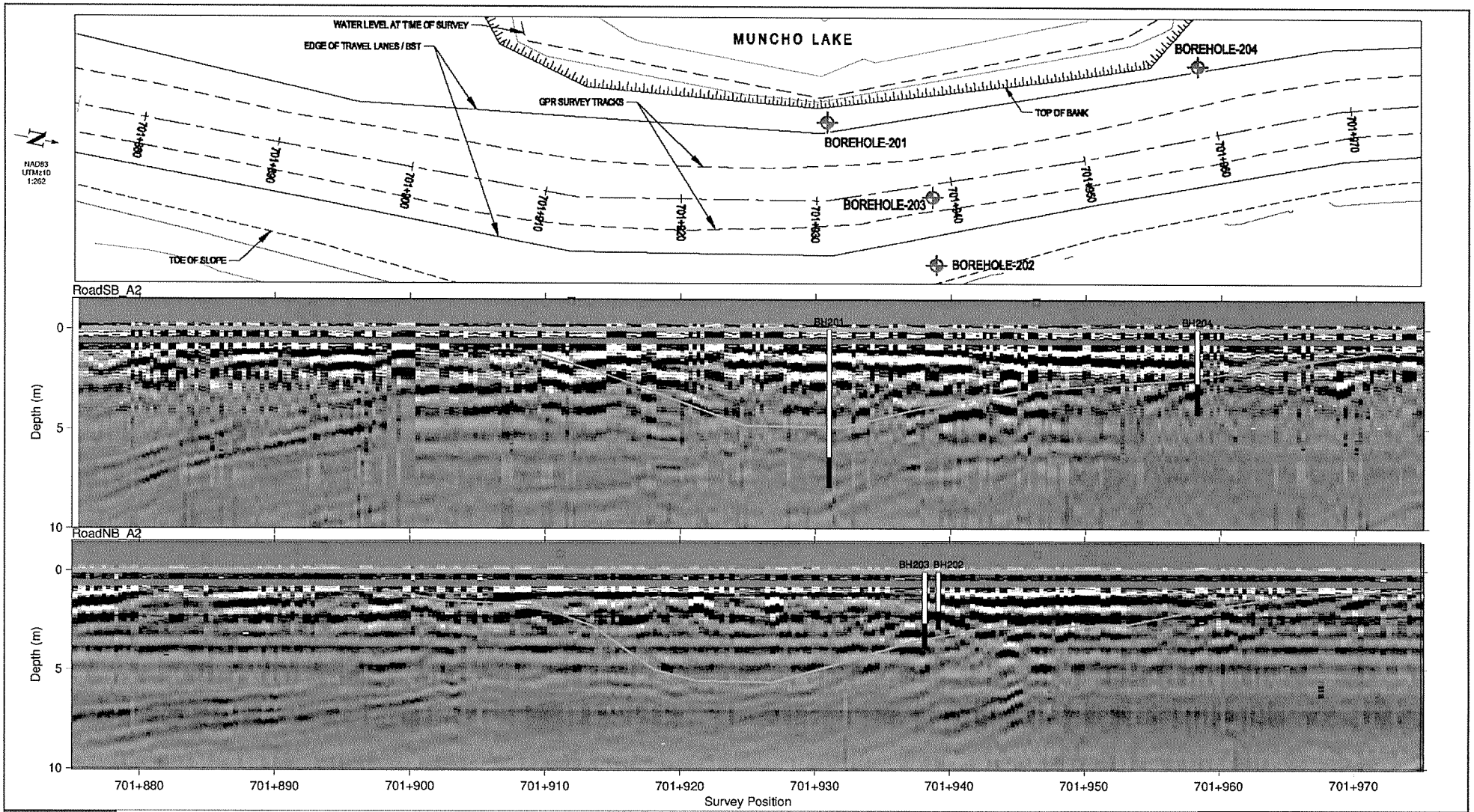
Muncho Lake Roadside Stabilization Geotechnical Data Report

On-Road GPR Survey
STA 701+588 to STA 701+690
(Area 1)

Project No.	DWN	CHKD	APVD	REV
V33103013-01	BJM	AH	AH	0

OFFICE: Edmonton
DATE: June 27, 2013

Figure 5



LEGEND

- GPR Tracks
- Ground Surface
- Bedrock Surface
- Problem Area
- Culvert
- Possible Object

