Public Works and Government Services Canada

Requisition No: _____

DRAWINGS & SPECIFICATIONS
for

Rock Slope Stabilization North Side, Esquimalt Graving Dock, Victoria, BC

Project No.: R.106340.001
March 2020

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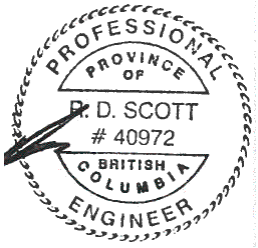


2020-08-17

PART 1– GENERAL

1.1 CODES, BYLAWS, STANDARDS

.1 Comply with applicable local bylaws, and all Esquimalt Graving Dock rules and regulations enforced at the location concerned.

.2 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.

.3 In any case of conflict or discrepancy, the most stringent requirements shall apply.

.4 Contractor shall apply and obtain any work permits required by authorities having jurisdiction.

1.2 DESCRIPTION OF WORK

.1 The work is located at the rock slopes behind select buildings within the operational area along the north side of the drydock at the Esquimalt Graving Dock, 825 Admirals Road, Victoria, BC.

.1 Area A is located behind Buildings 1037, 1036, 2029, 2028, 2025.

.2 Area B is located behind Buildings 2011, 2013, 2015, 2016.

.2 Work to be performed under this Contract includes, but is not limited to, the following items covered further in the Contract documents:

.1 Construction of new rock anchors and mesh at Area A and Area B.

.2 Vegetation removal as required to installed the anchors and mesh components.

1.3 CONTRACT METHOD

.1 Construct work under lump sum contract.

1.4 CONTRACT DOCUMENTS

.1 The Contract documents, drawings, and specifications are intended to complement each other, and to provide for and include everything necessary for the completion of the work.

.2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work.

.3 If there is any inconsistency or conflict between the provisions of the Contract Documents the:

.1 The Contract Documents shall govern and take precedence in the following order with the Agreement taking precedence over all other Contract Documents:

.1 Agreement

.2 Addenda

.3 Supplementary Specifications

.4 Specifications

.5 Drawings

.6 Supplementary Detailed Drawings

.7 Standard Detailed Drawings

.8 Executed Form of Tender

.9 Instructions to Tenderers

.10 All other Contract Documents;

.2 Drawings at a larger scale shall govern over Drawings at a smaller scale.

.3 Figured dimensions on a drawing shall govern over scaled measurements on the same Drawing; and

.4 Documents of later date shall always govern a similar type of document of an earlier date.

1.5 OTHER CONTRACTS

.1 Further Contracts may be awarded while this contract is in progress.

.2 Cooperate with other Contractors on site in carrying out their respective works and carry out instructions from Departmental Representative.

.3 Coordinate work with that of other Contractors.

1.6 DIVISION OF SPECIFICATIONS

.1 The specifications are subdivided in accordance with the current 6-digit National Master Specifications System.

.2 A division may consist of the work of more than one subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.

.3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern.

1.7 TIME OF COMPLETION

.1 Commence work immediately upon official notification of acceptance of offer and complete the project within eight (8) weeks after Contract Award.

1.8 HOURS OF WORK

.1 Restrictive as follows:

.1 Schedule deconstruction, removal and construction work during normal weekday working hours of the Esquimalt Graving Dock. Normal weekday working hours are 07:00-17:00 Monday through Friday, excluding statutory holidays.

.2 Submit written request to Departmental Representative for authorization prior to working outside of normal working hours including weekends or holidays.

1.9 WORK SCHEDULE

.1 Carry on work as indicated and as follows:

.1 Within 5 working days after Contract award, provide a Master Project Schedule, in the form of a bar chart, showing anticipated progress stages and final completion of the work within the time period required by the Contract documents. Schedule to indicate the following:

.1 Submission of shop drawings, product data, MSDS sheets and samples.

.2 Commencement and completion of work of each section of the specifications or trade for each stage of work as outlined.

.3 Final completion date within the time period required by the Contract documents.

.2 Do not change approved Schedule without notifying Departmental Representative.

.3 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to the approval of the Departmental Representative.

1.10 COST BREAKDOWN

.1 Before submitting the first progress claim, submit a breakdown of the contract lump sum price in detail as directed by the Departmental Representative. After approval, the cost breakdown will form the basis of progress payments.

1.11 DOCUMENTS REQUIRED

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

.1 Contract drawings.
.2 Contract specifications.
.3 Addenda to Contract documents.
.4 Copy of approved work schedule.
.5 Reviewed shop drawings.
.6 Change orders.
.7 Other modifications to Contract.
.8 Field test reports.
.9 Reviewed samples.
.10 Manufacturer’s installation and application instructions.
.11 One set of record drawings and specifications for "as-built" purposes.
.12 Contractor’s Health and Safety Plan and other Safety Related Documents.
.13 National Building Code of Canada 2015.
.14 Current construction standards of workmanship listed in technical specifications.
.15 WHMIS documents.
.16 Site Instructions.
.17 Request for Information (RFI).
.18 Contractor’s Environmental Management Plan (including spill management plan).
.19 Other documents as specified.

1.12 OWNER OCCUPANCY

.1 During the entire construction period, the owner (Canada) and tenants will occupy adjacent areas for execution of normal operations.

1.13 CONTRACTOR'S USE OF SITE

.1 The Esquimalt Graving Dock shall be assumed to be fully operational for the duration of the contract.

.2 The Contractor will assume the role of Prime Contractor as per Section 118 of the Workers Compensation Act.

.3 The use of Contractor’s work site is exclusive and complete for the execution of contract work.

.4 The Contractor shall:

.1 Assume responsibility for assigned premises for performance of the work.
.2 Coordinate all work activities on the Contractor’s work site, including the work of other contractors engaged by Departmental Representative.
.3 Provide security of Contractor’s work site and all Contractor’s and Subcontractor’s equipment and material. Secure Contractor’s work site at the end of each work day.
.4 Ensure the site is not unreasonably encumbered with material or equipment.

.5 Do not enter any area of the Esquimalt Graving Dock property to which access is restricted by sign is a secured or restricted area and shall not be entered.

.6 Do not obstruct access to PWGSC property outside of the Contractor's work site. Maintain overhead clearances, keep roadways and walkways clear, and maintain routes for emergency response vehicles.

1.14 EXISTING SERVICES

.1 Notify Departmental Representative of intended interruption of services and obtain required permission. Where work involves breaking into or connecting to existing services, contractor shall submit a request to the Departmental Representative a minimum of 48 hours prior to the event. The contractor will not proceed until approval has been granted. The PWGSC Departmental Representative will make all reasonable efforts to accommodate the request; however, PWGSC will not accept delay charges should the request not be accepted.

.2 Minimize duration of interruptions, and where required, provide temporary services to maintain critical systems.

.3 Contractor to identify that all unknown services encountered to the Departmental Representative who will provide direction on how to proceed.

.4 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in a manner approved by authorities having jurisdiction.

1.15 WORK BY OTHERS

.1 Co-ordinate work with that of other Contractors. If any part of the Work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of work.

1.16 EXAMINATION

.1 Examine site and be familiar and conversant with existing conditions likely to affect work.

.2 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

.3 At completion of operations the condition of existing work must be equal to or better than that which existed before new work started.

.4 Protect existing work to prevent injury or damage to portions of existing work which remain.

.5 Complete ground penetrating radar (GPR) to all excavation areas. Provide written report with findings to Departmental Representative prior to proceeding with any excavation activities

1.17 CUTTING AND PATCHING

.1 Cut existing surfaces as required to accommodate new work.

.2 Remove items so shown or specified.

.3 Except as noted on drawings, do not cut, bore, or sleeve load-bearing members.

.4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

.5 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval.

.6 Making good is defined as matching construction and finishing materials and the adjacent surfaces such that there is no visible difference between existing and new surfaces when viewed from 1.5 meters in ambient light.

1.18 SETTING OUT OF WORK

.1 Assume full responsibility for and execute complete layout of work to locations, lines, angles, and elevations indicated.

.2 Provide devices needed to lay out and construct work.

.3 Supply such devices as templates required to facilitate Departmental Representative's inspection of work.

1.19 ACCEPTANCE OF SUBSTRATES

.1 Each trade shall examine surfaces prepared by others and job conditions which may affect his work, and shall report defects to the Departmental Representative. Commencement of work shall imply acceptance of prepared work or substrate surfaces.

1.20 QUALITY OF WORK

.1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.

.2 In cases of dispute, decisions as to standard or quality of work rest solely with the Departmental Representative, whose decision is final.

1.21 MEETINGS

.1 Attend contract start-up meeting, progress meetings and all other meetings described herein including site meetings as directed by the Departmental Representative.

1.22 WORKS COORDINATION

.1 Coordinate work of subtrades:

.1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.

.2 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.

.1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.

.2 Develop coordination drawings where required, illustrating potential interference between work of various trades and distribute to affected parties.

.3 Work cooperation:

.1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.

.2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching and removal or replacement of completed work.

.4 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.

.5 Ensure disputes between subcontractors are resolved.

.6 Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.

.7 Maintain efficient and continuous supervision.

1.23 APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

.1 In accordance with Section 01 33 00 – Submittal Procedures, submit the requested shop drawings, product data, MSDS sheets and samples indicated in each of the technical Sections.

.2 Allow sufficient time for the following:

.1 Review of product data.

.2 Approval of shop drawings.

.3 Review of re-submission.

.4 Ordering of approved material and/or products - refer to technical Specifications.

1.24 SECURITY CLEARANCES

.1 Personnel employed on this project will be subject to security check. Obtain requisite clearances, as instructed, for each individual required to enter the premises.

.2 Personnel will need to obtain security clearance at start of project and be provided with a security badge which is to be worn and visible at all times while on the site.

.3 Contractor shall be fully responsible for securing the premises and its contents throughout the construction period.

1.25 TESTING AND INSPECTIONS

.1 Particular requirements for inspection and testing to be carried out by testing service or laboratory approved by the Departmental Representative and paid for by the Contractor.

.2 The Contractor will appoint and pay for the services of testing agency or testing laboratory as specified, and where required for the following:

.1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.

.2 Inspection and testing performed exclusively for Contractor's convenience.

.3 Where tests or inspections by designated testing laboratory reveal work is not in accordance with the Contract requirements, Contractor shall pay costs for additional tests or inspections as the Departmental Representative may require to verify acceptability of corrected work.

.4 Contractor shall notify Departmental Representative in advance of planned testing.

.5 Contractor shall pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.

.6 Provide Departmental Representative with 1 electronic copy of testing laboratory reports as soon as they are available.

1.26 AS-BUILT DOCUMENTS

.1 Refer to Section 01 78 30 - Closeout Submittals.

1.27 CLEANING

.1 Conduct daily cleaning and disposal operations. Comply with local ordinances and anti-pollution laws.

.2 Ensure cleanup of the work areas each day after completion of work.

1.28 DUST CONTROL

.1 Provide control measures as specified in Section 01 35 43 - Environmental Procedures.

1.29 ENVIRONMENTAL PROTECTION

.1 Refer to Section 01 35 43 - Environmental Procedures.

1.30 ADDITIONAL DRAWINGS

.1 The Departmental Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with plans referred to in the Contract documents.

.2 Upon request, Departmental Representative may furnish up to a maximum of 3 sets of Contract documents for use by the Contractor at no additional cost. Should more than 3 sets of documents be required, the Departmental Representative will provide them at additional cost.

1.31 SYSTEM OF MEASUREMENT

.1 The metric system of measurement (SI) will be employed on this Contract.

1.32 FAMILIARIZATION WITH SITE

.1 Before submitting tender, visit site - as indicated in tender documents and become familiar with all conditions likely to affect the cost of the work.

1.33 SUBMISSION OF TENDER

.1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents and inspected the site, and is fully conversant with all conditions.

END OF SECTION 01 11 55

PART 1– GENERAL

1.1 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

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

.3 Present information in SI Metric units.

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

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and will be considered rejected.

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

.7 Verify field measurements and affected adjacent Work are coordinated.

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

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

.10 Keep one reviewed copy of each submission on site.

.11 Do not proceed with work until relevant submissions are reviewed by Departmental Representative.

1.2 SHOP DRAWINGS

.1 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

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

1.3 PROGRESS PHOTOGRAPHS AND FINAL PHOTOGRAPHS

.1 Submit electronic copy of colour digital photography in jpg format, standard resolution, monthly with progress statement and as directed by Departmental Representative.

.2 Project Identification: Project name, project number, and date of exposure indicated.

.3 Progress and Final Photographs to be submitted using an electronic file share platform acceptable to PWGSC.

.4 Quantity: Provide sufficient number of photographs to adequately describe the work activities carried out during the reporting period. A minimum of two photographs taken from two viewpoints are to be provided for each clean-up/construction activity.

.5 Submit final photographs with as-built documents.

END OF SECTION 01 33 00

1 GENERAL

PWGSC Update on Asbestos Use
Effective April 1, 2016, all Public Works and Government Services of Canada (PWGSC) contracts for new construction and major rehabilitation will prohibit use of asbestos-containing materials.

COVID-19
All contractors shall follow Canadian Construction Association COVID-19 - Standardized Protocols for All Canadian Construction Sites, Provincial Regulations, and EGD site specific COVID-19 Procedures.

1.1 REFERENCES

.1 Government of Canada.

.1 Canada Labour Code - Part II (as amended)

.2 Canada Occupational Health and Safety Regulations (as amended)

.2 National Building Code of Canada (NBC): (as amended)

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

.3 The Canadian Electrical Code (as amended)

.4 Canadian Standards Association (CSA) as amended:

.1 CSA Z797-2018 Code of Practice for Access Scaffold.

.2 CSA S269.1-2016 Falsework for Construction Purposes.

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

.4 CSA Z1006-10 Management of Work in Confined Spaces.

.5 CSA Z462-18 Workplace Electrical Safety Standard

.5 National Fire Code of Canada 2015 (as amended)

.1 Part 5 – Hazardous Processes and Operations and Division B as applicable and required.

.6 American National Standards Institute (ANSI): (as amended)

.1 ANSI/ASSP A10.3-2013, Operations – Safety Requirements for Powder-Actuated Fastening Systems.

.7 Province of British Columbia:

.1 Workers Compensation Act Part 3-Occupational Health and Safety. (as amended)

.2 Occupational Health and Safety Regulation (as amended)

.8 NMS Section 00 10 10 Specification Index (Appendix X thru Appendix X)

.9 Esquimalt Graving Dock (EGD) Contractors Safety Booklet (as amended)

1.2 RELATED SECTIONS

.1 Refer to the current NMS sections as indicated in Section 001010 Specification Index, including Appendices.

1.3 WORKERS' COMPENSATION BOARD 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 30.

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

.3 Submit the following:

.1 Organizations Health and Safety Plan.

.2 Site Specific Safety Plan or Health and Safety Plan (SSSP or HASP)

.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 (SDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS 2015) requirements.

.5 Emergency Response Plan and Emergency Evacuation Plan and Procedures.

.4 The Departmental Representative will review the Contractor's Site Specific Safety Plan or Health and Safety Plan (SSSP/HASP) and emergency response procedures, and provide comments to the Contractor within 5 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 Site Specific Safety Plan or Health and Safety Plan, and any revised version, to the Departmental Representative is 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 Assume responsibility as the Prime Contractor for work under this contract.

.2 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.

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

.4 All contractor workers shall attend an EGD Safety Orientation prior to ant work starting.

.5 The contractor is responsible for reviewing the Esquimalt Graving Dock (EGD) Contractors Safety Handbook and ensuring that the Site Specific Safety Plan and/or Health and Safety Plan are harmonized with the EGD Contractors Safety Handbook.

1.7 HEALTH AND SAFETY COORDINATOR

.1 The contractor must assign a competent and qualified Health and Safety Coordinator who 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 Safety Plan (SSSP) or Health and Safety Plan (HASP)

.3 Be on site during execution of work.

.4 Have minimum two (2) years' site-related working experience

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

1.8 GENERAL CONDITIONS

.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 at night time or provide security guard as deemed necessary to protect site against entry.

1.9 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:

.1 PWGSC and other Federal employees,

.2 EGD (federal) operational staff,

.3 Ship repair and other contractors,

.4 Work over and under water, Protection Against Drowning, Refer to COHS Section A Part X11-Safety Materials, Equipment, Devices and Clothing – Section 12.11 inclusive.

.5 Overhead cranes,

.6 Work at heights, **(2.4m on Federal Property)**

.7 Unpredictable weather conditions,

.8 Threat of tsunami and earthquake,

.9 Confined space and restricted access space,

.10 Work with hazardous substances, and

.11 Refer to PWGSC Preliminary Hazard Assessment Appendix A

1.10 UTILITY CLEARANCES

.1 The Contractor is solely responsible for all utility detection and clearances prior to starting the work.

.2 The Contractor will not rely solely upon the Reference Drawings or other information provided for Utility locations.

1.11 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 provision of (.1) above, the authorities having 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.

1.12 WORK PERMITS

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

1.13 FILING OF NOTICE

.1 The General Contractor shall file Notice of Project with Provincial authorities prior to commencement of work. (All PWGSC construction projects require a Notice of Work)

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

1.14 SITE SPECIFIC HEALTH AND SAFETY PLAN

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

.2 Develop, implement, and enforce a Site Specific Safety Plan (SSSP) or Health and Safety Plan (HASP) 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.

.11 COVID 19 Protocols and Procedures (National, Provincial and EGD Site Specific)

.12 EGD Contractors Safety Handbook

.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. WHMIS 2015 SDS required for all products.

.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 site specific safety plan or health and/or safety 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 Site Specifc Safety Plan (SSSP) and/or Health and Safety Plan (HASP) as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review of Site Specific Safety Plan and/or 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 Site Specific Safety Plan and/or Health and Safety Plan of responsibility for meeting all requirements of construction and Contract documents and legislated requirements.

1.15 EMERGENCY PROCEDURES

.1 List standard operating procedures and measures to be taken in emergency situations. Include an emergency response and emergency 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 and Other PWGSC staff as required. (reference: EGD Contractors Safety Handbook)

.5 A route map with written directions to the nearest hospital or medical clinic.

.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 and PWGSC site staff.

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

.6 Contractors must not rely solely upon 911 for emergency rescue in a confined space, working at heights, etc.

.7 At least once each year, emergency drills, must be held to ensure awareness and effectiveness of emergency exit routes and procedures, and a record of the drills must be kept

1.16 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage and disposal of hazardous materials, and regarding labelling and provision of Safety Data Sheets (SDS) acceptable to the Departmental Representative and in accordance with the Canada 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 SDS and WHMIS 2015 documents as per Section 01 33 30.

.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 in accordance with Section 00 01 10.

.4 The contractor shall ensure that the product is applied as per manufacturers recommendations.

.5 The contractor shall ensure that only pre-approved products are bought onto the site.

1.17 OFF SITE CONTINGENCY and EMERGENCY RESPONSE PLAN

.1 Prior to commencing Work involving handling of hazardous materials, develop off site Contingency and Emergency Response Plan.

2. Plan must provide immediate response to serious site occurrence such as explosion, fire, or migration of significant quantities of toxic or hazardous material from Site.

3. Notification of fire departments [4.17 – Worksafe BC Regulations Part 4 Buildings, Structures, Equipment, and Site Conditions]

(1) An employer having at a workplace hazardous products covered by WHMIS, explosives, pesticides, radioactive material, consumer products or hazardous wastes in quantities which may endanger firefighters, must ensure the local fire department is notified of the nature and location of the hazardous materials or substances and methods to be used in their safe handling.

(2) Subsection (1) does not apply to a workplace

(a) where materials are kept on site for less than 15 days if the employer ensures an alternative effective means for notification of fire departments is in place in the event of fire or other emergency, or

(b) which is not within the service area of a fire department. [Amended by B.C. Reg. 30/2015, effective August 4, 2015.]

1.18. PERSONAL PROTECTIVE CLOTHING and EQUIPMENT

.1 Work shall be performed in compliance with Part 8 - Personal Protective Clothing and Equipment, and Part 5 – Chemical Agents and Biological Agents, (as applicable) Worksafe BC OHS Regulations (as amended)

1.19 ASBESTOS HAZARD

.1 Carry out any activities involving asbestos shall be in accordance with current applicable Federal and Provincial Regulations.

.2 Removal and handling of asbestos shall be in accordance with current applicable Provincial / Federal Regulations (as amended)

1.20 PCB REMOVALS

.1 Mercury-containing fluorescent tubes and ballasts which contain polychlorinated biphenyls (PCBs) are classified as hazardous waste.

.2 Remove, handle, transport and dispose of as indicated in Section 000110 specification index.