BOREHOLE LEGEND

- BEDROCK
- OVERBURDEN

CLIENT

Public Works and Government Services Canada

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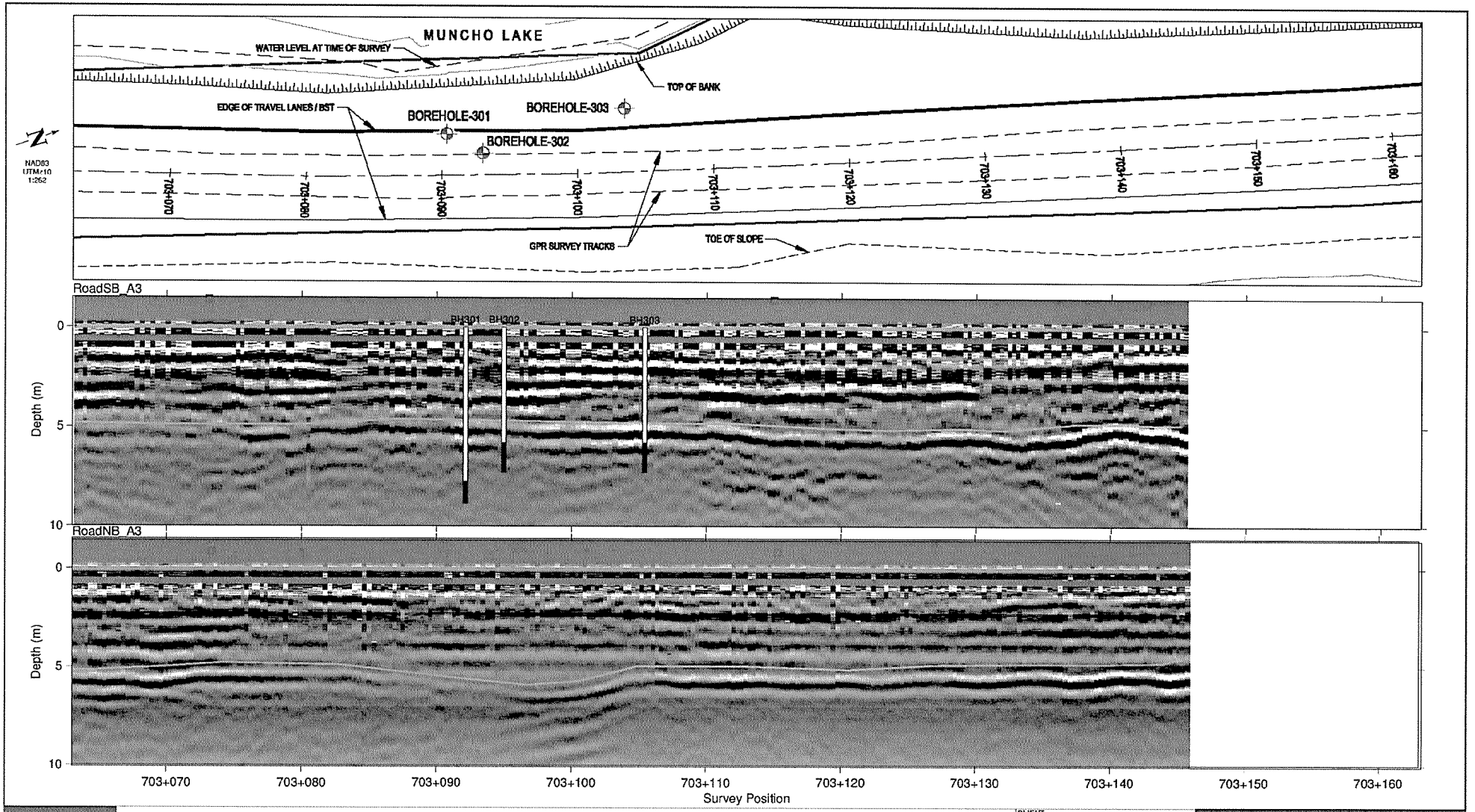
Muncho Lake Roadside Stabilization Geotechnical Data Report

On-Road GPR Survey
STA 701+875 to STA 701+975
(Area 2)

Project No.	DWN	CHKD	APVD	REV
V33103013-01	RJM	AH	AH	0

OFFICE: Edmonton
DATE: June 27, 2013

Figure 6



LEGEND

- GPR Tracks
- Ground Surface
- Bedrock Surface
- Problem Area
- Culvert
- Possible Object

BOREHOLE LEGEND

- BEDROCK
- OVERBURDEN

CLIENT

Public Works and Government Services Canada

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Muncho Lake Roadside Stabilization Geotechnical Data Report

On-Road GPR Survey
STA 703+063 to STA 703+145
(Area 3)

Project No.	DWN	CHKD	APVD	REV
V33103013-01	RJM	AH	AH	0

OFFICE: Edmonton
DATE: June 27, 2013

Figure 7

APPENDIX A
BOREHOLE LOGS

Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-101
	6538494.5N; 340699.5E; Zone 10	Elevation: 819.5 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	MOISTURE CONTENT	Backfill	Elevation (m)
0	BST , SAND AND GRAVEL (FILL) - BST (150 mm thick)						
	SAND AND GRAVEL (FILL) - trace silt, well graded, subangular, damp, loose, grey, (160 mm thick)		S1			115	
	GRAVEL (FILL) - sandy, trace silt, well graded, angular to subangular, damp, loose, grey						819.0
			S2			115	
	- BST layer with some sand and gravel (fill)						
	SAND AND GRAVEL (FILL) - some silt, poorly graded, subangular, moist, loose, grey		S3		4.5		
1	GRAVEL (FILL) - sandy, trace silt, well graded to 25 mm diameter, angular to subangular, moist, loose, grey		S4				
	SAND (FILL) - gravelly, some silt to silty, poorly graded, subangular, moist, loose, grey						
	COBBLES & BOULDERS (FILL) - angular, compact, dark grey		S5	22			818.0
			S6				
2							
	GRAVEL (FILL) - clayey (medium to low plastic), trace sand, trace silt, occasional cobbles (5 %, <150 mm), angular to subangular to mostly 20 mm diameter, damp, compact, grey		S7				817.0
	BST		S8				
	GRAVEL- angular, trace to some silt, very compact, grey						
3							
			S9				816.0
4							
			S10				
	BEDROCK - hard to very hard, grey						815.0
5							

POCKET PEN. (kPa): 100 200 300 400

STANDARD PENETRATION (N): 20 40 60 80

PLASTIC M.C. LIQUID: 20 40 60 80

POINT LOAD INDEX (MPa): 2 4 6 8

FRACTURE FREQUENCY: 2 4 6 8

RQD (%): 20 40 60 80

RECOVERY (%): 20 40 60 80

LOGGED BY: AT	COMPLETION DEPTH: 5.8 m
REVIEWED BY: KLJ	COMPLETE: 4/24/2013
DRAWING NO:	Page 1 of 2

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Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-101
	6538494.5N; 340699.5E; Zone 10	Elevation: 819.5 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	MOISTURE CONTENT	▲ POCKET PEN. (kPa) ▲ 100 200 300 400 / ■ STANDARD PENETRATION (N) ■ 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	◆ POINT LOAD INDEX (MPa) ◆ 2 4 6 8 / ● FRACTURE FREQUENCY ● 2 4 6 8 / ▲ RQD (%) ▲ 20 40 60 80 / ■ RECOVERY (%) ■ 20 40 60 80	Backfill	Elevation (m)
5			S11						814.0
	END OF HOLE (5.80 metres) - borehole backfilled								
6									813.0
7									812.0
8									811.0
9									810.0
10									

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LOGGED BY: AT	COMPLETION DEPTH: 5.8 m
REVIEWED BY: KLJ	COMPLETE: 4/24/2013
DRAWING NO:	Page 2 of 2

Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-102
	6538498.5N; 340705.2E; Zone 10	Elevation: 819.4 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	▲ POCKET PEN. (kPa) ▲ 100 200 300 400 / ■ STANDARD PENETRATION (N) ■ 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	◆ POINT LOAD INDEX (MPa) ◆ 2 4 6 8 / ● FRACTURE FREQUENCY ● 2 4 6 8 / ▲ RQD (%) ▲ 20 40 60 80 / ■ RECOVERY (%) ■ 20 40 60 80	Backfill	Elevation (m)
0	BST - trace sand, gravel, (100 mm thick)						
	GRAVEL (FILL) -sandy, trace silt, occasional cobbles (5%), subangular to 50 mm diameter, damp, loose, grey		S1				819.0
	BEDROCK - weathered, fractured, hard, grey						
1			S2				
	- trace silt		S3				818.0
2	BEDROCK - hard to very hard, grey						817.0
	END OF HOLE (2.75 metres) - borehole backfilled						
3							816.0
4							815.0
5							

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LOGGED BY: AT	COMPLETION DEPTH: 2.75 m
REVIEWED BY: KLJ	COMPLETE: 4/24/2013
DRAWING NO:	Page 1 of 1

Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-103
	6538485.2N; 340697.9E; Zone 10	Elevation: 819.4 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	MOISTURE CONTENT	▲ POCKET PEN. (kPa) ▲ 100 200 300 400 ■ STANDARD PENETRATION (N) ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	◆ POINT LOAD INDEX (MPa) ◆ 2 4 6 8 ● FRACTURE FREQUENCY ● 2 4 6 8 ▲ RQD (%) ▲ 20 40 60 80 ■ RECOVERY (%) ■ 20 40 60 80	Backfill	Elevation (m)
0	BST - trace sand, gravel (fill), (100 mm thick)							
	GRAVEL (FILL) - sandy, trace silt, well graded, angular, 40 mm, moist, loose, grey		S1					819.0
	SAND AND GRAVEL (FILL) - trace silt, poorly graded, angular, moist, loose, tan		S2					
1	BOULDER		S3					
	GRAVEL - some sand, some silt, poorly graded, subrounded to angular, moist, compact to very compact, grey		S4					818.0
2			S5	2.1	●			
	BEDROCK - weathered, fractured, hard		S6					817.0
	- unweathered, cobbles to 100 mm							
3								816.0
4								
	BEDROCK - hard to very hard							815.0
5								

eba A TETRA TECH COMPANY	LOGGED BY: AT	COMPLETION DEPTH: 5.5 m
	REVIEWED BY: KLJ	COMPLETE: 4/24/2013
	DRAWING NO:	Page 1 of 2

Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-103
	6538485.2N; 340697.9E; Zone 10	Elevation: 819.4 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	MOISTURE CONTENT	▲ POCKET PEN. (kPa) ▲ 100 200 300 400 / ■ STANDARD PENETRATION (N) ■ 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	◆ POINT LOAD INDEX (MPa) ◆ 2 4 6 8 / ● FRACTURE FREQUENCY ● 2 4 6 8 / ▲ RQD (%) ▲ 20 40 60 80 / ■ RECOVERY (%) ■ 20 40 60 80	Backfill	Elevation (m)
5								814.0
	END OF HOLE (5.50 metres) - borehole backfilled							
6								813.0
7								812.0
8								811.0
9								810.0
10								

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LOGGED BY: AT	COMPLETION DEPTH: 5.5 m
REVIEWED BY: KLJ	COMPLETE: 4/24/2013
DRAWING NO:	Page 2 of 2

Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-104
	6538515.7N; 340701.5E; Zone 10	Elevation: 819.5 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	MOISTURE CONTENT	▲ POCKET PEN. (kPa) ▲ 100 200 300 400 ■ STANDARD PENETRATION (N) ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	◆ POINT LOAD INDEX (MPa) ◆ 2 4 6 8 ● FRACTURE FREQUENCY ● 2 4 6 8 ▲ RQD (%) ▲ 20 40 60 80 ■ RECOVERY (%) ■ 20 40 60 80	Backfill	Elevation (m)
0	GRAVEL (FILL) - sandy, trace silt, subangular to 10 mm diameter, fine, damp, loose, grey - angular to subangular, trace of organic inclusions (<2%)							
	- angular gravel to 50 mm diameter, moist		S1					819.0
	SAND - silty, some gravel, trace organics, moist, soft to firm, dark brown/grey, beach deposits		S2	23.6	●			
1	GRAVEL - sandy, trace to some silt, angular to subangular to 40 mm diameter, moist, compact, grey.		S3					
	- silty, trace cobbles, angular, dry		S4					818.0
2	SILT (ORGANIC) - some clay, trace to some gravel, trace sand, moist, firm, brown							
	BEDROCK - weathered, fractured, hard							817.0
3	BEDROCK - hard to very hard, grey							
								816.0
4								
	END OF HOLE (4.25 metres) - borehole backfilled							815.0
5								

LOGGED BY: AT	COMPLETION DEPTH: 4.25 m
REVIEWED BY: KLJ	COMPLETE: 4/24/2013
DRAWING NO:	Page 1 of 1

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GEO/ROCK V31103013-01.GPJ EBA.GDT 7/2/13

Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-201
	6538778.8N; 340703.7E; Zone 10	Elevation: 819.3 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	MOISTURE CONTENT	Backfill	Elevation (m)
0	GRAVEL (FILL) - sandy, trace silt, well graded, angular to subangular to 30 mm diameter, moist, loose, grey		S1				819.0
1	GRAVEL AND COBBLES (FILL) - angular to subangular to 75 mm diameter fragments, compact, dark grey		S3 S2	15			
	COBBLES AND BOULDERS (FILL) - gravelly, some sand, some silt, angular to subangular to 100 mm diameter fragments		S4				818.0
2	GRAVEL (FILL) - clayey, cobbly, trace sand, trace silt, subangular, compact, grey						
	- sandy, some silt, angular to subangular, wet, loose		S5				817.0
3	GRAVEL - trace to some silt, trace clay (low to medium plastic), subangular to subrounded, compact		S6				
	- some silt, some sand, trace clay, damp, grey		S7		4.1		816.0
4	- silty, trace sand, trace clay (low to medium plastic)		S8				
	GRAVEL AND COBBLES - some sand, trace silt, subangular to 100 mm diameter, moist, compact, grey		S9	21/150mm			815.0
	- clayey (medium plastic), trace sand, medium grey		S10				
5							

POCKET PEN. (kPa): 100 200 300 400
STANDARD PENETRATION (N): 20 40 60 80
PLASTIC M.C. LIQUID: 20 40 60 80
POINT LOAD INDEX (MPa): 2 4 6 8
FRACTURE FREQUENCY: 2 4 6 8
RQD (%): 20 40 60 80
RECOVERY (%): 20 40 60 80

/150

eba A TETRA TECH COMPANY	LOGGED BY: AT	COMPLETION DEPTH: 7.9 m
	REVIEWED BY: KLJ	COMPLETE: 4/23/2013
	DRAWING NO:	Page 1 of 2

Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-201
	6538778.8N; 340703.7E; Zone 10	Elevation: 819.3 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	MOISTURE CONTENT	Backfill	Elevation (m)
5	- boulder		S11				814.0
6	GRAVEL - some sand, some silt, some clay, trace cobbles, subangular to subrounded, compact, grey		S12				813.0
	GRAVEL AND COBBLES - some clay, trace silt, sand, angular to subangular, moist, compact, grey						
7	BEDROCK - weathered, fractured, hard		S13			130	812.0
8	END OF HOLE (7.90 metres) - borehole backfilled						811.0
9							810.0
10							

POCKET PEN. (kPa): 100 200 300 400
STANDARD PENETRATION (N): 20 40 60 80
PLASTIC M.C. LIQUID: 20 40 60 80
POINT LOAD INDEX (MPa): 2 4 6 8
FRACTURE FREQUENCY: 2 4 6 8
RQD (%): 20 40 60 80
RECOVERY (%): 20 40 60 80

eba A TETRA TECH COMPANY	LOGGED BY: AT	COMPLETION DEPTH: 7.9 m
	REVIEWED BY: KLJ	COMPLETE: 4/23/2013
	DRAWING NO:	Page 2 of 2

Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-202
	6538788.6N; 340712.8E; Zone 10	Elevation: 819.6 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	Elevation (m)
0	GRAVEL (FILL) - trace sand, trace silt, fine, angular, wet, loose to dense, grey		S1		
	- clayey (low to medium plastic), angular to subangular, to 50 mm diameter		S2		
	BOULDER (FILL)				819.0
1	GRAVEL (FILL) - clayey (low to medium plastic), trace sand, trace silt, angular to subangular to 10 mm diameter, damp to moist, dense, grey		S3		
	GRAVEL - sandy, some silt, trace clay, angular to subangular, moist, dense, grey		S4	9/75mm	
			S5		818.0
2	BEDROCK - hard to very hard				
			S6		817.0
3	END OF HOLE (2.90 metres) - borehole backfilled				
					816.0
4					
					815.0
5					

POCKET PEN. (kPa): 100 200 300 400

STANDARD PENETRATION (N): 20 40 60 80

PLASTIC M.C. LIQUID: 20 40 60 80

POINT LOAD INDEX (MPa): 2 4 6 8

FRACTURE FREQUENCY: 2 4 6 8

RQD (%): 20 40 60 80

RECOVERY (%): 20 40 60 80

Backfill

LOGGED BY: AT	COMPLETION DEPTH: 2.9 m
REVIEWED BY: KLJ	COMPLETE: 4/23/2013
DRAWING NO:	Page 1 of 1

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Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-203
	6538787.4N; 340707.8E; Zone 10	Elevation: 819.8 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	Backfill	Elevation (m)
0	BST (FILL) - trace sand, trace gravel					
	GRAVEL (FILL) - sandy, trace silt, well graded, angular to subangular to 20 mm diameter, moist, loose, grey		S1			
	- trace cobbles, angular to 50 mm diameter, dry to damp, compact		S2			819.0
1			S3	24/100mm		
2	BOULDERS AND COBBLES - angular, dry, grey		S4			818.0
	BEDROCK - hard to very hard					817.0
3			S5			
	END OF HOLE (3.80 metres) - borehole backfilled					816.0
4						
5						815.0

POCKET PEN. (kPa): 100 200 300 400

STANDARD PENETRATION (N): 20 40 60 80

PLASTIC M.C. LIQUID: 20 40 60 80

POINT LOAD INDEX (MPa): 2 4 6 8

FRACTURE FREQUENCY: 2 4 6 8

RQD (%): 20 40 60 80

RECOVERY (%): 20 40 60 80

eba A TETRA TECH COMPANY	LOGGED BY: AT	COMPLETION DEPTH: 3.8 m
	REVIEWED BY: KLJ	COMPLETE: 4/23/2013
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GEO/ROCK V31103013-01.GPJ EBA.GDT 7/2/13

Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-204
	6538804.9N; 340694.8E; Zone 10	Elevation: 819.7 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	▲ POCKET PEN. (kPa) ▲ 100 200 300 400 ■ STANDARD PENETRATION (N) ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	◆ POINT LOAD INDEX (MPa) ◆ 2 4 6 8 ● FRACTURE FREQUENCY ● 2 4 6 8 ▲ RQD (%) ▲ 20 40 60 80 ■ RECOVERY (%) ■ 20 40 60 80	Backfill	Elevation (m)
0	GRAVEL (FILL) - sandy, trace silt, angular to subangular to 10 mm diameter, moist, loose, grey		S1				
	- gravel to 50 mm diameter		S2				819.0
1	BEDROCK - weathered, fractured, hard		S3				
							818.0
2			S4				
	BEDROCK - hard to very hard						817.0
3							
							816.0
4	END OF HOLE (4.25 metres) - borehole backfilled						
							815.0
5							

eba A TETRA TECH COMPANY	LOGGED BY: AT	COMPLETION DEPTH: 4.25 m
	REVIEWED BY: KLJ	COMPLETE: 4/23/2013
	DRAWING NO:	Page 1 of 1