1.21 REMOVAL OF LEAD-CONTAINING PAINT

.1 All paint containing TCLP lead concentrations above 5 ppm are classified as hazardous.

.2 Carry out demolition and/or remediation activities involving lead-containing paints in accordance with current applicable Provincial / Territorial Regulations.

.3 Work with lead-containing paint shall be completed as per Provincial and Federal regulations.

.4 Dry Scraping/Sanding of any materials containing lead is strictly prohibited.

.5 The use of Methylene Chloride based paint removal products is strictly prohibited.

1.22 SILICA

.1 Carry out work in accordance with Worksafe BC regulations.

1.23 ELECTRICAL SAFETY REQUIREMENTS (Reference: Worksafe BC OHS Regulation Part 19 – Electrical Safety)

.1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.

.1 Before undertaking any work, coordinate arc flash protection, required energizing and de-energizing of new and existing circuits with Departmental Representative.

.2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

.3 Develop, implement and enforce a communication plan with Departmental representative and EGD maintenance staff for all electrical work and lockout procedures.

1.24 ELECTRICAL LOCKOUT

.1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.

.2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.

.3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

4. Comply with EGD Lockout Policy and Procedures (as amended)

1.25 OVERLOADING

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

1.26 FALSEWORK

.1 Design and construct falsework in accordance with CSA S269.1-1975 (R2003) (as amended)

1.27 SCAFFOLDING

.1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 (as amended) and B.C. Occupational Health and Safety Regulations. (as amended)

1.28 CONFINED SPACES

.1 Carry out work in compliance with current Worksafe BC Part 9 Confined Spaces and CSA Z1006-10 Management of Work in Confined Space.

1.29 RESTRICTED ACCESS

.1 Contractor shall perform a hazard assessment and develop an appropriate restricted access entry and emergency rescue plan in accordance with Worksafe BC regulations.

1.30 CONFINED SPACE AND RESTRICTED SPACE OUTSIDE OF DEFINED WORK SITE

.1 Carry out work in confined spaces in compliance with Worksafe BC Part 9 Confined Spaces and CSA Z1006-10 Management of Work in Confined Space. Coordinate all confined space entry work with PWGSC Departmental Representative through the contractor's confined space entry permit system.

.2 Contractor shall perform a hazard assessment and develop an appropriate restricted access entry and emergency rescue plan in accordance with Worksafe BC regulations. Coordinate all restricted access space entry work with the Departmental Representative prior to entry.

.3 The Contractor is required to provide a reasonable amount of time to the Departmental Representative for making arrangements for entry and/or access to Confined Space or Restricted Access spaces located outside the designated work site.

1.31 POWDER-ACTUATED DEVICES

.1 Use powder-actuated devices in accordance with ANSI A10.3 (as amended) only after receipt of written permission from the Departmental Representative.

1.32 FIRE SAFETY AND HOT WORK

.1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.

.2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

.3 Coordinate all hot work with Departmental Representative through the contractors' hot work permit system. Hot Work permits are a mandatory requirement for any hot work activities.

1.33 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. (as amended)

.3 Portable gas and diesel fuel tanks are not permitted on most federal work sites. Approval from the Departmental Representative is required prior to any gas or diesel tank being brought onto the work site.

1.34 FIRE PROTECTION AND ALARM SYSTEM

.1 Fire protection and alarm systems shall not be:

.1 Obstructed.

.2 Shut off.

.3 Left inactive at the end of a working day or shift.

.2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.

.3 Be responsible/liable for costs incurred from the fire department, the building owner and the tenants, resulting from false alarms.

1.35 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 immediately advise the Departmental Representative verbally and in writing.

1.36 BLASTING OPERATIONS

.1 All blasting operations shall be in accordance with Worksafe BC OHS Regulation Part 21 – Blasting Operations.

1.37 POSTED DOCUMENTS

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

.1 Site Specific Safety Plan (SSSP) or Health and Safety Plan (HASP)

.2 Sequence of work.

.3 Emergency procedures.

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

.5 Notice of Project.

.6 Floor plans or site plans. Must be posted in a non-inmate access area and locked up when not being used.

.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 2015) documents.

.9 Material Safety Data Sheets (SDS).

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

.11 All Hazardous Material and Substance Reports including Lab Analysis

.2 Post all Safety Data Sheets (SDS) 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.

1.38 MEETINGS

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

1.39 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 noncompliance 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".

2 PRODUCTS

.1 Not used.

3 EXECUTION

.1 Not used.

END OF SECTION

PART 1– GENERAL

1.1 REFERENCES

.1 Appendix B – Esquimalt Graving Dock Environmental Best Management Practices.

1.2 DEFINITION

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.

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

1.3 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.

.2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.

.3 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.4 Environmental protection plan to include:

.1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.

.2 Names and qualifications of persons responsible for manifesting contaminated materials and hazardous waste to be removed from site.

.3 Names and qualifications of persons responsible for training site personnel.

.4 Descriptions of environmental protection personnel training program.

.5 Erosion and Sediment Control Plan 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 Erosion and Sediment Control Plan, Federal, Provincial, and Municipal laws and regulations.

.6 Spill Control Plan: including procedures, instructions, and reports to be used in 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 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.

.9 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.

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

.11 The contractor shall contain dust, debris and tailings from drilling/coring activities using wetting and HEPA vacuum.

.12 Provide temporary dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of work and the public.

1.4 FIRES

.1 Fires and burning of rubbish on site is not permitted.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Accomplish maximum control of construction waste to preserve environment and prevent pollution and environmental damage

.1 All disposal, recycling and waste manifests shall be provided to the Departmental Representative.

.2 Ensure proper disposal procedures in accordance with all applicable regulations.

.3 Contractor to provide all disposal certificates, receipts, and other applicable documentation for removal and disposal of existing hazardous materials in accordance with requirements

.2 Identify opportunities for waste reduction, reuse, and recycling of materials.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials

.5 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.6 Collect handle, store on-site, and transport off-site, salvaged materials in separated condition.

.7 Store materials to be reused, salvaged, and salvaged in locations as directed by the Departmental Representative.

.8 Unless otherwise specified, materials for removal become Contractors property.

.9 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.10 Do not bury rubbish and waste materials on site.

.11 Do not dispose of wastes into water courses, storm, or sanitary sewers.

.12 Place materials defined as hazardous or toxic in designated containers.

.13 Divert unused aggregate materials from landfill to facility for reuse as approved by Department Representative.

.14 Dispose of unused paint and paint thinner materials at official hazardous material collections site as approved by Department Representative.

.15 Fold up metal banding, flatten and place in designated area for recycling.

.16 Do not dispose of unused paint thinner material into sewer system, into streams, lakes, onto ground or in other location where it will pose health environmental hazard.

.17 Divert unused asphalt from landfill to facility capable of recycling materials.

.18 Conduct daily cleaning operations as work progresses.

.19 Conduct Final cleaning when work is complete, prior to final inspection.

1.6 WORK ADJACENT TO WATERWAY

.1 Do not dump waste material or debris in waterways.

1.7 POLLUTION CONTROL

.1 Maintain pollution control features installed under this contract.

.2 Control emissions from equipment and plant to local authorities' emission requirements.

.3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

1.8 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor: after receipt of such notice, 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.

1.9 SPILLS OR RELEASE OF DELETERIOUS SUBSTANCES

.1 Measures to be implemented to prevent, control or mitigate spills or release of deleterious substances:

.1 Contractor shall take due care to ensure no deleterious materials enter watercourses or any surface drainage pathways located in the project area.

.2 Emergency response procedure for spills of deleterious substances must be in place. In the event of a spill, the contractor will immediately implement their Spill Response Protocol.

.3 The Contractor is responsible for all costs associated with a spill or release as a result of their actions. This will include but not limited costs of spill response equipment and materials, associated sampling, analysis and any required restoration of the impacted area.

.4 Response equipment to be on site at all times (i.e. spill kits) and workers trained in their location and use. The resources on hand must be sufficient to respond effectively and expediently to any spill that could occur on site.

.5 All construction equipment brought onto the site will be clean and properly maintained.

.6 Any equipment maintenance must occur in a designated area and must be conducted away from any surface water drains or collection points.

.7 Any equipment remaining on site overnight shall have appropriately placed drip pans.

.8 Waste generated will be prevented from entering the environment.

.2 Prevent discharges containing asphalt, grout, concrete or other waste materials from reaching storm drains or the marine environment.

1.10 CLEANING

.1 Conduct daily cleaning and disposal operations. Comply with local ordinances and anti-pollution laws.

.2 Ensure cleanup of the work areas each day after the completion of work.

.3 No washing out of concrete trucks is permitted on site.

.4 Complete daily cleaning activities of all roadways and parking lot areas affected by work and by construction equipment traffic.

END OF SECTION 01 35 43

PART 1– GENERAL

1.1 INSPECTION

.1 Allow Department Representative access to Work. If part of Work is in preparation at locations other than Work Site, allow access to such Work whenever it is in progress.

.2 Give 48 hours notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Work Site.

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

.4 Department Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Contractor shall engage and pay for Independent Inspection/Testing Agencies for the purposes of Quality Control to ensure that Work meets the requirements of the Contract Documents. Contractor shall submit the document of Independent Inspection/Testing Agencies to Departmental Representative for approval.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Department Representative at no cost to Department Representative. Pay costs for retesting and re-inspection.

1.3 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

.1 Notify appropriate agency and Department Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Department Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

1.6 REPORTS

.1 Submit 2 copies of inspection and test reports to Department Representative.

.2 Provide copies to subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested.

END OF SECTION 01 45 00

PART 1– GENERAL

1.1 GENERAL

.1 Section 01 55 00 addresses general requirements for temporary vehicle movement, site access and parking not incorporated into the final or permanent work, as well as traffic control during construction. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

.2 During progress of the Work, make adequate provision to accommodate normal traffic along onsite roads immediately adjacent to or crossing the Works so as to minimize inconvenience to site operations.

.3 Give minimum 48 h notice or as otherwise required by Departmental Representative to local police, fire departments, emergency services, and site operations staff prior to beginning construction on roadways and comply in all respects with their requirements.

.4 Inform Departmental Representative and tenants where access is affected at least 24 hours in advance of proposed road and/or sidewalk closures.

.5 Fire lane between Buildings 2013, 2015, and 2018 shall be kept clear at all times.

1.2 SUBMITTALS

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

.2 Contractor to submit traffic control plan to Departmental Representative for review and approval prior to construction.

1.3 TEMPORARY ACCESS ROADS

.1 Provide and maintain temporary access roads at locations approved by the Departmental Representative.

1.4 TEMPORARY PARKING AREAS

.1 Parking will be permitted within the contractor’s work area only. Parking outside of the contractor’s work area is not permitted.

1.5 TRAFFIC CONTROL

.1 Comply with requirements of the “Traffic Control Manual for Work on Roadways”, published by the British Columbia Ministry of Transportation, for regulation of vehicle and pedestrian traffic or use of roadways upon or over which it is necessary to carry out work or haul materials or equipment.

.2 Regulate traffic in general accordance with Esquimalt Graving Dock requirements for uninterrupted access to all parts of this site except where specified otherwise and in compliance with specific requirements stipulated herein. Maintain access to parking lots at all times.

.3 Provide and maintain access to corridors specified on Contract Drawings.

.4 Provide and maintain reasonable road access and egress to tenants fronting along or in vicinity of work under contract unless approved otherwise by Departmental Representative.

.5 One way alternating traffic will generally be permitted during work involving road crossings. Do not close any lanes of road or highway without prior approval of the Departmental Representative. Before re-routing traffic erect suitable signs and devices as approved by the Departmental Representative. Provide sufficient crushed gravel to ensure a smooth riding surface during work. Replace surface asphalt within one week of completing the trench backfilling.

.6 Keep travelled way well graded, free of pot holes and of sufficient width that required number of lanes of traffic may pass.

.7 When directed by Departmental Representative, provide well graded, graveled detours or temporary roads to facilitate passage of traffic around restricted construction area. Provide and maintain signs and lights and maintain roadway.

.8 When working on travelled way:

.1 Place equipment in such position as to present a minimum of interference and hazard to the travelling public.

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

.3 Do not leave equipment on travelled way overnight.

.9 Traffic Control Informational and Warning Devices

.1 Meet with Departmental Representative prior to commencement of work to prepare list of signs and other devices required for project.

.2 Provide and maintain signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work which may require road user response.

.3 Supply and erect signs, delineators, barricades and other miscellaneous warning devices in accordance with Departmental Representative requirements.

.4 Place signs and other devices in additional locations as appropriate or as directed by 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 which do not apply to conditions existing from day to day.

.10 Control of Traffic Using Flaggers

.1 Provide flag persons, trained and properly equipped for the following situations:

.1 When graving dock traffic is required to pass working vehicles or equipment which may block all or part of travelled roadway.

.2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic signal system is not in use.

.3 When workers or equipment are employed on travelled way.

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

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

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

.11 Provide and maintain suitable detours or temporary access routes for pedestrian traffic, complete with suitable warning and advisory signs.

.12 Maintain existing conditions for traffic throughout period of contract expect that, when required for construction under contract and when measures have been taken as specified herein and approved by Departmental Representative to protect and control public traffic, existing conditions for traffic may be restricted.

END OF SECTION 01 55 00

PART 1– GENERAL

1.1 SUBMISSION

.1 Prepare instructions and data by personnel experienced in maintenance of described products.

.2 Revise content of documents as required before final submittal.

.3 If requested, furnish evidence as to type, source and quality of products provided.

.4 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

1.2 FORMAT

.1 Organize data in the form of an instructional manual.

.2 Binders: vinyl, hard covered, 3 "D" ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 Cover: identify each binder with type or printed title "Project Record Documents"; list title of project and identify subject matter of contents.

.4 Arrange content by product under section numbers and sequence of Table of Contents.

.5 Provide tabbed fly leaf for each separate product, with typed description of product and major component parts of equipment.

.6 Text: manufacturer's printed data, or typewritten data.

.7 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.3 CONTENTS, EACH VOLUME

.1 Table of Contents – provide the following:

.1 Title of project.

.2 Date of submission.

.3 Names, addresses, and telephone numbers of Departmental Representative and Contractor with name of responsible parties.

.4 Schedule of products, indexed to content of volume.

.2 For each product, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

1.4 AS-BUILT DOCUMENTS

.1 Contract drawings and shop drawings: legibly mark each item to record actual construction, including:

.1 Field changes of dimension and detail.

.2 Changes made by change orders.

.3 Details not on original Contract drawings.

.4 References to related shop drawings and modifications.

.2 Contract Specifications: legibly mark each item to record actual "Workmanship of Construction", including:

.1 Manufacturer, trade name, and catalogue number of each "Product/Material" actually installed, particularly optional items and substitute items.

.2 Changes made by addenda and change orders.

.3 As-built information:

.1 Record changes in red ink.

.2 On site “Red Line” As-Built documents to be reviewed with Departmental Representative at project meetings to ensure up-to-date and accurate As-Built documents at the end of the project.

.3 Mark on 1 set of drawings, specifications and shop drawings at completion of project and, before final inspection.

.4 Submit to the Departmental Representative.

1.5 TEST RESULTS & INSPECTION REPORTS

.1 Separate each Document with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier and manufacturer with name, address, and telephone number of responsible principal.

.3 Obtain Test Result and Inspection Reports executed in duplicate by subcontractors, suppliers, manufacturers, and inspection agencies within 10 days after completion of the applicable item of work.

.4 Except for items put into use with the Departmental Representative's permission, leave date of beginning of time of warranty until the date of substantial performance is determined.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Co-execute submittals when required.

1.6 COMPLETION

.1 Submit a written certificate that the following have been performed by the Contractor:

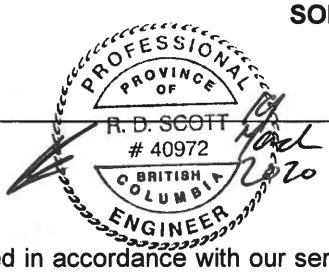
.1 Work has been completed and inspected for compliance with the Contract documents.

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

.3 Equipment and systems have been tested, adjusted and balanced as required.

.2 Work is complete and ready for final inspection.

END OF SECTION 01 78 30



PART 1– GENERAL

1.1 GENERAL REQUIREMENTS

.1 These specifications were prepared in accordance with our service agreement with Public Works and Government Services Canada. They should be read in conjunction with the project drawings.

.2 The work should only be done by personnel experienced in similar work.

.3 While the Contractor may employ subcontractors to undertake work outlined on the drawings and amendments there to, it is the Contractor's responsibility to ensure that the subcontractors are aware of the requirements and that all such work is adequately executed.

.4 The work consists of furnishing, transporting and constructing a slope stabilization system in accordance with the contract documents and the Manufacturer's standards and requirements. The system shall be installed at the location(s) shown on the final plans as approved by the Departmental Representative or as directed by the Departmental Representative.

.5 The system shall be designed to withstand static and dynamic forces generated from rocks or soil moving under the permanently installed system. The system design shall have been previously used and shall have demonstrated satisfactory performance in similar applications and capacities. The Contractor shall submit references for previous installations.

.6 The system shall be constructed of relatively lightweight components and shall be compact to minimize transportation cost and installation time on site.

.7 The Manufacturer shall be regularly engaged in the manufacturing of slope stabilization systems, having a documented experience with the manufacturing of slope stabilization systems used in similar application and capacity. The Manufacturer shall supply written evidence demonstrating certification of a quality assurance program, as well as proof and validity of seller's liability insurance.

.8 As referenced on the project drawings, the VSL generator and propane tanks shall be left in place and the Contractor shall protect the generator and tanks from rock fall and damage during construction.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanised) Coatings on Iron and Steel Products.

.2 ASTM A153/153M-16a, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.3 ASTM A1001-18, Standard Specification for High-Strength Steel Castings in Heavy Sections.

.4 ASTM A1007-15, Standard Specification for Carbon Steel Wire for Rope.

.5 ASTM A1023/A1023M-19, Standard Specification for Carbon Steel Wire Ropes for General Purposes.

.6 ASTM A563-15, Standard Specification for Carbon and Alloy Steel Nuts.

.7 ASTM A615/A615M-18, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

.2 American National Standard

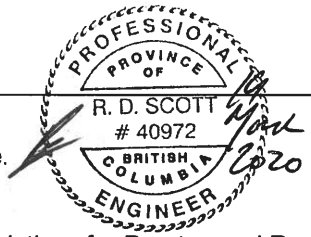
.1 ASME B30.26-2015, Rigging Hardware – Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks and Slings.

.3 CSA Group

.1 CSA A23.1:19/CSA A23.2:19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA A3000-18, Cementitious Materials Compendium.

.3 CSA G30.18-09 (reaffirmed 2019), Carbon Steel Bars for Concrete Reinforcement.



.4 Federal Specification

.1 FF-T-276C, Thimbles, Rope.

.5 Post-Tensioning Institute

.1 PTI DC35.1-14, Recommendations for Prestressed Rock and Soil Anchors.

.6 Canadian Geotechnical Society

.1 Canadian Foundation Engineering Manual.

.7 European Organisation for Technical Approvals

.1 ETAG 027 (September 2012, amended April 2013) Guideline for European Technical Approval of Falling Rock Protection Kits.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 The Contractor shall submit to the Departmental Representative the product data sheets, drawings and certification for each of the proposed materials described below. This information shall be provided a minimum of four (4) weeks prior to starting work.

1.4 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.

.1 Mill Test Report: Upon request, provide Departmental Representative with certified copy of mill test report of threadbar anchors, minimum four (4) weeks prior to beginning work.

.2 Rock mesh system CE mark: Provide Departmental Representative with certified copy of ETA verified declaration of performance.

.3 Upon request submit in writing to Departmental Representative proposed source of soil/rock anchor material to be supplied.

.2 The Contractor is to provide the proposed construction methodology at least 48 hours before work is to commence to allow review by the Departmental Representative.

.3 The Contractor is to notify the Departmental Representative of planned alterations in anchor slopes of more than 5° in order for the Departmental Representative to assess whether the anchorage will be acceptable.

.4 The Departmental Representative shall conduct periodic field reviews of the anchor installation works as it progresses. The Contractor shall give the Departmental Representative at least 48 hours notice before starting works to coordinate field reviews.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 35 43 Environmental Procedures and with Manufacturer's written instructions.

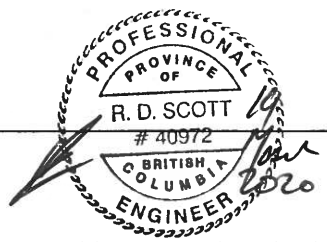
.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with Manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with Manufacturer's recommendations.