GEO/ROCK V31103013-01.GPJ EBA.GDT 7/2/13

Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-301
	6539900.7N; 340849.4E; Zone 10	Elevation: 819.3 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	MOISTURE CONTENT	Backfill	Elevation (m)
0	BST (FILL) - trace sand, trace gravel, (100 mm thick)						
	GRAVEL (FILL) - some sand to sandy, trace to some silt, well graded, subangular to 30 mm diameter, moist, loose, grey		S1				819.0
	- some sand, trace silt, trace clay		S2				
	GRAVEL AND SAND (FILL) - trace silt, angular to subangular, damp, loose, grey		S3				
1	SAND AND GRAVEL (FILL) - silty, trace clay, gravel to 20 mm diameter, moist, loose, grey						818.0
	GRAVEL - sandy, some silt, trace clay, subangular, to 25 mm diameter, moist to wet, loose, grey		S4		9.7		
2			S5		7.7		817.0
	- cobbles to 100 mm diameter						
3	- silty, some sand, wet, grey		S6	45	7.9		
	- and sand, some silt, subangular, to 20 mm diameter, damp, compact, grey		S7		4.9		816.0
	- cobbles to 100 mm diameter						
4			S8				
	- some silt, some sand, subangular to subrounded, medium grey		S9	45			815.0
	GRAVEL- some silt, some sand, trace clay, trace cobbles, weathered, angular, damp, compact, tan						
5			S10				

POCKET PEN. (kPa): 100 200 300 400

STANDARD PENETRATION (N): 20 40 60 80

PLASTIC M.C. LIQUID: 20 40 60 80

POINT LOAD INDEX (MPa): 2 4 6 8

FRACTURE FREQUENCY: 2 4 6 8

RQD (%): 20 40 60 80

RECOVERY (%): 20 40 60 80

LOGGED BY: AT	COMPLETION DEPTH: 8.85 m
REVIEWED BY: KLJ	COMPLETE: 4/25/2013
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GEO/ROCK V31103013-01.GPJ EBA.GDT 7/2/13

Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-301
	6539900.7N; 340849.4E; Zone 10	Elevation: 819.3 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	MOISTURE CONTENT	▲ POCKET PEN. (kPa) ▲ 100 200 300 400 / ■ STANDARD PENETRATION (N) ■ 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	◆ POINT LOAD INDEX (MPa) ◆ 2 4 6 8 / ● FRACTURE FREQUENCY ● 2 4 6 8 / ▲ RQD (%) ▲ 20 40 60 80 / ■ RECOVERY (%) ■ 20 40 60 80	Backfill	Elevation (m)
5				45					814.0
			S11						
	GRAVEL - clayey, some sand, trace silt, angular, wet, compact, dark grey		S12						
6									
			S13						813.0
	- sandy, trace to some clay, gravel to 10 mm diameter, moist								
7			S14						
	BEDROCK - weathered, fractured, hard, dark grey								812.0
	BEDROCK - hard to very hard		S15						
8									811.0
	END OF HOLE (8.85 metres) - borehole backfilled								
9									810.0
10									

eba A TETRA TECH COMPANY	LOGGED BY: AT	COMPLETION DEPTH: 8.85 m
	REVIEWED BY: KLJ	COMPLETE: 4/25/2013
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Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-302
	6539902.7N; 340851.6E; Zone 10	Elevation: 819.4 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	MOISTURE CONTENT	▲ POCKET PEN. (kPa) ▲ 100 200 300 400 ■ STANDARD PENETRATION (N) ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	◆ POINT LOAD INDEX (MPa) ◆ 2 4 6 8 ● FRACTURE FREQUENCY ● 2 4 6 8 ▲ RQD (%) ▲ 20 40 60 80 ■ RECOVERY (%) ■ 20 40 60 80	Backfill	Elevation (m)
0	BST - trace sand, trace gravel (100 mm thick)								
	GRAVEL (FILL) - sandy, trace silt, subangular to subrounded, damp, loose, grey		S1		3.5				819.0
	- trace cobbles		S2						
1	- trace to some clay (low to medium plastic)								
	GRAVEL - clayey, some sand, some silt, angular to subangular, moist, compact, grey		S3	54					818.0
	BOULDER - gravel sized rock fragments								
2	GRAVEL - sandy, trace silt, angular to subangular, moist, compact, grey		S4	54					
	- trace to some clay (low to medium plastic), coarse gravel								817.0
3									
	- clayey, some sand, some silt, trace cobbles, angular to subangular, wet								816.0
	- sandy, trace clay, tan		S5						
4	- silty, trace sand		S6						
	BOULDER - gravel sized rock fragments								815.0
	GRAVEL - clayey, trace silt, trace cobbles, angular, moist, compact, grey								
5									

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LOGGED BY: AT	COMPLETION DEPTH: 7.3 m
REVIEWED BY: KLJ	COMPLETE: 4/25/2013
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Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-302
	6539902.7N; 340851.6E; Zone 10	Elevation: 819.4 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	MOISTURE CONTENT	▲ POCKET PEN. (kPa) ▲ 100 200 300 400 ■ STANDARD PENETRATION (N) ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	◆ POINT LOAD INDEX (MPa) ◆ 2 4 6 8 ● FRACTURE FREQUENCY ● 2 4 6 8 ▲ RQD (%) ▲ 20 40 60 80 ■ RECOVERY (%) ■ 20 40 60 80	Backfill	Elevation (m)
5									814.0
	BEDROCK - hard to very hard								
6									813.0
7									812.0
	END OF HOLE (7.30 metres) - borehole backfilled								
8									811.0
9									810.0
10									

eba A TETRA TECH COMPANY	LOGGED BY: AT	COMPLETION DEPTH: 7.3 m
	REVIEWED BY: KLJ	COMPLETE: 4/25/2013
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Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-303
	6539913.7N; 340852E; Zone 10	Elevation: 819.4 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	MOISTURE CONTENT	Backfill	Elevation (m)
0	GRAVEL (FILL) - sandy, trace silt, occasional cobbles, angular to subangular to 50 mm diameter, damp, loose, grey						819.0
	- some clay						
	- trace clay		S1				
1	GRAVEL - some sand,some silt, subrounded to subangular, grey						818.0
	GRAVEL - trace sand, subrounded to subangular, moist, compact, brown, trace of organic inclusions		S2		5.7		
2	- CLAY, medium plastic, silty, sandy, some gravel, wet, grey		S3		11.2		817.0
3	- trace cobbles, trace sand, subrounded to angular		S4	38			816.0
	- some sand, some silt, wet, brown		S5		6.2		
4							815.0
	BEDROCK - weathered, fractured, hard, tan						
5							

POCKET PEN. (kPa): 100 200 300 400 | STANDARD PENETRATION (N): 20 40 60 80 | PLASTIC M.C. LIQUID: 20 40 60 80

POINT LOAD INDEX (MPa): 2 4 6 8 | FRACTURE FREQUENCY: 2 4 6 8 | RQD (%): 20 40 60 80 | RECOVERY (%): 20 40 60 80

eba A TETRA TECH COMPANY	LOGGED BY: AT	COMPLETION DEPTH: 7.3 m
	REVIEWED BY: KLJ	COMPLETE: 4/25/2013
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Project: Alaska Highway, Muncho Lake	Client: PWGSC	Project No: V33103013-01
Drilling Method: Sonic	Driller: Mud Bay	Borehole: BH-303
	6539913.7N; 340852E; Zone 10	Elevation: 819.4 m

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE/RUN #	SPT (N)	MOISTURE CONTENT	▲ POCKET PEN. (kPa) ▲ 100 200 300 400 / ■ STANDARD PENETRATION (N) ■ 20 40 60 80 / PLASTIC M.C. LIQUID 20 40 60 80	◆ POINT LOAD INDEX (MPa) ◆ 2 4 6 8 / ● FRACTURE FREQUENCY ● 2 4 6 8 / ▲ RQD (%) ▲ 20 40 60 80 / ■ RECOVERY (%) ■ 20 40 60 80	Backfill	Elevation (m)
5			S6						814.0
	- trace clay, angular, grey		S7						
	BEDROCK - hard to very hard								
6									813.0
7									
	END OF HOLE (7.30 metres) - borehole backfilled								812.0
8									811.0
9									810.0
10									

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LOGGED BY: AT	COMPLETION DEPTH: 7.3 m
REVIEWED BY: KLJ	COMPLETE: 4/25/2013
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APPENDIX B
GPR SURVEY DATA

APPENDIX C
EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA's Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

8.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

9.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

10.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

11.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

12.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

13.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

14.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

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Appendix B

Environmental Protection Plan (EPP) — Checklist

Note: This checklist was developed to assist the Contractor in determining and mitigating environmental issues at site. It is considered a generic checklist and it is in the Contractor's best interest to review the PWGSC Environmental Effects Evaluation as supporting documents in the completion of the site Environmental Protection Plan (EPP).

EPP Framework	Content Requirements	No	Yes	N/A
Project Setting and Site Activities				
Project Description	A brief description of the project and its location is provided.			
Environmental Sensitivities	Sensitive or protected features that could be impacted as a result of the Contractor's activities are described.			
Site Activities	A scope of work and a list of all construction or related activities to be undertaken during the project are provided.			
Project Schedule and Site Drawings				
Project Schedule	A project schedule is provided, including scheduled shut-downs and restricted work periods due to environmental requirements.			
Site Drawing	One or more site drawings(s) are provided, indicating the site location; site set-up and layout; erosion and sediment controls; in-stream work areas; and environmental sensitivities.			
Potential Environmental Impacts and Controls				
Potential Environmental Issues and Impacts	The potential environmental issues and impacts that may result from the construction activities are described. Environmental Reports (Environmental Assessments; Fish Habitat and Compensation etc) will be provided to the contractor especially with respect to any in-stream work procedures that will be required. For example, in-stream works will impact fish and fish habitat in the surrounding ecosystem. It is the Contractor's responsibility to ensure the work is completed in a manner that causes the least impact on the ecosystem (see section on Mitigation).			
Permits, Approvals, and Authorizations	List required permits, approvals and authorizations. As applicable, environmental mitigation measures prescribed by regulatory agencies and included in project permits, approvals and authorizations are described. NOTE: DFO, MOE and NWPA approvals and authorizations for in-stream works are PWGSC's responsibility however, the Contractor must be aware of the requirements of these approvals/authorizations. Permitting for water withdrawal from the waterbody as part of construction activities is part of the Contractor's responsibility.			
Mitigation Strategies	Procedures, controls or best management practices (BMPs) to prevent or reduce adverse impacts on the environment are provided. All work in BC must adhere to the BC MOE "Standards and Best Practices for Instream Works".			
Erosion and Sediment	Erosion and sediment controls are provided, as appropriate for the jurisdiction.			