.2 Replace defective or damaged materials with new.

.4 Develop Environmental Protection Plan related to Work of this Section and in accordance with Section 01 35 43 – Environmental Procedures.



PART 2 - PRODUCTS

2.1 MATERIALS

.1 **Primary Mesh A** shall be a rolled cable net mesh to be installed at the locations shown on the contract drawings:

.1 The mesh shall be of woven construction and fabricated with three (3) 4mm diameter wires twisted into one (1) strand and the ends of each strand formed into a loop and twisted. The loops of the wire mesh shall be fastened together to prevent unraveling of the mesh.

.2 Each wire shall be alloyed high strength carbon steel wire with a minimum tensile strength of 22kN in accordance with ASTM A1007-15 (Level 3 drawn Zn5 Al wire). The combined strength of three (3) strands shall have a minimum tensile strength of 66kN.

.3 The mesh shall have a tensile strength of 180kN/m.

.4 The wire shall be galvanised with a 95% zinc and 5% aluminum coating with a minimum weight of 125g/m^2.

.5 The size of the mesh opening shall be 350mm by 360mm (±5%). The mesh shall have 2.8 meshes per metre going down the mesh (longitudinal) and 2.9 meshes per metre going across the mesh (transversal).

.6 The weight per m^2 shall not exceed 2.7kg/m^2.

.7 All products must meet or exceed the minimum standards.

.2 **Secondary Mesh A** shall be a chain link mesh attached between the primary mesh and the slope in locations shown on the contract drawings:

.1 The mesh shall be woven construction and shall be diamond shaped. The mesh shall be made with 2mm diameter wire and the ends of each wire formed into a loop and twisted. The loops of the wire mesh shall be fastened together to prevent unraveling of the mesh.

.2 The wire shall be alloyed high strength carbon steel wire with a minimum tensile strength of 1770N/mm^2.

.3 The mesh shall have a minimal longitudinal tensile strength of 54kN/m.

.4 The wire shall be galvanised with a 95% zinc and 5% aluminum coating with a minimum weight of 115g/m^2.

.5 The size of the mesh opening shall be 83mm by 137 mm (±5%) and the depth of the mesh shall be 15 mm (±1 mm). The mesh shall have 12 meshes per meter going down the mesh (longitudinal) and seven (7) meshes per meter going across the mesh (transversal).

.6 To fasten the chain link mesh to the primary rolled cable net mesh, galvanised hog rings and/or galvanised tie wire shall be installed on 1m centers both horizontally and vertically.

.7 All products must meet or exceed the minimum standards.

.3 **Mesh B** shall be a woven, homogeneous mesh consisting of only one type of wire, installed at the locations shown on the contract drawings.

.1 The mesh shall be made with minimum 3mm diameter wire and the ends of each wire shall be formed into a loop and twisted. The loops of the wire mesh shall be fastened together to prevent unraveling of the mesh.

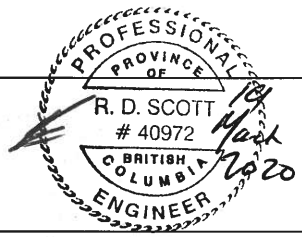
.2 The wire shall be alloyed high strength carbon steel wire with a minimum tensile strength of 12.5kN in accordance with ASTM A1007-15 (Level 3 drawn Zn5 Al wire).

.3 In combination with the system spike plates the mesh shall have a minimum punching strength of 180kN and a minimum resistance against slope parallel tensile stress of 30kN. The wire shall be hot dip galvanised with a zinc/aluminum coating with a minimum weight of 120g/m^2 for Level 3 drawn Zn5Al wire in accordance with ASTM A1007-15.

.4 The size of the mesh opening shall be a maximum of 83mm by 143mm (+ 3%) and the depth of the mesh shall be a minimum of 11mm (±10%).

.5 All products must meet or exceed the minimum standards.

.4 Geotextile shall be lain across the soil slope where shown on the design drawings before covering with secondary mesh.



.1 The geotextile shall be a mediumweight nonwoven geotextile.

.5 Wire rope cable anchors:

.1 The wire rope anchors shall be installed to meet the tensile requirements for resisting the design loads:

.1 Top rope wire rope anchors = 300kN

.2 Lateral and bottom rope wire rope anchors = 150kN.

.2 The wire rope cable anchors shall comprise a 25mm diameter rope. The wire rope shall be 6x19 construction (or equivalent), independent wire rope core (IWRC) and galvanised with a minimum breaking strength of 402kN. The rope shall be in accordance with ASTM A1023/A1023M-19 including galvanizing.

.6 Wire ropes:

.1 Wire ropes shall be 20mm diameter and shall be of 6x19 construction (or equivalent), IWRC and galvanised with a minimum breaking strength of 279kN in accordance with ASTM A1023/A1023M-19 including galvanising.

.7 Bar anchors:

.1 The anchors shall meet the tensile and shear strength requirements for resisting the design loads:

.1 4m anchors = 180kN

.2 8m anchors = 290kN.

.2 The length and spacing of the anchors shall be in accordance with the plans.

.3 A provisional 15 additional anchors shall be allowed for to be installed as directed by the Departmental Representative.

.4 Anchors shall be hot-rolled threadbar conforming to CSA Standard G30.18M, Grade 500 MPa with surface deformations for anchorages and coupling. The anchors shall be complete with compatible hardware. Diameters of threadbars shall be as specified on drawings.

.5 Grout shall be Portland Cement Type 10 or 30 with a water-cement ratio of not greater than 0.40 having a minimum compressive strength of 20MPa after 24 hours and 35MPa after seven (7) days. Grout shall be pre-mixed, non-shrink type and be in accordance with the requirements of CAN/CSA-A3000-13 and CSA A23.1/A23.2. Grout strength at the time of stressing shall not be less than 35MPa.

.6 The anchors shall be galvanised in accordance with ASTM A123 with a coating grade of G90.

.7 The threadbar shall be installed and grouted up to the top of the minimum required bond length. The anchor load shall be transferred to the soil/rock through the bond length by means of soil or rock/cement grout bond.

.8 Centralizers shall be installed a minimum of every 1.5m to ensure complete and even grout coverage around the bars. Spacers shall be a non-corroding type.

.9 Standard hex nuts can be used to attach the spike plates to the anchors. In the event that uneven seating of the spike plate occurs; spherical nuts, ball nuts, or beveled washers should be used. Nuts and couplers of the anchors shall be made from steel material conforming to ASTM A563-15 and shall develop at least 125% of the guaranteed ultimate strength of the threadbar.

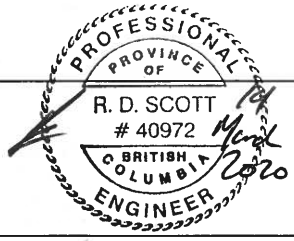
.10 The pullout resistance of the anchors shall be verified by the Contractor in the field by conducting pullout testing in accordance with PTI DC35.1-14 and this specification.

.8 Anchor spike plates:

.1 Spike plates shall be made from minimum 7mm thick steel and be hot dip galvanised in accordance with ASTM A123/ A123M-17 with a minimum layer thickness of 85µm.

.2 The plate shall be diamond shaped with minimum dimensions of 190 mm by 330 mm.

.3 All products must meet or exceed the minimum standards.



.9 System connection clips:

.1 The connection clips shall be fabricated from minimum 4.0mm diameter high strength steel wire with a minimum ultimate tensile strength of 22kN in accordance with ASTM A1007-15 (Level 3 drawn Zn5 Al wire).

.2 The clip shall measure 60mm x 21mm and have two reversed end hooks on one side of the clamp.

.3 The wire shall be galvanised with a 95% zinc and 5% aluminum coating with a minimum weight of 150g/m^2.

.4 All products must meet or exceed the minimum standards.

.10 Compression claws shall be used to fasten the mesh to the boundary ropes:

.1 The Type 2 compression claws shall be minimum 8mm diameter carbon steel bar and shall be hot dipped galvanised in accordance with ASTM A153/A153M-16a Class B-3 with a minimum layer thickness of 300g/m^2.

.11 Seam rope and fasteners:

.1 Seam rope, hog rings, or connection clips shall be used to fasten the mesh panels to each other. Seam rope shall be used to lace the mesh to the net support rope.

.2 The seam rope shall have a diameter of 6mm and shall be of 7x7, 7x19 construction (or equivalent) GAC with a minimum breaking strength of 27kN.

.12 Miscellaneous materials:

.1 All miscellaneous hardware such as wire rope clips, thimbles, bolts, shackles etc. shall be hot dip galvanised and be supplied by the vendor with the system.

.2 Thimbles shall be in accordance with Federal Specification FF-T-276b. Wire rope clips shall be in accordance with ASME B30.26-2015. Shackles shall be in accordance with ASTM A1001-18. All items shall be hot-dip zinc galvanised according to ASTM A153/ A153M-16a.

2.2 SOURCE QUALITY CONTROL

.1 Upon request, provide Departmental Representative with certified copy of mill test report of steel bars, showing physical and chemical analysis, minimum four (4) weeks prior to beginning reinforcing work.

.2 Upon request inform Departmental Representative of proposed source of material to be supplied.

.3 Provide Departmental Representative with CE Certificate of Conformity for mesh materials at least four (4) weeks prior to beginning mesh installation.

PART 3 - EXECUTION

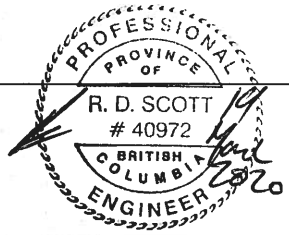
3.1 GEOTECHNICAL CONDITIONS

.1 A rock slope assessment report was prepared for this project by WSP Canada Inc. dated 10 April 2019, which is appended to the contract documents with financial information removed.

.2 The geotechnical report is not represented as a complete description of site conditions but only as to what was observed at the time of site review(s). The Departmental Representative assumes no responsibility for any interpretation or deduction that the Contractor may make from the data. The Contractor shall establish the nature of observable conditions to their own satisfaction and also has the right to obtain additional information if considered necessary in their judgment.

.3 The Contractor shall Notify the Departmental Representative immediately if subsurface conditions are found to differ materially from those indicated in the Contract Documents or geotechnical report.

.4 Final decisions as to the exact work and locations (including anchor placement) should be made in the field by the Departmental Representative.



3.2 INSTALLATION

.1 Installation shall be according to the project plans and specifications and the Manufacturer's installation instructions. Contact the Departmental Representative to resolve any discrepancies between the project documents and the Manufacturer's instructions.

.2 The Contractor shall remove all brush, debris and loose rock in accordance with the contract documents.

.3 The Contractor shall locate and install the wire anchors for the boundary ropes as shown on the design drawings and the locations shall be agreed in the field with the Departmental Representative prior to drilling.

.4 The Contractor shall locate the anchors on the face as shown on the design drawings and agreed onsite with the Departmental Representative. The anchors are to be installed in accordance with the anchor Manufacturer's instructions.

.1 Whenever possible the anchors should be located in the natural low spots of the slope in order to pull the mesh into them and against the ground. If the anchor pattern does not allow utilization of the low spots, the installation of additional shorter anchors may be necessary in these locations.

.5 Where applicable, a dell or hollow should be formed in soil 100mm to 300mm deep by 600mm wide at each anchor location. It is advised to create hollows prior to grouting of anchors.

.6 Lay the mesh on the slope by unrolling down the slope. The rolls can be shortened or lengthened as necessary by removing or adding sections, respectively. Secure the mesh panels in accordance with the Manufacturer's installation manual. The Contractor shall provide sufficient mesh coverage to allow for irregularities in the rock face such as overhangs or depressions.

.7 Install any required boundary ropes and fasten the mesh to boundary ropes with Type 2 connection clips. Boundary rope shall be tensioned and secured to the boundary rope anchors with a wire rope clip loop.

.8 Place the spike plates onto the anchors. Tighten the nuts in order to achieve a pretension force on the spike plates of 30kN to 50kN. Torque the nuts to the bar Manufacturer's requirements to reach the above forces.

.9 All anchor installation work shall be carried out in accordance with the approval of the Departmental Representative.

.10 The Contractor shall supply all materials, labour and equipment to install, test and tension the anchors in accordance with the drawings and these special provisions.

.11 Installation procedures shall conform to all applicable sections of the Post-Tensioning Institute, "Recommendations for Prestressed Rock and Soil Anchors" PTI DC35.1-14.

.12 The anchor installation Contractor shall demonstrate experience and expertise in installing anchors in similar conditions as encountered at this site.

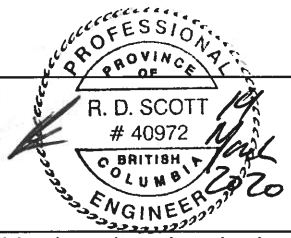
.13 Anchors shall be handled and protected prior to installation in such a manner as to avoid corrosion and physical damage thereto. Damaged anchors shall be replaced at the Contractor's expense.

.14 The drill holes shall not be less than 75mm diameter and shall allow for a minimum 13mm grout cover around the anchor. Anchor holes shall be drilled within a tolerance of 3 degrees from the design orientation angles. Holes shall enter the ground at a position agreed with the Departmental Representative.

.15 Drilling equipment may be percussion, rotary, or any type able to supply a hole of appropriate diameter and free of bends or protrusions so as to adequately accommodate the anchor without undue softening or loosening of the surrounding ground.

.16 Casing is required for drilling through all materials except intact rock.

.17 Holes shall be drilled to a minimum of 500mm beyond the full minimum design length so that debris that may collect in the bottom of the boreholes does not foul the bonded anchor length.



.18 Primary grout for bond length shall be introduced at the bottom of the drill hole using a full length tremie grout tube.

.19 If the total grout volume consumed in any hole exceeds three times the theoretical volume of the drill hole, work shall be stopped and the Departmental Representative notified immediately.

.20 Grouting equipment shall be capable of continuous mechanical mixing that will produce uniform and thoroughly mixed grout. Grouting equipment shall be capable of providing grout pressure of up to 1.5MPa.

.21 Coupling of threadbar anchors shall be limited to the minimum number necessary to permit installation within the available space.

.22 After acceptance of the required tests as specified hereafter and final tension adjustment of the anchor, grouting for filling the anchor head cavity shall be carried out. Grout shall be introduced at the lowest points using tremie tube. The holes and cavity shall be continuously filled until the grout emerges from the vent openings at the top of the anchors.

.23 The grouting procedures and required grouting pressure are the Contractor's sole responsibility. These procedures and the selected grouting pressure should be modified as necessary, with the approval of the Departmental Representative, to ensure that the anchors are capable of developing the tensile loads as indicated on the drawings and to meet the acceptance criteria as specified hereafter.

.24 All anchors are expected to meet the testing acceptance criteria after the first stage grouting. The provisions of the post-grouting system in each anchor are for unexpected ground conditions only, for example, where the total grout volume consumed in the hole during the first stage grouting exceeds three times the theoretical volume of the drill hole.

3.3 ANCHOR TESTING AND STRESSING

.1 Install anchors to develop the design tension load and test load shown on the drawings.

.2 Performance, proof and creep tests shall be carried out in accordance with these specifications, PTI DC35.1-14 and witnessed by the Departmental Representative.

.3 Provide all test reports to the Departmental Representative.

.4 The testing shall comprise performance testing of at least two anchors and proof testing on all other anchors. Testing shall be performed on both wire rope cable anchors and bar anchors.

.5 Failed anchors shall be replaced by the Contractor at no additional cost to the owner.

.6 Contractor will retain the testing laboratory and pay for costs of tests.

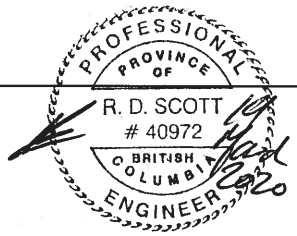
.7 Supply and erect equipment, and temporary structures necessary for making tests and stressing bars. Supply a qualified operator to operate jacks and maintain test loads throughout duration of tests. Anchor stressing against concrete foundations or the ground surface will not be permitted.

.8 Notify the Departmental Representative a minimum of 48 hours prior to testing the anchors.

.9 Provide a centre hold jack and hydraulic pressure pump for stressing or testing of the anchors. The hydraulic jack and pressure gauge shall be calibrated specifically for this project with calibration no more than 30 days before use. A copy of the calibration record shall be submitted to the Departmental Representative for review before use. The pressure gauge shall have an accuracy of +/- 1%. Each jack gauge unit used on the job site shall be accompanied with a dated calibration chart.

.10 Care shall be taken that the bars are concentrically located in the annular areas and that the axes of the bars and load cell are parallel to prevent eccentricities.

.11 At each load increment, the elongation of the bar shall be measured and recorded to the nearest 0.025 mm (0.001 inches) with respect to an independent fixed reference point. The Contractor shall provide the independent fixed reference point; provide the necessary devices and instruments for measuring bar elongation.



.12 Stressing shall not be performed until after the grout has reached a minimum compressive strength of 35MPa. Three grout test cylinders shall be provided for each production anchor by the Contractor to permit cylinder compressive testing to be carried out by an outside testing agency.

.13 Test Anchors

.1 Tension tests shall be carried out on the initial production anchors to confirm the load capacity of the threadbar anchor. Two separate tests shall be made.

.2 The anchors shall be tested using the sequence of loads specified in PTI DC35.1-14 Table 8.1.

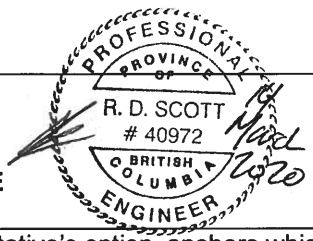
.14 Anchor Proof Testing

.1 The Contractor shall proof test every anchor to 133% of its design load using the proof testing criteria set out in PTI DC35.1-14.

.15 All test data shall be recorded by the Contractor on preprinted forms supplied by the anchor Manufacturer. These Recorded Data shall be submitted to the Departmental Representative for review after testing. Information to be recorded will include:

.1 Project identification
.2 Anchor reference number
.3 Location
.4 Type of anchor and diameter
.5 Diameter of drill hole
.6 Date of boring
.7 Date of grouting
.8 Date of stressing
.9 Consistency, colour, structure and type, and penetration rate of/through the various materials encountered in drilling
.10 Length of free anchor length
.11 Length of bonded anchor length
.12 Grout quantity
.13 Grout pressures
.14 Grout test results
.15 Grout mix preparation and additives
.16 Maximum and minimum daily site temperate during drilling and grouting
.17 Description of any special installation procedures used
.18 Notation of any unusual occurrences during installation
.19 Duration of grouting
.20 Load extension graph during stressing
.21 Date of acceptance
.22 Details of apparatus used to measure anchor movement.
.23 Testing procedures
.24 Temperature and weather conditions during test
.25 Tabulation of all load time movement reading
.26 Gauges, scales and reference points identified
.27 Details of adjustments made to field date and explanation
.28 Notation of any unusual occurrences during testing
.29 Test jack, load cell and other required calibration report.

.16 Acceptance criteria for each anchor test shall be in accordance with the Post Tensioning institute "Recommendations for Pre-stressed Rock and Soil Anchors" 2014.



.17 At the Departmental Representative's option, anchors which fail any or all of the acceptance criteria will be re-tested, de-rated or replaced.

.18 After anchors have been proof tested, the anchors are to be de-tensioned as necessary to permit installation of the mesh system as shown on the drawings. Following adequate placement of the mesh the anchors are to be tensioned and locked off to the levels shown on the drawings.

.19 Anchors which meet the acceptance criteria shall be locked off at the lock off loads on the drawings.

.20 At the completion of the work of this section, the Contractor shall supply to the Departmental Representative a sealed report certifying that the installation of the anchors conforms to the requirements of the drawings and specifications.

3.4 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of galvanised reinforcing steel with compatible finish to provide continuous coating.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 35 43 – Environmental Procedures.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 35 43 – Environmental Procedures.

.3 Waste Management: separate waste materials for recycling and reuse in accordance with 01 35 43 – Environmental Procedures.

END OF SECTION 31 68 13

APPENDIX A

PWGSC PRELIMINARY HAZARD ASSESSMENT FORM

PRELIMINARY HAZARD ASSESSMENT FORM

Project Number:	R.106340.001
Location:	Esquimalt Graving Dock
Date:	December 4, 2019
Name of Departmental Representative:	Jon Siska
Name of Client:	PWGSC
Name of Client Project Co-ordinator	Tim Aikin

Site Specific Orientation Provided at Project Location **Yes** **X** **No** ☐

Notice of Project Required **Yes** **X** **No** ☐

NOTE:
PWGSC requires "**A Notice of Project"** for all construction work related activities.