Waste Management and Hazardous Materials				
Waste Management and Hazardous Materials	Hazardous materials that will be used and/or stored on site are listed. Expected hazardous and non-hazardous waste materials along with proper handling, containment, storage, transportation and disposal methods are listed. As appropriate for the jurisdiction, estimated waste quantities and specific handling procedures are also provided. For example, re-fuelling of equipment will be conducted at least 100m away from any active drainage courses.			
EPP Implementation				
Site Representative	Name(s) and contact details for the person(s) who will be the Contractor's Site Representative(s) are provided.			
Training and Communication	Training and communication details are provided.			
Monitoring and Reporting	Monitoring and inspection procedures, including a schedule of monitoring activities and reporting procedures are provided. For example, this would include downstream monitoring activities for increased siltation during in-stream works.			
Documentation	Information and/or records that will be maintained relating to the EPP and end environmental matters on the project site are described.			
EPP Update	EPP review and update procedures are provided.			
Environmental Emergency Response Procedures				
Environmental Emergency Response Procedures	Potential incidents that may impact the environment are identified, and emergency response procedures to prevent and respond to incidents are provided. An environmental emergency response contact list is also provided.			

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Appendix C

Responsibility Checklist For Authorizations/Approvals/Notifications/Permitting

Project Title	
Project Description	
Project Type	
Comments	

Issued By	Document Type	Yes	No	N/A
PWGSC Responsibility				
Federal				
DFO - Fisheries Act http://laws.justice.gc.ca/en/F-14/	Section 35(2) Authorization for Harmful Alteration Disruption or Destruction (HADD) to fish habitat (eg. new bridges that are not clear span; erosion protection works that extend into the river channel).			
	Section 32 Authorization for Destruction of Fish (when explosives are used). Protects fish from being destroyed except by fishing or as Authorized by DFO.			
	Section 20 Approval – The Need for Safe Fish Passage – Every obstruction across or in any stream where DFO determines it necessary that a fish-pass should exist requires either a fish way or canal around the obstruction.			
	Notification process required for culverts and those works that fall under DFO Operational Statements. Stream Crossings by Roads: • Clear Span Bridges • Temporary Ford Stream Crossing • Ice Bridges and Snow Fills • Bridge Maintenance • Maintenance of Riparian Vegetation in Existing Rights-of Way			
	Section 36 – under this Section of the Fisheries Act the proponent can be FINED resulting from deposition of substances deleterious to fish in waters frequented by fish – this includes release of silt laden waters from construction activities.			
Transport Canada NWPA http://laws.justice.gc.ca/en/N-22/text.html	Section 5(1) Formal Approval for construction of new structures (new bridges, culverts, scour protection).			
	Section 5(2) Work Assessment for work resulting			

	in insignificant impacts on navigability.			
	Section 6(4) Formal Approval for existing structures (existing bridges).			
	Minor Works and Waters Order – This is an amendment to the NWPA that streamlines the federal review process by establishing classes of waters and works (projects) that do not require an Application or Approval through the NWPP because they are "minor" in nature. These would include such "works" as repairs to riprap (no gryones) or "waters" that are not large enough for vessel traffic (ie. Contact Creek). http://www.tc.gc.ca/eng/marinesafety/oep-nwpp-minorworks-menu-1743.htm			
Indian and Northern Affairs Canada – Indian Act	Approval for activities on lands under their jurisdiction. This is addressed under the EA review process in most cases. If the project is exempt from an EA it must be addressed by the PM or ES personnel.			
Migratory Birds Convention Act (MBCA)	Environment Canada is responsible for implementing the *Migratory Birds Convention Act*, which provides for the protection of migratory birds through the *Migratory Birds Regulations*. This is addressed under the EA review process in most cases. If the project is exempt from and EA it must be addressed by the PM or ES personnel.			
ECMP	Has taken over for our old CEAA form. The ECMP Checklist and the Preliminary Identification of Environmental Support Required (PIESR) Form have been developed to ensure that applicable environmental legislation and relevant aspects are identified during a project. The ECMP Checklist replaces the PWGSC CEAA Checklist, and will be the mechanism by which project information is submitted to PWGSC Environmental Services to determine whether environmental support is required. The ECMP Checklist is located in ELF (Form 183_e). By completing and submitting the ECMP Checklist to Environmental Services, PWGSC project managers1 will ensure that their projects are systematically evaluated for compliance with environmental legislation, policies and sustainable development requirements			
Species at Risk Act (SARA) http://www.sararegistry.gc.ca/default_e.cfm	A list of federally-listed species at risk likely to occur at a given subject site must be compiled in order to identify potential impacts & propose mitigation measures for minimizing impacts to these species as a result of project activities. In			

[1] Project Manager refers to anyone who leads, manages or delivers a project

	cases where suitable habitat for a given species exists at/near the project site, mitigation measures are recommended, including avoidance of areas containing said habitat and informing site workers of these issues to prevent incidents.			
First Nations Notifications and Consultations http://clss.nrcan.gc.ca/googledata-donneesgoogle-eng.php	Natural Resources Canada has developed an overlay to be used with Google Earth & Google Maps to identify First Nations lands throughout the country. Notifications of projects within 5 km of such lands and/or directly upstream from such lands should be submitted to the relevant First Nations for a determination of their interest in a given project and/or to request any traditional knowledge they may have to offer.			
Provincial – **Note one submission package for instream works is sent to FrontCounter BC at MOE who then send off to the appropriate departments for approval/notification/permitting – this does not apply to the archeological.**				
Wildlife Act – WLAP – MOE http://www.qp.gov.bc.ca/statreg/stat/W/96488.01.htm	Wildlife Act – Section 34 – Birds, Nests and Eggs – vegetation clearing should not occur during critical bird nesting periods, which typically occur in the spring and summer. Contact the local WLAP for vegetation clearing timing windows.			
Water Act - Water Stewardship Division - MOE http://www.qp.gov.bc.ca/statreg/stat/W/96483	Section 9 – regulates changes in or about a stream and ensure that water quality, riparian habitat, and the rights of licensed water users are not compromised. This is an approval process and takes approximately 140 days. An application fee is also required. Works requiring approval include channel realignment, retaining wall or bank protection stabilization ect.			
Environmental Stewardship Division - MOE	Notification process for such works as replacement and maintenance of culverts and outfalls; temporary stream diversions around a worksite and takes approximately 45 days to receive notification approval. In general, those works requiring a notification are those that do not involve any diversion of water.			
Fish Protection Act – MOE http://wlapwww.gov.bc.ca/habitat/fishprotectionact/	This Act was passed in 1997 and is reviewed as part of the Water Act under Section 9 when applying for approval.			
Ministry of Forests, Lands and Natural Resources Operations Archaeological http://www.for.gov.bc.ca/archaeology/requesting_archaeological_site_information/process_steps.htm *Contact: Hayley Bond (250) 953-3343*	When completing projects such as quarry pits and new highway alignments, a request is put into the archaeological branch of MFLNSO via the EA process to search the data base. An archaeological assessment may be required on those areas that are previously undisturbed or undeveloped.			
BC Parks	Various permits are required when completing construction activities within the Parks. Please note that all works within 150 feet of the			

	centreline of the highway (Right-of-Way) are NOT subject to construction permitting. (this does not include permitting for fish surveys).			
Canada-British Columbia Agreement for Environmental Assessment Cooperation http://www.ceaa.gc.ca/default.asp?lang=En&n=04A20DBC-1	Most Alaska Highway Projects will not trigger this agreement, as both the Vancouver CEAA office and the Victoria BC Environmental Assessment Office (EAO) have confirmed that the types and scopes of the projects are not described in the BC Environmental Assessment Act – Reviewable Projects Regulation. However, for due diligence, it is recommended that notifications for all Alaska Highway projects be submitted to CEAA (info@ceaa-acee.gc.ca) for review and, if necessary, a determination of whether or not CEAA and/or the BC EAO should be involved.			
BC Ministry of Environment – BC Species and Ecosystems Explorer http://a100.gov.bc.ca/pub/eswp/	A list of provincially-listed species at risk likely to occur at a given subject site must be compiled in order to identify potential impacts & propose mitigation measures for minimizing impacts to these species as a result of project activities. This process involves conducting a search of the BC Species and Ecosystems Explorer inventory for the specific area of BC containing the proposed project site.			
Consultant Responsibility				
Provincial				
BC Parks Ministry of Forests, Lands and Natural Resources Operations http://www.env.gov.bc.ca/bcparks/permits/	Permit to Collect Fish For a Scientific Purpose - Regulation Research activities in parks and protected areas, including: collection; monitoring; survey and inventory; and, other research trigger a Park Permit - – Ministry of Forests, Lands and Natural Resources Operations is responsible for the administration of fish and wildlife permits. Note that these permits are taking approx 6 months to receive due to recent involvement and subsequent consultation with Treaty 8.			
Water Act – Regulation's Protection of Habitat - Section 42(1)	Permit to Collect Fish For a Scientific Purpose – Subsection 42(1)(e) – It is the responsibility of the salvage crew to obtain the necessary permit required to complete a fish and amphibian salvage – in conjunction with the BC Parks permitting.			
Note: research projects and inventory projects are under the same Permit and are applied for under the "Application to Collect Fish for a Scientific Purpose". **http://www.env.gov.bc.ca/pasb/applications/process/scientific_fish_collect.html#a5**				

Contractor Responsibility				
Federal				
DFO – End of Pipe Guidelines	End-of- pipe guidelines for freshwater intake to avoid fish entrainment.			
Provincial				
Water Act - MOE	Schedule A – Water License Applications – use of water from waterbody for road maintenance.			

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Appendix D

Relevant Environmental Publications

The below list of documents are those commonly used when determining how to design and advance a project with the potential to impact a waterbody.

Agency	Publications	Summary
DFO	***Land Development Guidelines for the Protection of Aquatic Habitat - 1993***	This document is a good reference guide for any works that are occurring in or around the water.
	Canada's Fish Habitat Law	Document explaining the fish and fish habitat laws under the Fisheries Act.
	Riparian Revegetation	Information on minimizing, stabilizing and revegetating construction areas.
	Freshwater Intake End-of Pipe Fish Screen Guideline - 1995	Provides guidelines for the contractor to follow to ensure fish screens are used during freshwater intake operations at construction sites.
	Operational Statements Stream Crossings by Roads: • Clear Span Bridges • Temporary Ford Stream Crossing • Ice Bridges and Snow Fills • Bridge Maintenance • Maintenance of Riparian Vegetation in Existing Rights-of Way	Fisheries and Oceans Canada has developed a series of Operational Statements to streamline the undertaking of low risk activities. The Operational Statements outline conditions and measures for avoiding harmful alteration, disruption and destruction (HADD) of fish habitat, and applying them will ensure the project complies with subsection 35(1) of the *Fisheries Act*. You are NOT required to submit a proposal for review by Fisheries and Oceans Canada when you incorporate the measures and conditions outlined in an appropriate Operational Statement into your plans. http://www.pac.dfo-mpo.gc.ca/habitat/os-eo/index-eng.htm
MOE	***Fish-stream Crossing Guidebook - 2002***	Guidelines in protection of fish and fish habitat and the safe passage of fish during construction at/on stream crossings.
	Standards and Best Practices for Instream Works - 2004	Guide to planning and carrying out the proposed construction activities to comply with relevant legislation, regulations and policies.
	A User's Guide to Working In and Around Water - 2005	Understanding the regulation under British Columbia's Water Act.
	Fish-Stream Identification Guidebook - 1998	Assists in providing information on determining fish streams.
	The Streamkeepers Handbook	A practical guide to stream and wetland care in regards to rehabilitation planting.

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Appendix E

Photo 1: Looking North at Existing Gabions between Stn.701+628 and Stn. 701+646.

Photo 2: Looking South at Highway Shoulder above Existing Gabions between Stn. 701+628 and Stn. 701+646.

Photo 1: Looking North at Existing Gabions, Riprap, and Logs between Stn. 703+082 and Stn. 703+097.

Photo 2: Looking South at Existing Gabions, Riprap, and Logs between Stn. 703+082 and Stn. 703+097.

Photo 1: Looking South at Existing Riprap and Logs between Stn. 703+082 to Stn. 703+097.


Photo 2: Looking North at Highway Shoulder between Stn. 703+082 to Stn. 703+097.