NOTE:
OHS law is made up of many municipal, provincial, and federal acts, regulations, bylaws and codes. There are also many other pieces of legislation in British Columbia that impose OHS obligations.

Important Notice: This hazard assessment has been prepared by PWGSC for its own project planning process, and to inform the service provider of actual and potential hazards that may be encountered in performance of the work. PWGSC does not warrant the completeness or adequacy of this hazard assessment for the project and the paramount responsibility for project hazard assessment rests with the service provider.

TYPES OF HAZARDS TO CONSIDER	Potential Risk for:				COMMENTS
Examples: Chemical, Biological, Natural, Physical, and Ergonomic Listed below are common construction related hazards. Your project may include pre-existing hazards that are not listed. Contact the Regional Construction Safety Coordinator for assistance should this issue arise.	**PWGSC, OGD's, or tenants**		**General Public or other contractors**		Note: When thinking about this pre-construction hazard assessment, remember a **hazard** is anything that may cause harm, such as chemicals, electricity, working from heights, etc; the **risk** is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.
	Yes	**No**	**Yes**	**No**	
Typical Construction Hazards					
Concealed/Buried Services (electrical, gas, water, sewer etc)	**X**		**X**		No natural gas services on site
Slip Hazards or Unsound Footing	**X**		**X**		
Working at Heights	**X**		**X**		
Working Over or Around Water		**X**		**X**	
Heavy overhead lifting operations, mobile cranes etc.	**X**		**X**		

Marine and/or Vehicular Traffic (site vehicles, public vehicles, etc.	X		X		
Fire and Explosion Hazards	X		X		
High Noise Levels	X		X		
Excavations	X		X		Active construction sites.
Blasting		X		X	None expected on site.
Construction Equipment	X		X		
Pedestrian Traffic (site personnel, tenants, visitors, public)	X		X		
Multiple Employer Worksite	X		X		

Electrical Hazards					**Comments**
Contact With Overhead Wires		X		X	
Live Electrical Systems or Equipment	X		X		
Other:					
Physical Hazards					
Equipment Slippage Due To Slopes/Ground Conditions	X		X		
Earthquake	X		X		
Tsunami	X		X		
Avalanche		X		X	
Forest Fires		X		X	
Fire and Explosion Hazards	X		X		
Working in Isolation		X		X	
Working Alone		X		X	Working alone not permitted.
Violence in the Workplace	X		X		
High Noise Levels	X		X		
Inclement weather	X		X		
High Pressure Systems	X		X		
Other:					
Hazardous Work Environments					
Confined Spaces / Restricted Spaces		X		X	Confined space entry not required.
Suspended / Mobile Work Platforms	X		X		
Other:					
Biological Hazards					
Mould Proliferations		X		X	
Accumulation of Bird or Bat Guano		X		X	
Bacteria / Legionella in Cooling Towers / Process Water		X		X	
Rodent / Insect Infestation		X		X	
Poisonous Plants		X		X	
Sharp or Potentially Infectious Objects in Wastes	X		X		Multiple employer workplace

Wildlife	X		X		Resident deer population
Chemical Hazards					
Asbestos Materials on Site		X		X	None known in project work areas
Designated Substance Present		X		X	
Chemicals Used in work	X		X		Active ship repair facility
Lead in paint	X		X		Paint on steel and concrete surfaces may contain lead.
Mercury in Thermostats or Switches		X		X	
Application of Chemicals or Pesticides		X		X	
PCB Liquids in Electrical Equipment		X		X	
Radioactive Materials in Equipment		X		X	
Other:					
Contaminated Sites Hazards					
Hazardous Waste	X		X		Suspected contaminated soils
Hydrocarbons	X		X		Suspected contaminated soils
Metals	X		X		Suspected contaminated soils
Other:	X		X		Suspected contaminated soils

Security Hazards					**Comments**
Risk of Assault	X		X		Multiple employer workplace
Other:	X		X		Unauthorized entry to site
Other Hazards					

Other Compliance and Permit Requirements[1]	**YES**	**NO**	**Notes / Comments[2]**
Is a Building Permit required?			**N/A**
Is a Electrical permit required?			**N/A**
Is a Plumbing Permit required?			**N/A**
Is a Sewage Permit required?			**N/A**
Is a Dumping Permit required?			**N/A**
Is a Hot Work Permit required?	**X**		**For any spark generating activity**
Is a Permit to Work required?			**N/A**
Is a Confined Space Entry Permit required?			**N/A**
Is a Confined Space Entry Log required?			**N/A**
Discharge Approval for treated water required?			**N/A**

Notes:

(1) Does not relieve Service Provider from complying with all applicable federal, provincial, and municipal laws and regulations.

(2) TBD means To Be Determined by Service Provider.

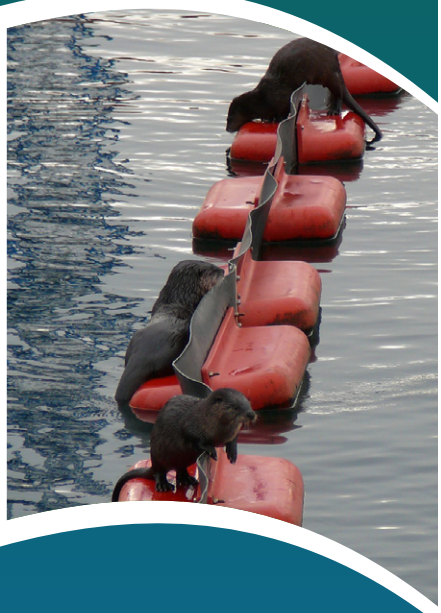
Service Provider Acknowledgement: We confirm receipt and review of this Pre-Project Hazard Assessment and acknowledge our responsibility for conducting our own assessment of project hazards, and taking all necessary protective measures (which may exceed those cited herein) for performance of the work.			
Service Provider Name			
Signatory for Service Provider		**Date Signed**	
RETURN EXECUTED DOCUMENT TO PWGSC DEPARTMENTAL REPRESENTATIVE PRIOR TO ANY WORK COMMENCING			

APPENDIX B

EGD ENVIRONMENTAL BEST MANAGEMENT PRACTICES

EGD
Esquimalt Graving Dock

Environmental Best Management Practices



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October 2016
Version: 05

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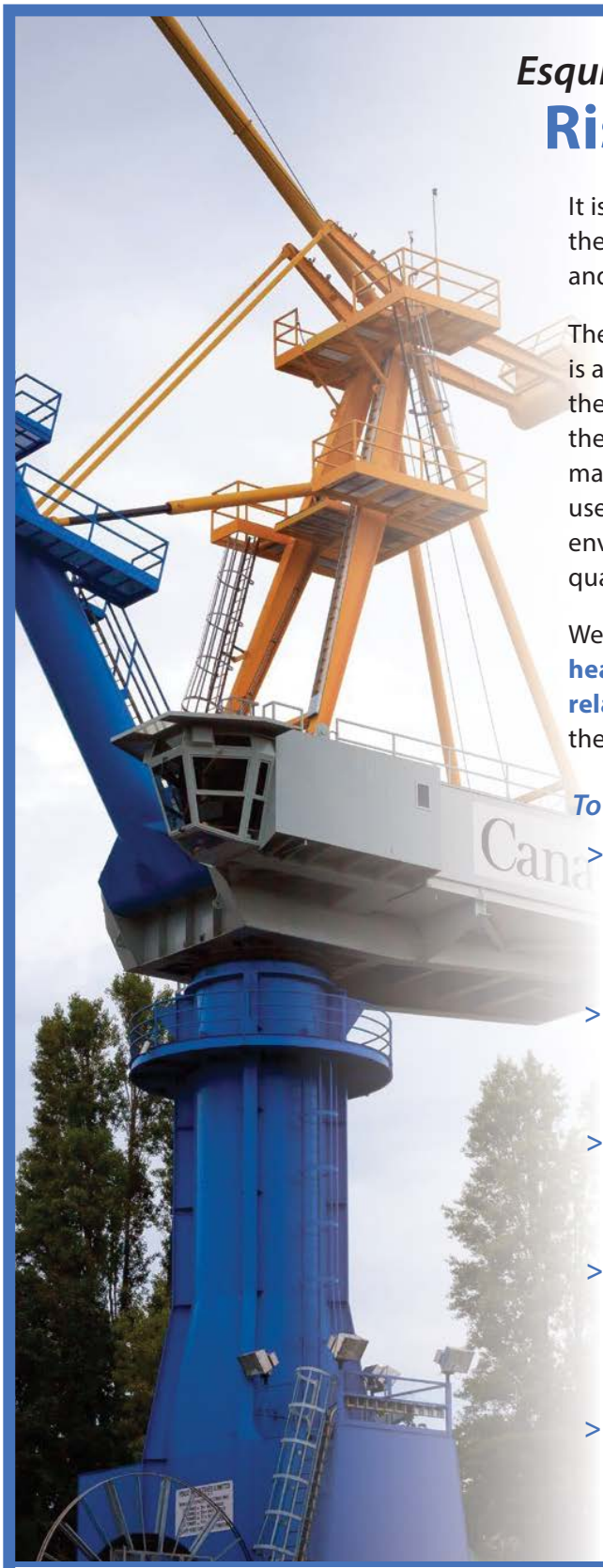
OVERVIEW

The **Esquimalt Graving Dock** (*EGD*) is a federal government owned and operated, multi-user ship repair and maintenance facility located in Esquimalt, British Columbia. The facility has been in operation since 1925, and provides service to local, Federal, and international vessels. The vessel repair and maintenance work at the EGD is carried out by privately owned shipyard repair contractors that rent the required sections of the drydock, lease upland work space from the government, and pay a fee for services such as cranes, compressed air, water, sewer and power.

The EGD is committed to managing the actual and potential health and safety, environmental, security, financial and public relations risks, while ensuring quality operations and services. In order to identify and manage these risks, the EGD has implemented an **Environmental Management System** (*EMS*) and a Risk Management Framework (*in conformance with the internationally recognized standards ISO 14001 and ISO 31000*). The EMS provides the framework for identifying environmental impacts, and ensures adequate controls are in place to effectively manage them.

This manual contains a series of **Environmental Best Management Practices** (*EBMPs*) developed to reduce impact to the environment related to common activities and operations at the Esquimalt Graving Dock. The manual contains guidance and recommendations for those operating at the EGD, and is intended to complement existing environmental legislation. It does not remove the responsibility of all contractors and companies operating at the EGD to abide by all applicable regulatory requirements and industry standards. All users of the facility are expected to follow the EBMPs.

For additional information contact the EGD Environmental Services Department.



Esquimalt Graving Dock

Risk Management Policy

It is the goal of the Esquimalt Graving Dock, in partnership with the ship repair industry, to be the premier ship repair, construction and maintenance facility on the west coast of North America.

The Esquimalt Graving Dock acknowledges that risk management is an integral part of attaining this goal. We recognize that risk is the effect of uncertainty on our operations and is inherent within the ship repair industry. Our objective is to identify, monitor and manage risk in order to prevent the harm of our employees, site users, contractors, neighbours, other stakeholders, the environment and our facility, while ensuring and maintaining quality operations and services.

We are committed to managing the actual and potential **health & safety, environmental, security, financial and public relation risks** pertaining to strategies, policies and practices at the Esquimalt Graving Dock.

To meet our commitment we will:

> *Implement systems and processes to consistently identify, measure, mitigate, minimize and report on risks, while continuing to uphold and adapt the established Environmental Management System and other relevant Management Frameworks.*

> *Meet or exceed applicable federal, provincial and municipal legislation and regulations, departmental policies, industry standards, practices and other requirements.*

> *Communicate openly with our employees to ensure they are aware of and understand our Risk Management Framework, the nature of our operations and their roles and responsibilities in managing risk.*

> *Monitor and review our Risk Management Framework to ensure we are meeting our goals. Ongoing oversight of the effectiveness of our Risk Management Framework is the responsibility of the Esquimalt Graving Dock Risk Management Team.*

> *Provide the necessary resources to effectively implement our Risk Management Framework, while continuing to improve our programs, procedures and operations.*

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

Jim Milne
Director
Esquimalt Graving Dock
Engineering Assets
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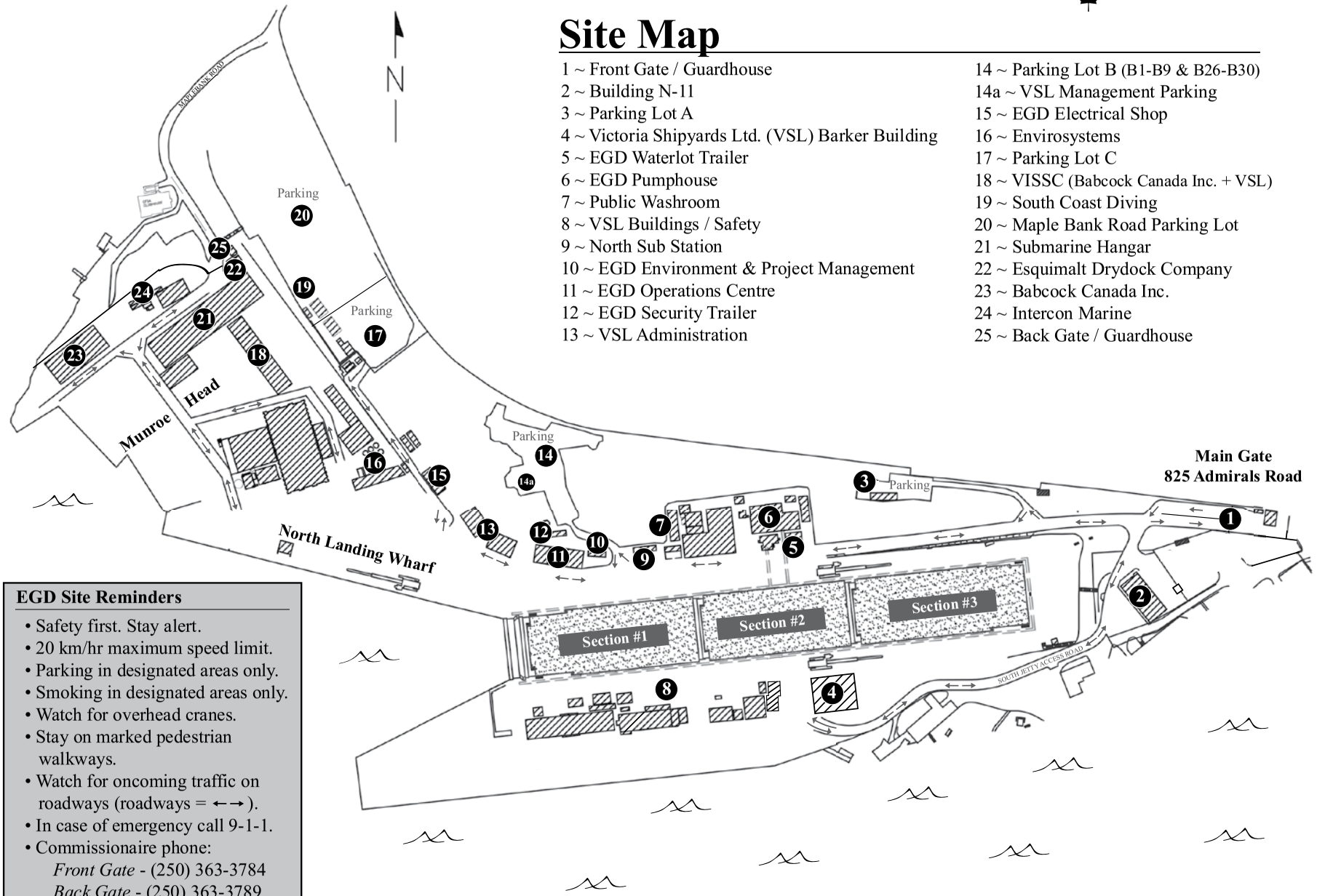
Canada

August 2015

Site Map

1 ~ Front Gate / Guardhouse
2 ~ Building N-11
3 ~ Parking Lot A
4 ~ Victoria Shipyards Ltd. (VSL) Barker Building
5 ~ EGD Waterlot Trailer
6 ~ EGD Pumphouse
7 ~ Public Washroom
8 ~ VSL Buildings / Safety
9 ~ North Sub Station
10 ~ EGD Environment & Project Management
11 ~ EGD Operations Centre
12 ~ EGD Security Trailer
13 ~ VSL Administration
14 ~ Parking Lot B (B1-B9 & B26-B30)
14a ~ VSL Management Parking
15 ~ EGD Electrical Shop
16 ~ Envirosystems
17 ~ Parking Lot C
18 ~ VISSC (Babcock Canada Inc. + VSL)
19 ~ South Coast Diving
20 ~ Maple Bank Road Parking Lot
21 ~ Submarine Hangar
22 ~ Esquimalt Drydock Company
23 ~ Babcock Canada Inc.
24 ~ Intercon Marine
25 ~ Back Gate / Guardhouse



EGD Site Reminders

- Safety first. Stay alert.
- 20 km/hr maximum speed limit.
- Parking in designated areas only.
- Smoking in designated areas only.
- Watch for overhead cranes.
- Stay on marked pedestrian walkways.
- Watch for oncoming traffic on roadways (roadways = ←→).
- In case of emergency call 9-1-1.
- Commissionaire phone:
  Front Gate - (250) 363-3784
  Back Gate - (250) 363-3789

Environmental Best Management Practices

EBMP #1: Pressure Washing (High and Ultra High)

One of the first activities to occur on a drydocked vessel is pressure washing of the hull to remove salts, marine growth and residual paint, prior to surface preparation or painting. This typically involves pressure washing the underwater hull and/or super structure with water at 2,000 – 3,500 psi. This activity produces large volumes of paint contaminated wastewater (*e.g. washwater*). Ship repair contractors may also use an Ultra High Pressure (*UHP)* washing process (*from 40,000 – 55,000 psi*) to completely remove all paints, often eliminating the need for further surface preparation (*e.g. sandblasting*) prior to painting. UHP generates even larger volumes of wastewater and slurry solids. All wastewater created from pressure washing and UHP requires management (*i.e. assessment, collection, handling, treatment and disposal*).

Management of Wastewater on the Graving Dock Floor

- Ensure all wastes and wastewater discharges, resulting from hull and anchor chain washing, as well as dock bottom clean-up activities, are collected and disposed of properly.
- Close all sump well valves in the drydock floor collection system prior to and during pressure washing operations.
- Manage pumps to ensure they are handling the volume of washwater sufficiently.
- Manage washwater storage containers to ensure they are not overfilled.
- Divert contaminated wastewater, that falls outside of the drydock floor collection system, away from the tunnel drains.
- Direct non-contaminated water (*e.g. ballast water, cooling water, dock wall/moon pool leakage water*) away from contaminants on the drydock floor.
- Collect and dispose of stormwater that comes into contact with contaminants.
- Do not use detergents or additives in washwater.

Opening Sump Well Valves

Sump well valves in the drydock floor can be opened to manage rainwater under the following conditions ONLY:

- Dock floor has been pre-cleaned, prior to the completion of the work period.
- A filter cloth has been installed to reduce the migration of debris.

All wastewater containing paint contaminants must be directed to the collection trench drains and sump wells on the drydock floor, collected, and sent for proper treatment.

Antifoulant contaminated washwater entering the collection system (trench drains and sump wells) on the drydock floor.

The sill diversion pump removes clean seawater from the pool at the front of Section 1 (moon pool) and discharges into the tunnel drains through a hard pipe on the graving dock wall.

Sediment from the harbour often settles on dock bottom after dewatering. If this becomes contaminated with paint, etc., it must be disposed of.

The hull of a cruise ship being ultra high pressure washed.

Section 1 Considerations:
Caisson and Dock Wall Leakage & Drydock Floor Sediment

Managing Caisson and Dock Wall Leakage:

- Divert caisson leakage water away from pressure washing areas.
- Water leakage from the caisson can be diverted by using a sump pump connected to the PVC diversion pipe installed on the north wall of the drydock Section 1.
- Divert water leakage from the graving dock walls, during high tide, directly into the drainage tunnel.

Managing Entrained Sediment:

Harbour sediment may accumulate in the corners, trenches, keel blocks and sumps of the drydock Section 1 during normal docking procedure. Users of the section will need to consider management of this sediment and are responsible for removal and proper disposal if it becomes contaminated from their operations and activities on dock floor (*e.g. pressure washing wastewater, sandblast grit, paint chips, paint overspray, and other contaminants*).

Ultra High Pressure (UHP) Washing

Ultra high-pressure washing generates significant volumes of wastewater and sludge that may pose a challenge for collection and disposal.

- Prepare in advance for the management of UHP waste.
- Remove all water, sludge and debris, generated from UHP washing, from the drydock.
- Ensure the washwater and sludge is disposed of at an appropriately permitted facility.
- Disposal certificates may be requested, by EGD Management, to ensure washwater is being properly managed.

Management of Pressure Wastewater in Upland Areas/Dockside

- Perform pressure washing of small vessels and parts, in designated areas only, where wastewater management can be effectively achieved.
- Approval for pressure washing in upland areas (*including the use of a stormwater trench for water collection*) is required from EGD Management
- Wash vessel parts in a suitable contained area (*e.g. enclosed skip*).
- Completely block all drains in the area where pressure washing will occur (*e.g. cover nearby trench drains with filter cloth, place a foam bung in the trench drain to prevent migration of wash water should an incident occur*).
- Ensure sufficient equipment (*e.g. pumps, totes, tanks, foam blocks and sandbags*) is available for the timely collection, control and removal of washwater.
- Contaminated washwater requires proper treatment for disposal. Label containers.

A small vessel is power washed on the North Landing Wharf (NLW).

The trench drain is blocked and a sump pump is installed to collect wash water into a tote.

Example of high density styrofoam blocks used as a drain blocker on the NLW.

Large tank dockside with an attendant.

EBMP #2: Abrasive Blasting

Abrasive blasting is a common operation performed at the Esquimalt Graving Dock (*EGD*) to prepare vessel surfaces for painting. However, this operation creates challenges with respect to controlling air emissions and the waste materials generated.

The dust emissions generated from abrasive blasting operations can contain harmful environmental pollutants and have the potential to negatively effect employees, facility users, neighbours, equipment and infrastructure if it is not properly managed. Fugitive dust may also impact the local marine environment by entering the Esquimalt Harbour directly, or via stormwater runoff, and through direct deposit to uplands soil.

Waste grit may be highly contaminated with antifouling paint and other metals, which also poses a risk to the environment if not handled and disposed of properly.

Dust Control

- Establish dust suppression controls in advance of starting any work.
- Do not abrasive blast during conditions that render containment ineffective *(e.g. during windy conditions)*.
- No abrasive blasting of vessels shall be performed while vessels are docked alongside the North Landing Wharf or South Jetty.
- Minimize dust emissions by ensuring blast nozzles are angled perpendicular to the vessel and aimed slightly downward during blasting.
- Properly manage (*contained, covered and secure*) all sandblast product and wastes during transport.

ADEQUATE containment.

Hoarding (*Physical Containment*)

- Use containment such as tarps, shrouds or portable structures to prevent airborne particles from entering the atmosphere and surface waters.
- Containment should be large enough to adequately enclose or segregate the working area and reach the dock floor or walls.
- Ensure containment is properly installed (*connected and overlapped*) so there are no gaps.
- Used tarps with tears and holes should be replaced, repaired or doubled with additional layers.

INADEQUATE containment.

Water Use (*Fugitive Dust Suppression*)

- Where physical containment techniques are not sufficient to prevent fugitive dust emissions, water may be used to mitigate dust.
- Users may requisition use of Dust Suppression Units (*e.g. Dust Boss*) from the EGD. The units are highly effective at mitigating dust.
- Monitor areas where dust escapes physical containment and adjust dust suppression unit water spray accordingly.
- Do not allow water from the dust suppression units to enter other sections of the dock, especially in the case where another user occupies it.
- Do not allow water from the dust suppression units to come in contact with contaminants on the drydock floor or other work areas. Adjust water spray and relocate contaminants to mitigate impacts.
- Fire nozzle "water curtains" may only be used to control dust emissions when approved by EGD Management in advance. The dust suppression units generates a more effective water mist and uses significantly less fresh water during operation.

Waste Grit Management

- Cover trench drains and tunnel grates in work areas with filter cloth. Replace the cloth as required.
- Manage waste grit by sweeping it into central areas, away from trenches, tunnel grates and dock floor traffic.
- Remove waste grit from work areas as soon as possible.
- Store all waste grit in appropriate containers to prevent leakage.
- Cover all skips, storage bins, tanks, and hoppers to prevent dust emissions and spills.
- Characterize and dispose of waste grit in accordance with applicable provincial regulations.

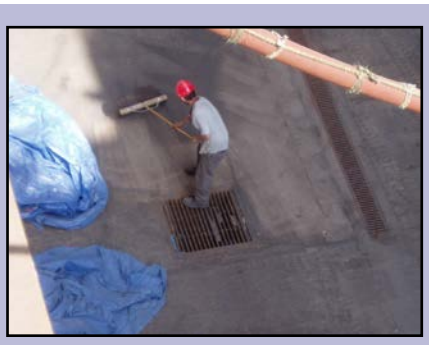
Dust suppression unit in operation.

Store all waste grit away from drains, to prevent contaminates migrating into the marine environment.

INADEQUATE waste grit storage.

ADEQUATE waste grit storage.

Environmental Best Management Practices



Clean up waste grit to prevent it from being washed into the drainage system by clean water (e.g. cooling water discharge, stormwater, dust suppression unit spray).

Store waste grit in appropriate containers.

Remove waste grit from work areas as soon as possible to prevent migration of contaminates throughout the drydock floor.

Keel / Bilge Blocks

Keel and bilge blocks on dock bottom present a challenge for the clean up of spent waste grit.

Waste grit must be removed from areas around excess blocks stored in the dock bottom. To prevent grit from collecting between the blocks, they can be relocated or covered prior to sandblasting.

Power washing at the base of the blocks can be effective in removing contaminants.

Environmental Best Management Practices

EBMP #3: Painting and Coating

Ship repair and maintenance often requires the painting and coating of vessel surfaces to protect them from corrosion or to inhibit the growth of marine life. The industrial nature of marine paints and solvents, in particular antifouling paints, may result in negative impacts to the environment and surrounding infrastructure, if not properly managed.

Spray Painting

Paint overspray has the potential to impact the marine environment, soils, neighbouring residences, and nearby equipment and infrastructure.

- Use containment such as tarps, shrouds or portable structures to prevent airborne particles from entering the atmosphere and surface waters.
    - Containment should be large enough to adequately enclose or segregate the working area.
    - Ensure containment is secured so there are no gaps.
    - Ensure that containment reaches the dock floor or walls.
    - Do not use keel blocks, dock floor or dock walls to test paint sprayers.
- Do not spray paint during conditions that render containment ineffective (*e.g. windy*).
- Place containment beneath and around structures being painted on dock floor and in work areas to ensure overspray does not reach the surrounding area (*e.g. during painting of anchor chains, or grates*).
- Manage overspray on the drydock floor to prevent safety hazards (*e.g. slippage*).
- When spray painting materials inside the stabilizer pockets, ensure the area is sealed and that the walls and floors are covered.
- For vessels docked in Section 1, ensure that overspray does not reach the caisson sill/moon pool water. Avoid docking vessels so they extend over sill area.

Spray Painting

ADEQUATE containment.

INADEQUATE containment.

INADEQUATE containment. Ensure tarps are in place to prevent overspray impacting the surrounding work area.

Environmental Best Management Practices

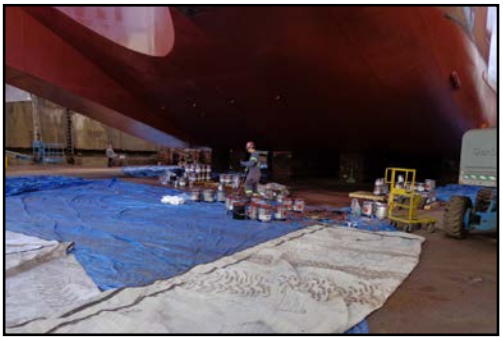
ADEQUATE containment on stablizer pocket doors.

Paint overspray due to INADEQUATE containment stablizer pocket doors.

Manual Painting

Painting by hand (*roller, brush*) can be conducted without shrouding the work area; however, the potential remains for product to migrate into the environment. Work spaces and product handling must be managed with care, similar to dockside painting.

- Containment should be large enough to adequately cover the work area and provide a barrier between the work and the environment (*e.g. dock floor, ocean and soil*).
- Ensure containment is secured so there are no gaps.
- Product container lids are to be secured.



ADEQUATE containment.

Painting Dockside

- Do not spray paint vessels docked alongside the wharves or jetties *(e.g. North Landing Wharf)*.
- Use rollers and brushes to paint vessels dockside.
- Ensure tarps are in place below work areas, as well as in between the vessel and the dock, to prevent spills and drips from entering the water.
- Ensure paint cans are stored securely when working alongside vessel edges.
- Ensure floor grates of manlifts are covered to prevent spills from going into the marine environment.
- Waste generated from painting and other activities such as grinding, hand tooling and welding, must be prevented from entering the marine environment.

While painting vessels docked alongside the wharves or jetties, do not spray paint. Take sufficient measures to prevent paint from entering the marine environment.

Environmental Best Management Practices

Empty paint cans must be properly stored on dock bottom and dock side.

Temporary Paint Storage/Mixing Areas

- Must be under cover to protect from inclement weather.
- Only in designated areas.
- Must be on secondary containment (*a tarp at minimum*).
- Ensure empty paint cans and other associated wastes from painting are stored properly, protected from the weather, and removed from dock bottom as soon as possible.
- Ensure empty paint containers being dried for disposal are protected from rain.
- Do not dispose of used paint containers that still contain wet paint.

IMPORTANT!

In rare situations (*e.g. shape of the vessel, combined with ideal weather conditions*) containment may not be necessary to prevent overspray from escaping the area.

In this situation, the User must notify EGD Management prior to beginning the work, and obtain approval (*in writing*) to paint without completely enclosing the vessel.

Restrictions and monitoring requirements will be applied.

To this date this has only been allowed in three situations:

- Painting underneath a flat bottom barge.
- Painting the underwater hull portion of the midsection of a cruise ship.
- Painting of a C-class ferry underwater hull area, during calm wind conditions.

Environmental Best Management Practices

EBMP #4:
Dry Dock Floor Management and Clean Up

Drain Management

- All sump well valves must be closed prior to and during power washing operations.
- Cover all tunnel drains and net cages during sandblasting, painting and power washing to prevent contaminants from entering the marine environment.
- In the case of a spill or release on dock bottom all sump well valves must be closed and all contaminated material contained and removed from dock bottom.
- Direct all contaminated water to the trench drain system, to avoid entering the tunnel drains.
- Collect and properly dispose of all contaminated water. Ensure sufficient equipment is available for contaminated water collection.
- Ensure all non-contaminated water is directed away from work areas and into the tunnel drain system (*e.g. ballast water, cooling water, caisson sill water*).

Hazardous Materials Managementt

- Store hazardous materials (*e.g. fuel, paint, waste oils*) away from the drains on dock bottom.
- Store hazardous materials to the inside of the trench drains so that any spills or releases can be captured.
- Store hazardous materials in areas protected from the weather, water curtains and other water sources.
- Ensure adequate spill response equipment is in close proximity to hazardous material transfer operations. At a minimum one spill kit is required per section of the graving dock.

Collect and properly dispose of all contaminated water.

Sediment Management

- Segregate any marine sediment, that may enter the dock during vessel transfer, from the waste generated during vessel repair. This is to reduce the amount of wastes requiring disposal.
- Collect and properly dispose of marine sediment that becomes contaminated with waste generated from vessel repair.
- Remove all contaminants and residues from the trench drains and sump wells prior to flooding at the end of work period.

Housekeeping

- Remove waste sandblast grit from the work area as soon as possible to prevent migration of grit contaminants into tunnel drain system.
- Store wastes collected from the dock floor in appropriate secondary containment and remove from dock bottom as soon as possible.

Residual paint in the cans may drip out of the skip and enter the marine environment through the drain systems.

Leaving garbage around the work site attracts wildlife such as seagulls, racoons and rats.

When cleaning dock bottom, skips of waste sandblast grit may leak contaminated water and should be removed as soon as possible.

All hazardous materials must be stored in appropriate containment and away from tunnel drain system.

Inspection and Cleanliness

- Prior to flooding, the drydock must be cleaned to meet the Esquimalt Graving Dock (*EGD*) *Standard of Cleanliness (see below),* as determined by the EGD undocking supervisor.
- Users must ensure that the dock floor is free of deleterious substances prior to flooding.
- Water may be used to clean the dock floor; however, any wastewater generated must be collected and disposed of properly.
- If a vessel occupies a shared portion of a dock section each User must clean the trench drains up to and including the section sump well.

ADEQUATE:
Example of a dock floor that would pass inspection.

INADEQUATE:
Example of a dock floor that would not pass inspection.

EGD Standards of Cleanliness

Due to the importance of drydock cleanliness prior to flooding, and since quantitative testing is impractical due to time and cost restrictions, the following guidelines will be used to assess cleanliness of drydock surfaces.

- All drydock surfaces, including stairwells and sills must meet the standard for "**residue free**" prior to flooding of the drydock. "**Residue free**" is considered met when a person of normal visual acuity, while standing, is unable to detect visible accumulations of potential pollutants.
- This includes, but is not restricted to:
    - the removal of abrasive grit,
    - paint residues or paint chips,
    - cutting and grinding wastes,
    - oil and grease,
    - food and drink containers,
    - ear plugs,
    - dust masks,
    - rope,
    - cigarette butts, or
    - any other refuse that may have been deposited during the work period.
- Debris of natural origin that may have been deposited during the previous flooding of the drydock, such as wood, sand, silt, seaweed, or marine life may be exempt from these requirements, as long as it will not contaminate the environment upon reintroduction.

AREAS IN NEED OF *SPECIAL ATTENTION*

ACCEPTABLE		NOT ACCEPTABLE
	**RAMPS**	
	**SILLS**	
	**KEEL BLOCKS**	
	**TRENCH DRAINS**	
	**SUMP WELLS**	

Environmental Best Management Practices

EBMP #5: Hazardous Materials Handling and Storage

A variety of hazardous materials are used, stored and transported by Users at the Esquimalt Graving Dock (*EGD*). If not handled appropriately, these materials have the potential to negatively impact worker health and safety, infrastructure and the environment. Hazardous materials commonly used at the EGD include: antifoulant paint, fuels and oils, antifreeze.

Storage

Users must have designated storage areas suitable for the materials they use on site. Where applicable, these areas must:

- Have appropriate secondary containment suitable to the quantity and nature of the material in that area.
- Ensure materials are stored in accordance with compatibility requirements.
- Be protected from the weather (*covered, lids secured, valves closed*).
- Have placards and proper ventilation.
- Have controlled access.
- Be located away from pathways to the marine environment.
- Be located on impervious surfaces (*e.g. concrete*).

Handling

All hazardous materials must be:

- Labelled appropriately with the owner name, product name, first aid information, and PPE requirements.
- Secured appropriately during transport.
- Transported by equipment that can sufficiently handle its weight and size.
- Transported in containers that are stable and not in need of repair (*e.g. totes with broken feet, excessive rust, faulty valves*).

ADEQUATE storage.

ADEQUATE storage.

INADEQUATE storage.

Any container holding hazardous materials must be clearly and properly labelled.

Areas to Avoid Storing Hazardous Materials

Trench Storm Drains
Any containers placed directly over top or beside a trench drain have the potential to spill to the drain leading directly to the ocean.

Storm Drains
Any containers placed directly over top or beside a storm drain have the potential to spill to the drain leading directly to the ocean.

Alongside Wharves and Jetties
Any containers placed alongside the edge of the wharves and jetties at the EGD have the potential to spill directly to the ocean, as there are no berms or secondary containment available.

Dock Floor Trench Drains
If a tote or drum is placed directly over or beside a trench drain, hazardous materials have the potential to flow down the drain and into the marine environment. Although the drains are designed for rapid containment and recovery, there is no guarantee that workers will be present to close drain valves during an incident.

Dock Floor Sump Wells
When the sump well valve is open the sump drains directly into the marine environment. Any containers placed on top of or adjacent to the sump well have the potential to enter the ocean if a spill were to occur.

Dock Floor Tunnel Grate Drains
Tunnel grate drains lead directly to the marine environment. Any containers placed directly over top of or beside a tunnel grate have the potential to impact the marine environment, should a spill occur.

Environmental Best Management Practices

Safety Data Sheet *(formerly Material Data Safety Sheet)*

A Safety Data Sheet (SDS) is a document that contains information on the potential hazards (*health, fire, reactivity and environmental*) and how to work safely with the product. SDSs also contains information on the use, storage, handling and emergency procedures all related to the hazards of the material. SDSs must be available (*electronically or hardcopy*) for all products stored on site and be readily available to all employees.

Storage Tanks and Totes

Storage tanks and totes are used for a variety of materials at the EGD, including: washwater, fuel products, bilge water, waste oil/fuel and other waste liquids. Storage tanks and totes may be considered portable/mobile, temporary or permanent. The regulatory requirements for proper use of these tanks vary and is dependent on a variety of factors.

Federal Regulation for Fuel Storage Tanks

The EGD is a Federal facility; therefore, storage tanks onsite need to comply with the Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations. Users may be required to register their tanks with Environment Canada. **Contact EGD Environmental Services for information.**

There are four different fuel tanks at the Esquimalt Graving Dock.

National Fire Code

The National Fire Code outlines the requirements for containment, labelling and location of flammable liquid storage.

EBMP #6:
Waste Management and Recycling

Operations at the Esquimalt Graving Dock (*EGD*) generate a variety of waste streams including hazardous waste, controlled waste, biological waste, international waste, and general refuse and recyclables.

Hazardous Waste

Hazardous wastes generated at the EGD may include waste oil and oil filters, antifreeze, batteries, paint and solvents, oily rags and absorbent materials, spent grit, solids generated during power washing, mercury, PCB containing equipment and asbestos. Appropriate management of hazardous waste will reduce environmental liability associated with inappropriate disposal and storage as well as reduce the risk of human injury and environmental impact.

Hazardous waste storage should be segregated from new product storage.

- Ensure designated storage areas are away from active work areas.
- Ensure areas are covered to reduce exposure to environment and wildlife.
- Ensure that waste accumulation areas are organized.

Hazardous waste should be segregated into separate containers.

- Ensure containers used are appropriate for the type of waste (*e.g. separate drums for waste oil, oil filters, antifreeze, batteries, paint and solvents, oily rags and absorbent material, spent grit*).
- Store batteries in a manner that prevents leakage of acid to the environment.
- Properly dispose of contaminated clean-up materials (*e.g. absorbents, rags, etc.*).
- Do not dilute or mix hazardous waste, other hazardous or non-hazardous wastes.
- Cover waste containers to prevent exposure to weather (*e.g. rain*).

All hazardous waste must be carefully stored and disposed of.

Asbestos

All asbestos containers and asbestos-containing materials must be identified by signage and labelling in accordance with applicable legislation.

Companies that engage in asbestos related work at the EGD must be qualified to do so.

Clearly label all hazardous waste containers.

- Labels should include: type of waste, generator/company name, and contact information.

Controlled Waste

Controlled waste such as animal feces, sewage, contaminated grit, stormwater catch basin waste, creosote wood and dead animals can be disposed of at the **Capital Regional District (*CRD*) Hartland Landfill.**

Controlled waste disposal at requires a permit.

For more information about Controlled Waste disposal contact the CRD Hotline at (250) 360-3030.

Large scale food waste bin.

An example of a Waste Management Area at the EGD.

Food Waste

During normal activity at the EGD, food waste is collected in conveniently located and accessible receptacles onsite and disposed of at the landfill. During larger projects, however, alternative measures are taken to account for the increase in generated wastes.

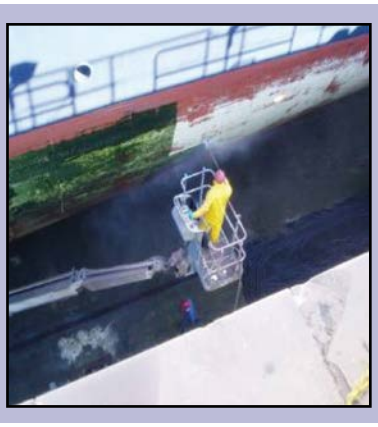
General Refuse

General refuse should be separated into categories to enable easy disposal. Users are responsible for properly disposing of refuse and recyclable materials. There are many containers throughout the site for disposal of common refuse materials (*e.g. steel, wood, glass, cardboard etc.*).

Biological Waste

Marine life removed from vessel hulls and sea chests may contain paint contaminants. This waste may be considered a controlled or hazardous waste and would need to be handled and disposed of accordingly.

Biological waste should be stored out of the sun, covered and removed from the facility quickly to prevent any odours from emanating.



Recycling

All Users of the EGD are responsible for collecting and disposing of the solid waste they generate from their activities, properties and vessels they are responsible for.

- Recycle solid waste such as plastic, glass, aluminum, mixed paper and cardboard. Recycling areas should be conveniently located and easily identifiable.
- Segregate other solid waste, such as scrap metal, wood, electronics, polystyrene foam and soft plastics for recycling at an approved facility.
- Leaf and yard waste collected on property should be composted or disposed of appropriately.
- Construction and demolition waste should be reused or recycled wherever cost effective and technically feasible.
- Encourage the use of recyclable products to reduce the solid waste impact on the environment.

International Waste

Like hazardous waste, International Wastes may pose a threat to human health and the environment.

Dunnage from vessels has been known to carry invasive species to local areas. Foreign dunnage must be identified, stored, and disposed of at an approved facility without delay.

Food wastes may carry pathogenic organisms that could cause illness to those handling it. Food wastes shall be kept in separate, closed containers. The **Canadian Food Inspection Agency *(CFIA)*** will inspect foreign vessels and issue directions on disposal.

EBMP #7:
Fuelling and Oil Transfer

The transfer of fuel and oil is a common activity at the Esquimalt Graving Dock (*EGD*). Transfer may be from ship to shore (*e.g. removal of waste fuel/oil*), from shore to ship (*e.g. refuelling a vessel from a truck)* or land based.

An accidental release during these operations has the potential to negatively impact the environment and health and safety of those at the facility.

- Prior to any fuelling or oil transfer operations:
    - the ***EGD Oil Transfer Checklist*** must be complete;
    - an emergency plan must be in place and readily available;
    - adequate spill response equipment must be available; and
    - personnel must be aware of spill response procedures.
- All transfer and storage equipment must be in good condition, tested, and properly connected.
- Do not place storage and transfer equipment near pathways to the marine environment (*e.g. storm drains, trench drains, edge of the dock*) without effective mitigation measures in place.

Vessel Fuelling and Bulk Oil Transfer
Definition of Oil: as described in the Canada Shipping Act **oil** is considered petroleum in any form, including: crude oil, fuel oil, sludge, oil refuse, gasoline, lube oil and refined products.

Berthed Vessels

- ALL berthed vessels receiving fuel from a truck or a barge require a containment boom.
- Transfers of fuel and oil to and from ALL berthed vessels require a containment boom.
- An ***EGD Oil Transfer Checklist*** must be filled out and signed by representatives from the truck and the vessel and submitted to EGD representatives in the Pumphouse prior to fuelling or oil transfer operations.
- Transfer operations must comply with the *Canada Shipping Act, Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals Subdivision 5*.

Vessels in Drydock

- ALL fuel and oil transfers occurring in the drydock require spill kits to be placed nearby and are not to be completed next to drainage pathways to the marine environment (*e.g. trench drains, sump wells, tunnel grate drains*).

On Land Transfers

- ALL fuel and oil transfers occurring on land require spill kits to be placed nearby and are not to be completed next to drainage pathways to the marine environment (*e.g. storm drains, edge of dock*).

Containment Boom Requisition

The Esquimalt Graving Dock has containment boom and deployment equipment available for requisition. To arrange for booking or rental, contact the EGD Operations Manager.

An orange inshore containment boom fully surrounds the vessel while being fuelled.

The hydraulic powered deployment reel with inshore containment boom available for requisition.

EXAMPLE SCENARIO REQUIREMENTS

Scenario 1: FUELLING A BERTHED VESSEL

- Completed and signed ***EGD Oil Transfer Checklist*** submitted to EGD Pumphouse.
- Containment boom deployed and effectively secured at both ends.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

EXAMPLE SCENARIO REQUIREMENTS (*Continued*)

Scenario 2: BULK OIL TRANSFER FROM A BERTHED VESSEL

- Completed and signed ***EGD Oil Transfer Checklist*** submitted to EGD Pumphouse.
- Containment boom deployed and adequately secured at both ends.
- Receiving containers located away from pathways to the harbour (*e.g. storm drains, edge of dock*).
- Receiving containers in secondary containment and in good condition.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

Scenario 3: FUELLING A VESSEL OR BULK OIL TRANSFER IN THE DRYDOCK

- Pumphouse operation on site prepared to shut down auxiliary pumps in case of an emergency.
- Receiving containers located away from pathways to the harbour (*e.g. trench drains, sump wells, tunnel grate drains*).
- Receiving containers in secondary containment and in good condition.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

Scenario 4: ONSHORE OIL TRANSFER BETWEEN CONTAINERS

- All containers located away from pathways to the harbour (*e.g. storm drains, edge of dock)*.
- Receiving containers in secondary containment and in good condition.
- Emergency response plan in place.
- Adequate spill response equipment and qualified personnel available.

Environmental Best Management Practices

EBMP #8: Invasive Species

Invasive species are a significant threat to the marine ecosystems of British Columbia. The Esquimalt Harbour is known to have a disproportionately high number of non-indigenous species. It has been widely recognized that the primary source of non indigenous marine species in local waters are the ballast tanks and hull surfaces of transoceanic vessels. Ship repair contractors are encouraged to report unusual species observed during hull cleaning activities.

Ballast Water

- Vessels must follow *Transport Canada Ballast Water Control and Management Regulations*

Ballast Tank Sediment

- Shipyards must follow *Transport Canada Ballast Water Control and Management Regulations*
- Sediments removed from the ballast tanks at the EGD must be contained, collected and disposed of at an authorized facility.
- Sediments must not be allowed to enter the harbour.

Anchor chain-growth

- All biological material removed from anchor chains must be contained, collected and disposed of appropriately.

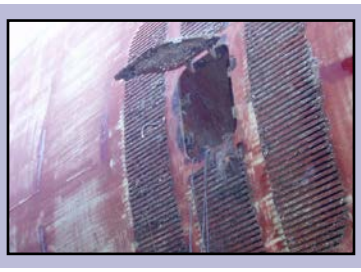
Sea chests

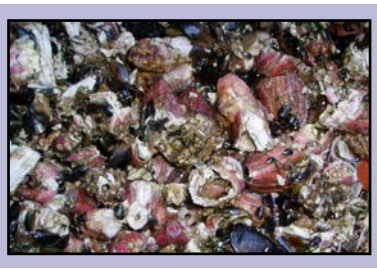
- All biological material removed from sea chests must be contained, covered and disposed of appropriately.
- Material must be stored away from direct sunlight/heat and disposed of as soon as possible, to avoid nuisance odour pollution.

Marine growth removed from vessel hulls must not be allowed to enter the harbour through the drydock drainage system.

INADEQUATE containment: Biological waste on drydock floor near drains.

INADEQUATE containment: Biological growth mixed with paint waste on drydock floor.





Sea chests, such as this one from a cruise ship docked at the EGD, often contain a significant amount of marine life.

If not managed appropriately, this marine life has the potential to negatively impact the local ecosystem of the harbour.

EBMP #9: Fish and Wildlife Management

The daily operations and activities of the Esquimalt Graving Dock (*EGD*) have the potential to negatively impact wildlife that frequents the property. The *EGD Wildlife Management Plan* has been developed to assist EGD employees and Users to properly manage interaction with fish and wildlife that are common to the facility.

Fish

Fish and other marine life have the potential to become stranded in the drydock during normal vessel docking/undocking operations. This may include, but is not limited to: salmon and other fish species, seals and octopus.

- The bubble curtain must be employed during vessel transfer into and out of the drydock.
- EGD employees must monitor the drydock for stranded fish and/or other marine life during dewatering and report cases to EGD Environmental Services.
- Whenever possible, EGD employees must retrieve fish and marine life and safely return them to the Esquimalt Harbour.
- Users are prohibited from removing fish and marine life from the drydock.

Report all cases of fish and marine life interaction with the drydock to EGD Environmental Services.

Wildlife

A variety of wildlife is known to occupy areas of the EGD property. In some cases wildlife may use the facility as a nesting/breeding ground, while others are present for short periods of time during migration or to feed. Activities and operations at the EGD have the potential to impact the well being of wildlife at the facility.

Such wildlife includes: deer, raccoon, mink, river otter, great blue heron, osprey, raven, Canada goose and a variety of other common waterfowl, nesting and songbirds and pollinators *(e.g. bats, native bees)*.

Bubble curtain employed during vessel transfer.

Stranded marine life must be carefully returned back to the Harbour.

Fisheries Act - Destruction of Fish

The EGD has received authorization for the destruction of fish associated with normal operation of the drydock from the Department of Fisheries and Oceans (*DFO*).

Conditions of the Authorization:

- Take all reasonable precautions to prevent the trapping and mortality of fish.
- Monitor the success of preventative measures and retrieval success.
- Report to the DFO annually.

Environmental Best Management Practices

- ALL wildlife must be left alone. Do not approach or handle newborn or juvenile wildlife.
- Injured or orphaned wildlife must not be handled without proper experience and equipment.
- Dispose of dead wildlife appropriately.
- Report observations of injured or deceased animals to EGD Environmental Services.
- Prior approval from EGD Environmental Services is required for the relocation or removal of nesting wildlife; a Migratory Bird Damage or Danger Permit is required to remove nests and retrieve eggs of migratory birds (*e.g. seagulls*).
- Never mistreat, remove or destroy any areas that could provide habitat for wildlife without prior approval and receipt of appropriate permits from the relevant authority.

Contact EGD Environmental Services for wildlife related information, incidents and interactions.
Contact the Front Gate Commissionaires for afterhours assistance.

A variety of wildlife is known to occupy areas of the Esquimalt Graving Dock property.

Incidents with wildlife are managed on a case by case basis.
Direction and/or assistance must be taken from the appropriate authority when required.

EBMP #10: Water Use

The Esquimalt Graving Dock (*EGD*) is considered a major consumer of fresh water. Water is provided to the facility by the Capital Regional District (*CRD*) distribution system, on a fee for use basis. Inefficient use of water may result in a negative economic and environmental impact. Water consumption and the quality of water are both considerations of the environmental management systems at the EGD.

Water Consumption

Large volumes of water are used during normal operations at the facility; because of this, the EGD is considered a high volume user of fresh water in the CRD. Users must be conscious of activities that consume high volumes of water and work to mitigate any water waste.

In order to reduce the amount of water consumed onsite:

- Mitigate dust in problem areas using high efficiency Dust Suppression Units, when physical containment techniques are not sufficient to prevent fugitive dust emissions.
- Use fire nozzle water curtains only when all other attempts to contain particulate emissions from sandblasting have failed. Water curtain use must be approved by EGD Management in advance.
- Avoid use of freshwater to clean work areas, where possible.
- Maintain fittings in buildings and on equipment to prevent leakages.

Water Consuming Activities

Activities associated with vessel surface preparation and dust control use significant amounts of water.

Conventional pressure washing and ultra high pressure (UHP) washing use large amounts of water at high pressure to scour paint and biological material from the hulls of ships.

Dust Suppression Units

Dust Suppression Units are used to mitigate the escape of dust from sandblasting operations in the drydock.

Water Quality

The water distribution system at the EGD was originally designed as a fire suppression system; therefore, the water in certain areas of the system may not be considered potable.

- Potable water is not available throughout the facility (*this includes intake to vessels moored alongside or in the drydock*).
- Users of the facility are responsible for ensuring that the water they use meets the guidelines for the purpose intended.
- Users must use backflow prevention when accessing the water distribution system.

The EGD maintains the fresh water distribution system.

- Flushing of the entire system is conducted on an annual basis.
- Collection and analysis of water, in comparison to drinking water quality guidelines, is conducted on an annual basis.

Metered Water Use at the Esquimalt Graving Dock

- Users of the facility must ensure that water is accessed from a metered line when connecting to the water distribution system.
- Portable meters are to be used when required.
- The EGD Pumphouse must be contacted for proper access to the water distribution system.

EBMP #11: Energy Conservation

The Esquimalt Graving Dock (*EGD*), as an industrial facility, is a major consumer of energy. Inefficient energy use may result in negative economic and environmental impacts. Economic impacts are associated with inefficient electrical usage (e.g. cost), while environmental impacts include those associated with the consumption of fuel (*e.g. air emissions*).

Energy consumption also results in the production and release of greenhouse gas emissions through the combustion of fossil fuels. Every aspect of work at the EGD results in the release of greenhouse gases, whether it is operating the cranes or printing a report. It is important to minimize energy consumption wherever possible to reduce the release of harmful greenhouse gases and conserve energy.

Electrical Consumption

There are a number of opportunities to increase the efficiency of electrical usage at the EGD:

- Turn off lights and equipment when not in use (*e.g. flood lights, office buildings*).
- Install energy efficient devices in buildings (*e.g. sensor switches, efficient light bulbs*).
- Use energy efficient equipment whenever possible and consider energy efficient options when purchasing new equipment.
- Stagger equipment start-up to decrease load on electrical system.

Environmental Best Management Practices

Fuel Consumption and Emissions

Opportunities to decrease the amount of fuel consumed by day to day activities include:

- Using energy efficient vehicles.
- Using alternative fuels where possible (*e.g. Biofuels*).
- Using alternative energy sources where possible (*e.g. LED, solar, rechargeable*).
- Avoid idling vehicles (*e.g. delivery vehicles*).
- Use shore power where possible.
- Encourage staff to try alternative means for commuting to work (*e.g. carpool, public transit, cycling*).

Be aware of the potential impacts of emmissions on neighours near the EGD.

Idling Vehicles

- Do not idle vehicles near building doorways or air intakes
- Vehicles must be turned off if idling for more than 3 minutes in a 60-minute period.

Idling vehicles produce unnecessary air emissions and noise.

Shore Power

For vessels moored alongside at the North Landing Wharf and in the drydock it is important that they utilize shore power when possible. With shore power, the auxiliary generator can be turned off, thereby saving fuel and preventing the release of harmful air pollutants.

Did You Know?

Shore Power may be accessed at the EGD:

- 208V and 480V available on the North Landing Wharf and drydock.

EBMP #12:
Nuisance Pollution (Noise/Odour/Light)

The daily operations of the Esquimalt Graving Dock (*EGD*) Users have the potential to negatively impact neighbouring residents and businesses, as well as the immediate work area. Nuisance pollution is often created by noise, odour and light.

Noise

- Noise pollution can be generated and recognized in decibel levels, pitch, oscillation and duration.
- The main sources of noise at the EGD include sandblasting, drilling, hammering, compressors, generators and the crane warning bell. Even general shop repair activities generate large amounts of noise.
- Sound carries. Operational noise, vehicle noise and loud voices can be heard in nearby areas. Site Users must be aware of the potential impacts of all activities taking place at EGD and be respectful of neighbours.
- Schedule noisy activities for daytime hours 0700 hrs to 2300 hrs on weekdays, weekends and holidays. Through worker education and good practice the generation of high-level intermittent or non-continuous noises can be minimized.
- Personal vehicles, including motorcycles, can disturb neighbouring residents. Your vigilance is appreciated especially during quiet hours. Warning signs are posted at parking areas to remind personnel to be respectful of neighbours when arriving and departing the EGD.
- The EGD recognizes applicable municipal laws and regulations. Operations will consider the requirements of the *Municipality of Esquimalt Bylaw 2826 Maintenance of Property, Unsightly Properties and Nuisance Bylaw Part III Nuisances Noise Contro*l.

The EGD is located in close proximity to residential areas.

Personal vehicles with loud engines can disturb neighbouring residents.

Warning signs in parking areas act as a reminder to minimize noise at EGD.

Responses to nuisance pollution complaints will be taken on a concern-by-concern basis.

To submit a nuisance complaint contact the Esquimalt Graving Dock Information Line at (250) 363-0227.

Odour

- Daily dock operations often create strong and unpleasant odours whether from the release of VOCs, H2S, organic materials, or chemicals. An offensive smell can reduce the quality of the work environment for neighbouring tenants and residents. Biological material removed from bilges, sea chests and hulls must be contained, covered and disposed of appropriately. Be proactive in planning for timely transport and proper disposal of material; a permit may be required for disposal.
- Material must be stored away from direct sunlight/heat and disposed of in a timely manner, to avoid nuisance odour pollution.
- Odour mitigating measures may be required, if odours are negatively affecting neighbouring properties or onsite personnel.
- The EGD recognizes applicable municipal laws and regulations. Operations will consider the requirements of the *Municipality of Esquimalt Bylaw 2826 Maintenance of Property, Unsightly Properties and Nuisance Bylaw Part III Odour and Disturbances*.

ADEQUATE containment of odorous waste.

INADEQUATE containment of odorous waste.

Light

- Night time dock operations require spotlights to provide a safe work environment. Be aware that strong spotlights can be a significant intrusion for residential neighbours.
- Only utilize spotlights when absolutely necessary. This will help prevent disturbing the neighbours, as well as to ensure a more energy efficient work environment.
- Changing the direction of stationary and portable lights in the workplace may reduce the effect they have on the neighbours.
- Turn off any unnecessary lights.
- The EGD recognizes applicable municipal laws and regulations. Operations will consider the requirements of the *Municipality of Esquimalt Bylaw 2826 Maintenance of Property, Unsightly Properties and Nuisance Bylaw Part III Odour and Disturbances.*

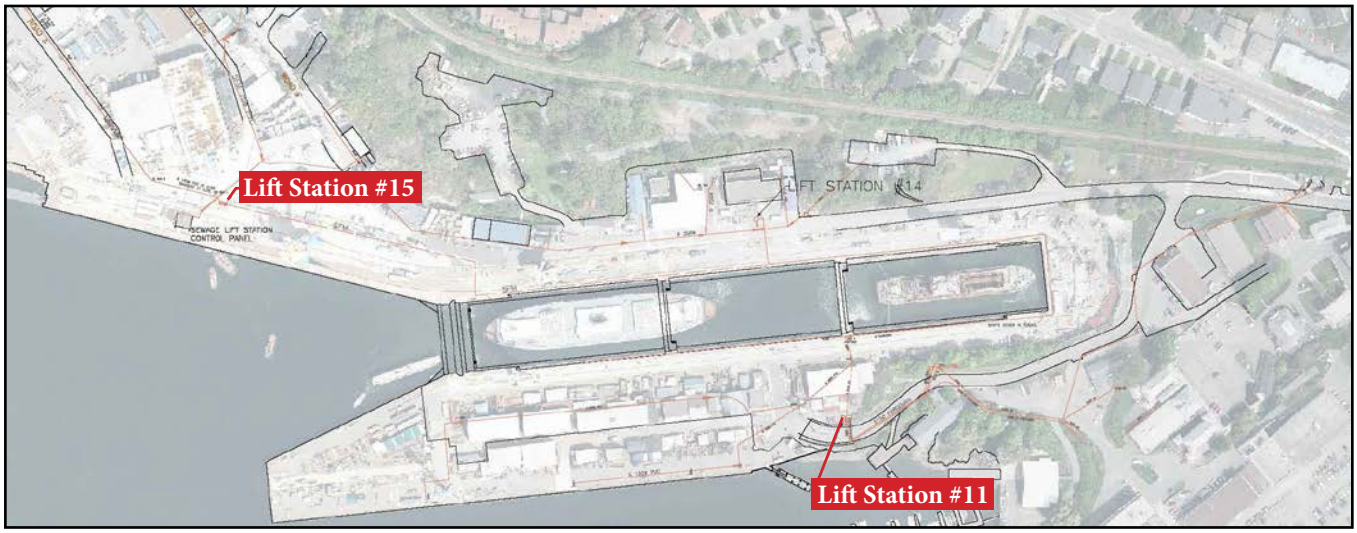
Only utilize spotlights when necessary.

Changing the direction of spotlights can reduce light impact on neighbours.

EBMP #13:
Sanitary Waste Management and Sewer Use

The Esquimalt Graving Dock (*EGD*) is authorized by the Capital Regional District (*CRD*) as a ship and boat waste disposal facility. The authorization allows for the proper discharge of sanitary waste, grey water and superchlorinated water at designated locations at the EGD, and stipulates the requirements that must be met prior to discharge.

Discharge to the sanitary sewer at any location other than at LS#15, LS#11 or at vessel connections located in the services tunnels of the drydock is prohibited.



Lift Station #11.

Lift Station Maintenance.

The EGD is authorized to discharge to the sanitary sewer at:

- Lift Station #15 (*LS#15*),
- Lift Station #11 (*LS#11*), and
- Vessel connections in the drydock.

Permitted wastes include:

- Sanitary waste, *
- Grey water, and
- Treated superchlorinated water.**

Sanitary Waste: *must contain <50,000 ppm total solids.*

***Superchlorinated Water:** must not be discharged to the sanitary sewer unless it has been de-chlorinated to less than 5 ppm chlorine.*

Prohibited wastes include:

- Bilge and ballast water,
- Wastewater sludge, and
- Fuel and oil, paint, paint thinner, solvents, and products containing toxic chemicals.

Other Wastes

Other wastes may be considered for discharge to the sanitary sewer on a case-by-case basis; approval *must be* requested from EGD Management prior to discharge.

Discharge to the sanitary sewer at locations other than those authorized may be considered on a case-by-case basis; approval *must be* requested from EGD Management prior to discharge.

Waste Discharge Notification

Envirosystems Inc. will, as a standard operating procedure, notify the EGD Pumphouse prior to large volume discharges to the sewer system (*e.g. any "batch discharge" in excess of 20,000 litres*). Coordination of discharge may be required depending on usage of the sanitary sewer system at the time.

Envirosystems Inc. will contact the Pumphouse on a regular work day if Envirosystems Inc. is planning to discharge large volumes during times other than Monday to Friday, day shift (*0730 hrs to 1600 hrs*) or on statutory holidays.

Envirosystems Inc. must contact EGD Management if there is a change in normal discharge operations (*e.g. increase in daily volume*).

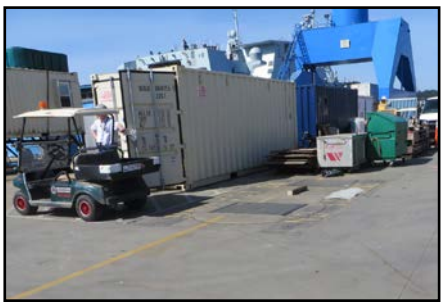
Access to the Sanitary Sewer

- Users must notify the Pumphouse before conducting any discharges to the sanitary sewer. Typical methods of discharge include: large (*direct connection and discharge from a vessel*), and small (*portable discharges from totes and tanks*).
- Users must complete a ***Sanitary Sewage Discharge Form*** and provide it to the Pumphouse prior to discharging to the sanitary sewer.
    - Pumphouse Operators will ensure that sanitary sewer discharges are in accordance with applicable regulations and authorizations.
    - Pumphouse Operators will provide all completed ***Sanitary Sewer Discharge Forms*** to EGD Environmental Services.
- Users must ensure a sample collection point is accessible at the point of discharge.
- Users must request approval from EGD Management to connect directly to the sanitary sewer for regular domestic waste (*e.g. washrooms, sinks, toilets*). Any other waste is prohibited from being discharged of through these lines.

Lift Station Maintenance

- Commissionaires will contact the Pumphouse on radio Channel 4 when DND sewer maintenance personnel enter the facility.
- Pumphouse staff will supervise DND personnel work on the lift stations where required.

AUTHORIZED Sanitary Sewer Discharge point, Lift Station #11.



AUTHORIZED Sanitary Sewer Discharge point, Lift Station #15.

UNAUTHORIZED Sanitary Sewer Discharge point (i.e. storm drain).

UNAUTHORIZED Sanitary Sewer Discharge point (i.e. trench drains).

UNAUTHORIZED Sanitary Sewer Discharge point (i.e. sewer manhole).

EBMP #14: Spill Preparedness and Response

The Esquimalt Graving Dock (*EGD*) is committed to the protection of human health and the environment. Safety and environmental management programs have been implemented at the EGD to reduce the potential for accidents and spills. Emphasis is placed on the prevention of spills, and although the potential for spills can be reduced through these programs, spills do still happen.

All Users operating at the EGD must have the capability to effectively manage spills resulting from their activities and operations.

- User employees must have adequate training in spill response.
- User employees must have access to spill response equipment and materials appropriate to the work they are performing.
- Users must have plans and procedures in place to respond to spills.

For spills which are beyond the capability of the User or are not being effectively responded to by the User, the EGD will provide assistance. The EGD has additional resources available, including:

- Spill kits and response materials for land and water based spills.
- Containment boom, deployment reels and boat.
- Pneumatic skimmer with drum and brush recovery modules, deployment and retrieval services.
- Staff trained to deal with land and water based spills.

For spills beyond the capability of the facility to manage, contact *Emergency Management* (EM*BC*). Additional resources will be coordinated for response to land and water based spills.

ALL Spills at the Facility
MUST BE REPORTED to EGD Management.
Details are to be provided in an *Incident or Spill Report*.

Spill response training at EGD.

Spill response training at EGD.

Spill response equipment: Skimmer.

Spill response equipment: Spill Kit.

Environmental Best Management Practices

Assess the situation.

Stop product flow.

Secure the area.

Steps to Spill Response

Assess the Situation

- Never rush in. Warn others in the immediate area.
- Stay upwind of the spill and avoid low lying areas.
- Quickly and accurately gather details that may need to be communicated to spill response personnel and the authorities including:
    - What equipment or work activity is involved?
    - What hazards are associated with the spilled product?
    - How large is the spill?
    - Is the situation under control or is it escalating?
    - What areas are or could be affected?
    - Proposed strategy to contain/control the spill.
    - Notify others in the area of the spill.

Stop Product Flow

- Act quickly to stop product flow, ONLY IF SAFE TO DO SO.
- Activate emergency shutdowns (*if applicable*).
- Close delivery truck manifold valves, etc. (*if applicable*).

Secure the Area

- Clear the area of public and untrained personnel.
- Ensure those onsite are wearing appropriate PPE.
- If spill is indoors, ensure the building is evacuated.
- Isolate large spills in all directions.
- Limit or prevent access to the site.
- Enforce safety procedures.

Contain the Spill

- Approach the spill from an upwind direction and avoid low lying areas.
- Use appropriate PPE (*e.g. gloves, eye protection, respirator*).
- Follow safe work procedures.
- Block drains, culverts, and ditches to prevent entry into waterways, sewers or confined areas.
- Contain spill with absorbent materials (*from spill kits*), earth, sand, or other non-combustible materials.

Notify the Authorities

- Contact your Supervisor immediately.
- Report the spill to EGD Management.
- For spills greater than 100L on land, or any spill of any size that enters the marine environment, contact: Emergency Management (*EMBC*) Reporting Line: 1-800-663-3456.
- Additional reporting requirements may be required depending on the spilled material.

Recovery and Clean Up

- Use appropriate materials to recover spilled product (*e.g. loose absorbent, pads, booms, socks*).
- Place waste in labelled 6mm plastic bags or leak proof containers.
- Store waste in secure, dry, well-ventilated location, away from heat and ignition sources.
- Consult with authorities before removing waste from site.
- Arrange for waste disposal at an approved facility by a qualified contractor.

Investigation & Reporting

- Investigate the spill or incident and complete and submit required reports to the authority having jurisdiction.

Contain the spill.

Environmental Emergency Contacts (24 Hours):

EGD Commissionaires
250-363-3784

Emergency Management (*BC*) Reporting Line
1-800-663-3456

DND QHM
250-363-2160
or
VHF Channel 10

Recovery and clean up.

EBMP #15:
In-Water Hull Cleaning and Maintenance

The cleaning, maintenance and repair of the underwater hull and associated appendages in water has the potential to release harmful contaminants into the marine environment.

In-water Hull Cleaning

- In-water hull cleaning of vessel hulls, that are coated with antifouling paint, is **prohibited** at the Esquimalt Graving Dock.
- In-water hull cleaning of vessels coated in non-biocide containing paints (*such as silicone based*), **may be considered** on a case-by-case basis and must be approved by EGD Management prior to the commencement of work. This applies to in-water hull cleaning to remove organic growth only, NOT to coating removal.

In-water Maintenance

- In-water maintenance may be considered on a case by case basis and must be approved by EGD Management prior to the commencement of work. In-water maintenance may include but is not limited to:
    - Cleaning of anodes, inlets, props, and transducers for operational and inspection purposes only.

All vessels approved for in-water hull cleaning or maintenance must have a containment boom in place prior to work starting.

Additional requirements may be required on a case by case basis depending on the scope of work involved.

NOTE: Cleaning of the above water hull while berthed alongside the dock is PROHIBITED.

Did You Know?
Antifouling paints and their residues contain heavy metals, such as copper, which are toxic to aquatic organisms, including salmon and shellfish.

Wash water and solid residues from the washing, scraping, sanding and blasting of antifouling paints from boat hulls are considered "*deleterious substances*" under the *Fisheries Act*. Releasing these wastes to fish bearing waters is a violation of the Act.

Environmental Best Management Practices

EBMP #16: Housekeeping

An organized, clean facility provides an environment that reduces the potential for pollutants to enter surface and ground water through spills and accidents. General cleanliness will lead to more organized and consistent handling of hazardous materials and waste products. Good housekeeping programs will identify and assign responsibilities for shift clean up, day-to-day cleanup, proper waste disposal, removal of unused material, and regular inspection.

Clean-Up

- Clean debris from work areas immediately after any maintenance activity. Dispose of collected material appropriately.
- Ensure garbage and recycling containers are available in all leased areas and are emptied regularly.
- Do not use running water to clean the work areas where potentially contaminated water could enter the stormwater system.
- Ensure trench and storm drains within designated leased areas are kept clean and free of debris.
- Sweep and/or clean active working areas on a regular basis.

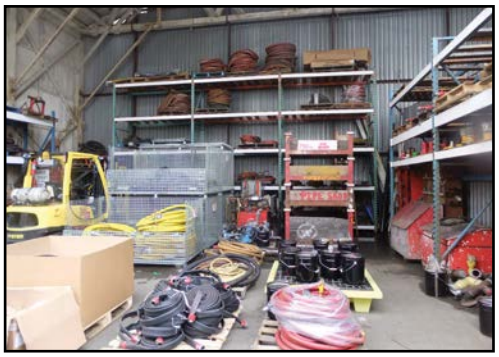
Storage

- Do not store materials or equipment outside of leased areas.
- Regularly inspect lease areas for unidentified or improperly stored materials.
- Ensure all stored products and wastes are clearly labelled and identifiable.
- Place a drip pan underneath vehicles and equipment when performing maintenance. Promptly transfer used fluids to the proper waste or recycling drums.
- Ensure all containers (*e.g. drums, totes, pails*) are in good condition and have a clean exterior at all times. Ensure containers are not left open; secure lids or cover containers when not in use.

INADEQUATE: Keep work areas neat & orderly.

INADEQUATE:
Keep trench and storm drains free of debris.

INADEQUATE:
Ensure storage containers are not left open.



ADEQUATE: Keep work spaces organized and clear of debris to prevent accidents.

EBMP #17: Stormwater Management

Stormwater has been identified as one of the primary pathways of contaminant loading to the local harbour associated with Esquimalt Graving Dock (*EGD*) operations. Common contaminants found in stormwater samples include metals, extractable petroleum hydrocarbons (*LEPH/HEPH)*, and total suspended solids (*TSS*). Five upland stormwater catchment areas terminate into the Esquimalt Harbour from the EGD property. The drydock floor tunnel drainage system leads directly to the Esquimalt Harbour. Any material entering the tunnel drainage system, either through tunnel grate drains or open sump well valves, will end up in the harbour. Deleterious materials must not be allowed to enter the storm or tunnel drain system.

Uplands Stormwater Management

- Store hazardous materials away from storm drains and trenches on the dock floor and in upland areas.
- Ensure totes, drums, pails and skips containing hazardous materials are protected from the weather (*e.g. lids secure, tarps in place*).
- Place filter cloth over storm and trench drains when working with deleterious substances that are in close proximity to, and that could pose a hazard to the marine environment.
- Divert and contain stormwater runoff containing contaminants and sediment with proper materials and filtration, prior to entering the drains (*e.g. use filter cloth, hay bales, sand bags*).
- During heavy stormwater events, ensure storm drains and trenches are kept clear of debris to prevent flooding.
- Conduct regular inspections of storm and trench drains in lease areas to ensure they are kept clear of debris.
- When using trench drains for secondary containment, ensure the containment system is monitored and removed in a stormwater event. A blocked trench drain may cause flooding of the area.

Prevent deleterious substances entering marine environment by placing filter cloth in the trench drains.

Sand bags used on dock bottom to divert and filter excess water.

Do not allow trench drains to build up with debris. This helps to prevent flooding during heavy stormwater events.

Drydock Floor Stormwater Management

- Stormwater has the potential to mix with washwater and other contaminants on the drydock floor during normal operations. Users of the drydock must plan in advance for stormwater management during their work period.
- To reduce the amount of washwater requiring treatment, stop power washing operations until stormwater can be controlled.
- To prevent contamination of stormwater with washwater, waste sandblast grit and other hazardous materials and wastes, cleanup work areas as soon as possible.
- Sump well valves may be opened to allow stormwater to drain into the tunnel drains when the trench drains, sump wells and dock floor area is clear of contaminants and debris. In the case where washwater collection is completed, but the trench drains, sump wells and dock floor have not been cleaned, a filter cloth may be secured over an open sump well valve to allow stormwater flow. This procedure prevents contaminants and debris from entering the drainage system. This method requires dedicated personnel management of the process and regular filter cloth replacement. Do not poke holes in the filter cloth.
- Tunnel grate drains on the drydock floor in Section 2 and 3 may be uncovered enough to allow stormwater to flow into the drains. Ensure the area is clear of contaminants and debris.
- Sump well valves must be closed in sumps containing visibly contaminated material. Sump wells must be pumped out and cleaned prior to opening the valves.
- Ensure there is capacity in the trench drain/sump well collection system to manage expected stormwater volume. This will allow for continued collection and will prevent flooding of the dock floor.
- Prior to flooding and dewatering of the drydock, ensure all sump well valves are open.

Uplands storm drain with filter cloth. Avoid storing hazardous materials near storm drains, which are directly linked to the marine environment.

Filter cloth secured over sump well valve to allow stormwater flow.

EBMP #18:
Property and Infrastructure Maintenance, Modifications and Construction

Significant environmental issues and potential impacts are known to be related to the management of Esquimalt Graving Dock (*EGD*) property and infrastructure. Any new property and infrastructure construction or modification projects at the EGD must consider environmental issues in project planning and implementation. Common environmental aspects that require consideration and management when planning and implementing projects include: dust emissions, hazardous materials and wastes, storm water runoff, noise, and prevention and response to accidental spills and releases. Requirements for the operational aspects are identified in specific sections of the EGD EBMPs.

Infrastructure Maintenance & Repair

Maintenance and repair of existing facility property and infrastructure often results in waste generation and other environmental aspect considerations to be addressed.

Minor Concrete Work

- Contain dust emissions from cutting and drilling.
- Prevent concrete slurry runoff from entering storm drains.
- Prevent debris from mixing concrete from entering storm drains or the marine environment.
- Prevent concrete slurry runoff from entering the trench and tunnel drains and the "moonpool" on the drydock floor.

Use of Preserved Wood

- Avoid use of creosote preserved wood products where possible.
- Follow applicable guideline for use of preserved wood products.
- Creosote wood waste may be considered a hazardous, restricted or controlled waste, and must be handled and disposed of accordingly.

Demolition/Renovation

- Ensure structures are assessed for the presence of hazardous materials prior to demolition or renovation (*e.g. asbestos, lead based paint, PCB and mercury containing ballasts, mould*).
- Hazardous materials and waste must be handled and disposed of according to applicable regulatory requirements.
- Halocarbon containing equipment must be managed in accordance with the Federal Halocarbon Regulations.

Land Use Application

The EGD Land Use Application (*EGD LUA*) contains sections specific to potential environmental aspects related to the project. These sections must be completed with all relevant information.

EGD Management will respond with additional environmental protection and mitigation measures if required.

Infrastructure Modification & Construction

All modification and construction projects at the EGD must be assessed for environmental impacts, and plans put in place to mitigate the identified impacts. Projects managed by the EGD will be completed in accordance with the national project management system and site specific requirements.

For projects managed by Users:

- Any changes to infrastructure, changes to an existing lease or application for a new lease, must be approved by EGD Management.
- Prior to the approval of a property or infrastructure project, the EGD Land Use Application must be completed in full and submitted to EGD Management for review.

Green Space and Vegetation

The EGD property includes areas of vegetation that provides many benefits, including important habitat for wildlife and sensitive native plant species, and act as a buffer between the industrial operations of the facility and the neighbouring residential area.

All projects which have the potential to impact green space, vegetation and wildlife habitat must be reviewed and approved by EGD Management.

Tree and Vegetation Compensation Policy

To facilitate the EGD wildlife management plan and reduce the likelihood of habitat loss at the facility, property and infrastructure projects that require the removal of vegetation must provide compensation in the form of appropriate vegetation replacement. Additional supplies are also required when compensation vegetation is purchased to ensure that new plantings will be successful (*e.g. soil, mulch, tree protection, and water bags*). Consult with EGD Management prior to work to determine what compensation is required.

Soil Management

The EGD has undergone significant capital and operation and maintenance projects in recent years. Extensive investigations into the soil conditions (*e.g. contamination and structure*), utility mapping and identification of archaeological conditions have taken place. The industrial history of the facility has resulted in known contamination of the soil and in-fill material used on site. The primary contaminants commonly found at levels exceeding industrial soil standards include: arsenic, cadmium, copper, lead, mercury, zinc, and polycyclic aromatic hydrocarbons (*PAH*).

Requirements for Excavation

Planning Excavation

1. Consult with EGD Management prior to excavation to identify:

- Project area and excavation boundaries.
- Known utilities, structures, and historical information regarding the proposed excavation area.
- Known contaminated soil locations and the nature and level of contaminants potentially in the soils to be excavated.
- Archaeologically significant areas, requirements for mitigation of archaeological impacts, and dealing with unanticipated archaeological finds.

2. Prepare a plan for soil management: stockpiling and sampling of soils to be excavated. Key issues to be considered include:

- Turnaround times for sample results may take up to 2 weeks.
- Parameters to be sampled may vary depending on the area of excavation. Common parameters include total metals, leachable metals, PAHs, and hydrocarbons (*LEPH, HEPH*).
- EGD Management must approve stockpile areas.
- Soils which exceed the CCME Industrial Levels or BC CSR Industrial Levels: must be disposed of off site at an approved disposal facility.
- Soils which are below industrial standards: may remain on site if geotechnically suitable, if there is an identified use for the soil, and when approved by EGD Management.

3. Ensure contractors and employees are aware of the health and environmental risks associated with the suspected contaminated soils and have procedures in place to mitigate the risks. This includes adequate Personal Protective Equipment (PPE) and hygiene practices (e.g. no smoking, wear gloves).

ADEQUATE soil stockpile management. Soils placed on poly and covered.

INADEQUATE stockpile of contaminated soil. Soil should be covered to prevent exposure to elements, runoff and people.

Conducting Excavation

- Ensure appropriate PPE and hygienic precautions are in place to prevent exposure to contaminants in the soils.
- Monitor all excavations for visible soil contamination or archaeologically significant material.
- Ensure soil is stockpiled, sampled and analyzed in accordance with the Environmental Management Act and Contaminated Sites Regulation, and BC Ministry of Environment Technical Guidance Document 1, Site Characterization BC Government Technical Guidance on Contaminated Sites (*January 2009*).
- Ensure soils suspected of contamination are stockpiled on an impervious surface (*e.g. 6 mil PVC or plastic poly liner*) and adequately covered to prevent exposure to wind, storm water runoff or people. Stockpiles must not exceed 50m^3 in size.
- Imported fill material used for surfacing, backfilling or any other use must meet CCME Residential/Parkland (*RL/PL)* Land Usage Soil Quality Guidelines. Fill material information must be provided to and approved by EGD Management before being used on site.

After Excavation

- Ensure all soil is disposed of at a facility that is permitted to accept that material.
- Obtain all disposal records, including: waste manifests, weigh bills and disposal certificates from the receiver.
- Report the volume, analysis results, excavation details and dimensions and disposal records to EGD Management.
- Provide all as-builts and project drawings to EGD Management in the format compatible with the EGD drawing standards.

Archaeological Considerations

The EGD property and surrounding area has a rich First Nations history. There are Provincially Registered Archaeological Sites listed within the property boundaries of the EGD.

- All excavation projects must be reviewed and approved by EGD Management prior to work beginning.
- Depending on the scope of the project a detailed Archaeological Impact Assessment may be required.
- All Users, including contractors and employees working on excavation projects, must be made aware of the potential for archaeological chance finds. In the case where suspect archaeological material is discovered during excavation, work must stop in that area and EGD Management must be notified immediately.

Archaeological Overview Assessment

An Archaeological Overview Assessment was conducted for the EGD which outlines the archaeologically sensitive areas on the property and identifies areas of high archaeological potential.

Archaeological significant materials found during excavation projects at the facility include shell midden, artifacts, faunal and human remains.

Many archaeologically sensitive areas exist on the EGD Property.

First Nations archaeologists examine materials unearthed during excavations at EGD.

APPENDIX C

WSP ROCK SLOPE ASSESSMENT REPORT APRIL 10, 2019

ROCK SLOPE ASSESSMENT NORTH SIDE

PHASE 2 APRIL 2019

ESQUIMALT GRAVING DOCK

PROJECT NO.: R.091150.001

CONFIDENTIAL

WSP PROJECT NO.: 171-08146-02
DATE: APRIL 10, 2019

WSP
760 ENTERPRISE CRESCENT
VICTORIA, BC
V8Z 6R4
T: 250-475-1000

WSP.COM

April 10, 2019

Confidential

PWGSC
Esquimalt Graving Dock
Victoria, BC

Attention: **Jon Siska, Project Management Officer (via email)**

Dear Sir:

Subject: **Esquimalt Graving Dock – Rock Slope Assessment North Side Phase 2 March 2019**

WSP Canada Inc. (WSP) is pleased to submit a Final PDF copy of the Rock Slope Assessment North Side.

We trust the enclosed report meets your current requirements. If you have any questions regarding the project, the enclosed report, or our services, please do not hesitate to call the undersigned at (250) 360-3572.

Yours sincerely,

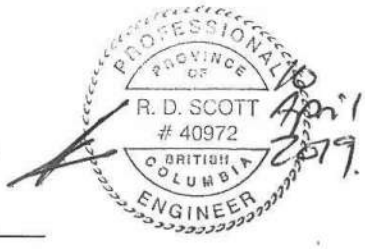
Russell Scott, M. Sc., P. Eng.
Senior Geotechnical Engineer

WSP Ref: 171-08146-02

760 Enterprise Crescent
Victoria, BC V8Z 6R4
Tel: 250.475.1000
WSP.com

SIGNATURES

PREPARED BY



Russell Scott, M.Sc., P.Eng.
Senior Geotechnical Engineer

REVIEWED BY

Don Kaluza, P.Eng.
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1 INTRODUCTION

WSP Canada Inc. (WSP) was engaged by Public Works and Government Services Canada (PWGSC) to undertake a geotechnical rock slope hazard assessment of the north side rock face at the Esquimalt Graving Dock site (EGD) in Esquimalt, BC (Figure 1). Our initial phase work was undertaken as part of our PSPC-EGD Multidisciplinary SOA EZ899-170242, and the project reference is Project No. R.091150.001.

This rock slope assessment has been implemented due to a recent slope failure that occurred near the Pumphouse building in the area. The failure resulted in the total loss of a contractor's site trailer. The goal of the geotechnical assessment is to review the cut rock slope on the north side of the dry dock to characterize the existing condition and provide comment in relation to further review and mitigation works that would prevent a similar incident from occurring.

The first phase of the project (Phase 1) was to be undertaken during the 2017-18 fiscal year with the aim of conducting the above noted assessment with the results of the findings and recommendations contained herein. Cost estimates for the work are being undertaken by a cost estimating consultant and are included in Appendix B. Should there be a decision to proceed with any remedial works, we understand that this would likely happen in 2019-20, following a detailed design exercise.

1.1 PHASE 2 WORK

PWGSC instructed WSP to undertake an update to our original work through Amendment #1 to the contract, dated 11 December 2018. This report covers the changes from Phase 1 and is referred to as the Phase 2 report.

To inform our updated report, WSP attended a meeting with PWGSC at the EGD on 29th January 2019 to discuss the scope of work where it was discussed that the principal change would be in relation to a revision of our original risk matrix relative to worker access. WSP subsequently carried out a site reconnaissance to observe the recent site conditions and update photographs and records. These observations, along with information supplied by PWGSC (via email on 01 March 2019) have been used to update our original Phase 1 report, including our Hazard Zones drawing (presented as Figure 7 in this report). A revised Class C cost estimate from specialist sub-consultant Advicas, allowing for a phased approach, will be included in the final report.

2 SCOPE OF WORK

The Phase 1 scope of work below is presented with the Terms of Reference (ToR) document provided by PWGSC dated 11 August 2017.

The scope of work included:

- Meet with PWGSC and EGD staff and review existing and background information;
- Conduct a site visit and identify areas of potential risk and concerns;
- Undertake a detailed assessment, including identification of potential failure zones under various conditions (seismic, surface drainage, pore water pressure, weathering, thermal); and,
- Report existing conditions, make recommendations for a remedial action plan for slope stabilization, and provide the associated cost estimates.

The deliverables are to include:

- Prepare and submit a report which includes the purpose of the slope assessment, procedures, descriptions of findings, results and analysis of the assessment, discussion, conclusions and recommendations (provided in this report) and;
- Prepare and submit a detailed design report detailing the remedial measures and associated costs (Class C Cost Estimate) – prepared by cost consultant under separate cover.

WSP notes that our review from a seismic perspective did not include detailed modelling under specific seismic events. The intent of the review from a seismic perspective was to visually identify areas that would be susceptible to movements and potential rock fall hazard.

2.1 PHASE 2 WORK

The Phase 2 Scope of Work as noted in the Amendment #1 was as follows:

Update the *Rock Slope Assessment North Side* report, dated March 28, 2018, to reflect current site conditions and to incorporate the considerations listed below.

1) Replacement Main Substation North Side, New Building

a) Review rock slope stabilization work, directly behind the new Replacement Main Substation North Side (RMSNS) building, recently completed as part of that project. The building is located in Area of Concern # 3 identified in the March 2018 report. Determine if risk is mitigated or if additional stabilization work is required.

b) Review risk mitigation work, directly west and north of the PWGSC washroom building completed as part of the RMSNS project scope, to determine if risk is mitigated or if additional measures are required.

2) North Landing Wharf Substation Replacement, Proposed Building

a) Review proposed rock slope stabilization work proposed for completion within the North Landing Wharf Substation Replacement (NLWSR) project to determine if risk will be mitigated or if additional measures are required. This is located in Area of Concern # 1 identified in the March 2018 report.

3) Reassess Report Recommendations and Risk Levels on North Side of Site

a) Based on current conditions, reassess areas previously identified as GREEN/YELLOW/RED on Figure 7 in the March 2018 report. Provide an update of this figure in the final report.

b) Please consider the following in the reassessment:

i) Reassessment to include both geotechnical risk and personnel access risk factors to determine priority levels. For example, a site with high geotechnical risk and high likelihood of personnel being in the area should be classified as higher risk than an area with high geotechnical risk where personnel are rarely present.

ii) EGD's priority areas of concern are the areas directly behind the Pump House Substation (PHS) westward to the Main Substation (within Areas of Concern # 3 and # 4 in the March 2018 report), and areas directly adjacent to the PWGSC washroom building.

c) Analyze phased approach for slope stabilization project scope for high risk areas as a higher priority down to low risk areas as a lesser priority. Provide comment on whether this approach will result in significant additional costs compared to doing all the work at once, or grouping projects together based on geographic proximity (e.g. doing work in one area of concern at a time).

d) Provide recommendations for interim risk mitigation measures to be implemented as applicable in advance of long-term rock slope stabilization measures.

4) Cost Estimates for Design and Construction

a) Provide updated Class C cost estimate for rock slope stabilization project, based on priority and phased approach.

b) Provide consultant fee estimate for development of drawings, specifications, and Class B (66%) and Class A (99%) cost estimates for construction assuming a phased delivery approach, including estimated schedule for deliverables including 33%, 66%, 99% and IFT submissions.

c) Provide consultant fee estimate for services during tender, construction review and construction administration.

Deliverables:

1) Meeting minutes
2) Monthly report on physical and financial progress per SOA
3) Health and Safety Plan for site visits
4) Draft Updated Report and Cost Estimates
5) Final Updated Report and Cost Estimates, with consultant responses to PWGSC technical review comments.

Schedule

The project is to be completed with the following schedule.

1) Fee proposal submitted to PWGSC no later than December 21, 2018(revised to 04 January 2019)
2) Schedule any necessary site visits to occur within 2 weeks of receiving call-up.
3) Submit draft report within 3 weeks of site visit or before February 28, 2019, whichever is earlier.
4) Submit final deliverables within 2 weeks of receiving PWGSC review comments.
5) Note that final deliverables and final invoices must be submitted before March 31, 2019.

Out of the above we understand our element comprises:

Geotechnical Scope

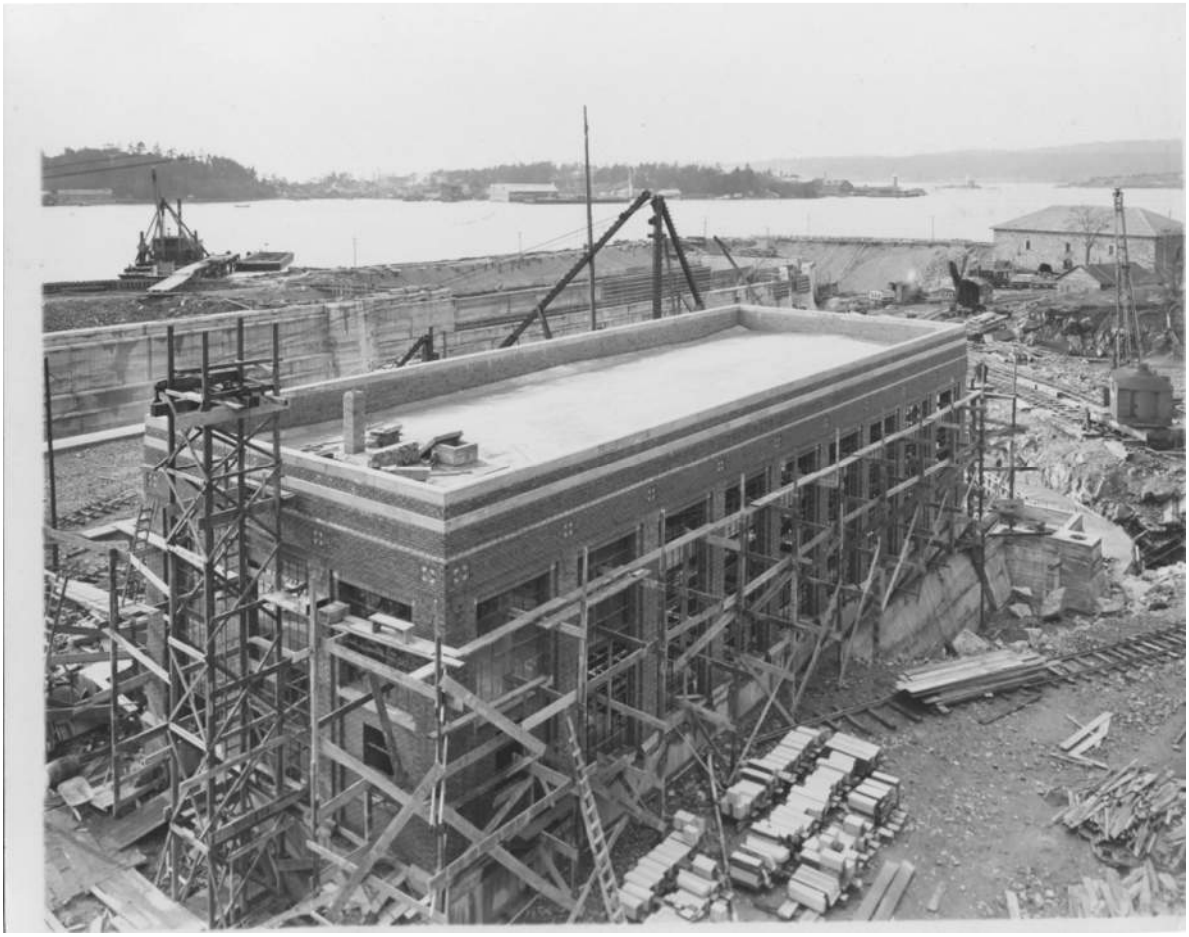
- Provide safety plan and arrange site visit
- Attend site to review present site conditions, take records/photographs.
- Update original geotechnical report incorporating considerations listed above.
- Provide consultant fee estimates as outlined above for development of drawings and specifications.
- Provide Consultant fee estimate for tender support services and construction review.

3 BACKGROUND INFORMATION AND GEOLOGICAL SETTING

As part of our desktop review, WSP met with PWGSC and EGD staff and requested a copy of any available information regarding the cut rock slopes and any historical remediation works that have been installed over the lifespan of the EGD.

The following summarises what we know regarding the cut rock slopes and any works on the slopes:

- Cut slopes likely created via drilling and blasting of natural shoreline between 1920 and 1930, as is shown in the historical photo below;



1925 – Photo looking generally west showing the construction of the Pumphouse (source: PWGSC website)

- The mesh and rock bolts/anchors located in the cut rock face behind the EGD Ops Building are at least 20 years old. No records were available;
- The mesh and rock bolts/anchors behind the Victoria Shipyards Ltd (VSL)/Seaspan Buildings were installed between 2007-10 during the construction of those buildings. No records were available;
- In early 2017 a rockfall event occurred to the west of the Pumphouse resulting in the destruction of a contractor's work trailer. Temporary rockfall mitigation, in the form of a concrete block and gravel backfill catch zone, was installed in spring/summer 2017 and was in place at the time of this report; and
- No other information relating to the cut rock slope, rockfall events or rockfall hazard mitigation installation was available to WSP at the time of writing this report.

The published geological information for the area records the bedrock in this area to comprise massive and gneissic metadiorite, meta gabbro and amphibolite rocks that are collectively known as the Wark Gneiss of lower Paleozoic age. The surficial soils are shown to be thin soil cover, typically marine clays locally named as Victoria Clays.

4 FIELDWORK OBSERVATIONS

4.1 GENERAL

WSP attended site on 26 October 2017 for an initial walkover of the site to make initial high-level observations. Subsequent visits on 14th and 20th December 2017 were undertaken to photograph the cut rock slope in detail, undertake field measurements relating to rock mass structure, joint sets etc., and record pertinent geotechnical observations in relation to the condition of both the cut rock face as well as historically installed mesh and rock anchors.

The rock face assessment has been split into four distinct areas as detailed in the TOR, as noted in the attached Figure 2. Area 1 is in the west and Area 4 in the east. Our field observations are presented below relating to each area in turn. Select photographs taken during our field visit are attached and again are presented for each area in turn along with a photo legend map showing the approximate location and direction each photograph was taken.

In general, the observed rock face was noted to be a slightly weathered metamorphic rock (Wark Gneiss) with localised zones of more prolific jointing. The cut face was typically sloped at around 70° – 90° with localised areas of undercutting. The cut face did not appear to have been created using a pre-shear/presplit blasting technique resulting in a face that was irregular in shape and exhibited signs of over break in places.

4.1.1 2019 OBSERVATIONS

WSP carried out a walkover review of the entire north cut rock face on 20 February 2019 to review current conditions, log and photograph any pertinent changes from those during the Phase 1 walkover in December 2017. These observations are documented below at the end of each section.

4.2 AREA 1

The westernmost part of Area 1 (western edge to the newly constructed electrical ductbank running up the rock face) comprises a relatively gentle bedrock controlled slope (+/- 35°) with little in the way of rockfall hazard.

Observations in this area:

- Occasional loose rock/boulder sitting atop the slope – potential for rolling rockfall, especially during a seismic event; and
- Cut slope to rear of rubbish/trash disposal area – potential for loose blocks to roll into worker area.

The eastern section of Area 1 (east of the electrical conduit) comprises a steep rock cut (sub-vertical) with cut rock face heights of up to 8m with total heights of the rock face in the order of 12 m.

Observations in this area:

- The EGD Electrical Shop Washroom was located towards the east of Area 1. The structure was located within 1m of the rock face in places;

- The easternmost part of this area was located immediately behind the VSL Tech/Estimating Building. The rock face was typically within 2 – 3 m of the building and was sub-vertical with localised undercutting in places. Where the undercuts were recorded, the rock overhang was in the order of 1-1.5 m out from the rock face below;
- Localised groundwater seepage was observed exiting joints with occasional plant/moss growth at these locations on the face. Where access allowed, a number of field measurements pertaining to the dip, strike, and orientation of the joints were measured;
- Where joints were able to be measured (challenging due to existing mesh on rock face) the typical orientation was steeply dipping with a dip towards the south (towards the building). In a number of locations the observed joint was noted to be open up to several centimetres;
- Typical dip/strike readings noted;

  Set 1 – Strike 320-360°, dip 60-80° to South West

  Set 2 – Strike 280°, dip steep – sub-vertical to South

  Set 3 – Strike 10°, dip 30-45° to West
- An existing rock mesh was noted from behind the washrooms across the entire face to the end of Area 1. The mesh appeared to be in relatively good condition, however it had been installed without any overlap (which would typically be recommended for such designs) and in a number of places the joined mesh was noted to have come apart (i.e. 'unzipped'). In places, the mesh was supported at the crest of the slope by a thin (+/-5 mm diameter) wire rope that in turn was supported by thin wires intermitently spaced along the crest and held in place by small rock bolts; and
- A number of rock bolts of unknown length and condition were noted.

WSP understands that a new North Landing Wharf Substation immediately east of the existing ductbank will be constructed in the future and this work will be undertaken with geotechnical input from another consultant. We understand the works will involve the drilling and blasting of the existing rock slope to create sufficient space to allow construction of the new building, and that a number of rockfall mitigation measures are proposed including rock bolts and mesh. We recommend that any proposed works in this area be reviewed by WSP with the aim of harmonising any future rockfall mitigation measures along the face to the east.

4.2.1 AREA 1 – 2019 OBSERVATIONS

The following changes were noted from our Phase 1 Report:

- EGD Electrical Shop Washroom was no longer present;
- EGD Electrical Room was being dismantled in preparation for demolition/re-development;
- No significant changes were noted with regards to the cut rock face.

4.3 AREA 2

The western half of Area 2 comprises an extension of the same 8-12 m high rock face as noted in the eastern part of Area 1 above.

Observations in this area:

- The observed bedrock conditions and historically installed mesh conditions were similar to those described above;
- Another undercut area was noted to the rear of the VSL Administration Building;
- Typical dip/strike readings noted;

  Set 1 – Strike 320-360°, dip 60-80° to South West

  Set 2 – Strike 280°, dip steep – sub-vertical to South

  Set 3 – Strike 10°, dip 30-45° to West
- The rock mesh was not installed to the full height of the rock face, with the bottom +/-2-3 m not covered by mesh;
- A number of rock bolts of unknown length were observed, some without face plates/nuts and showing signs of corrosion;
- This area behind VSL Administration Building and Sea Can Garage and Storage Area was being used as a storage area for a variety of equipment, some of which was stored immediately below the rock face; and
- A compressed gas storage cage and a VSL building's emergency generator that appeared to be connected via pipes laid along a concrete plinth was located immediately below the rock face. Some fallen rock was observed in the vicinity of the cage that was typically around 0.2 m in diameter.

The eastern half of Area 2 (east of the EGD Sea Can Garage and Storage Area) was observed to have a much lower cut face, typically in the order of 1-3 m in height.

Observations in this area:

- The slope in this area was heavily vegetated with ivy and small bushes, and therefore was difficult to review the actual slope conditions;
- Several utilities were observed running up the face including a clay pipe (0.15 m in diameter) and a cable;
- The slope was covered in a heavy gauge mesh that was secured along the base with a heavy steel wire rope and shackles;
- The mesh typically extended to the base of the slope, but locally was observed to stop within 0.3 m of the base; and
- Where visible, the mesh appeared to be held in place with epoxy coated rebar within the soil covered portion of the slope above the crest.

4.3.1 AREA 2 – 2019 OBSERVATIONS

The following observations were noted:

- No significant changes were noted with regards to the cut rock face or the historically installed mesh;
- It was noted that the area is still being used for storage and looked similar to the 2017 observations.

4.4 AREA 3

Area 3 comprises two distinct zones. The first in the western half comprises a low cut rock slope adjacent to a proposed new Main Substation North Side and an area of higher cut rock slope that was located immediately west and north of the main Public Washroom building.

WSP understands that the westernmost area will essentially be buried by the proposed new Main Substation North Side.

Observations in this area:

- The bedrock was observed to be closely fractured and irregular with the exposed cut face typically between 1.5-2.5 m in height;
- The slope above the bedrock cut was grassed and typically gently sloping up to the north; and
- No observations of groundwater were noted in this area.

The eastern area around the Public Washrooms building was closed due to safety concerns in December 2017.

Observations in this area:

- The bedrock cut slopes in this area were noted to be typically around 2-4 m to the west of the washroom block and up to 8m in height to the north of the washroom block;
- The rock was noted to be closely fractured with many of the joints observed to be open (up to 15 mm), many of which had groundwater seepage and vegetation growth in and around;
- A clay tile pipe and plastic pipe were noted running down the face west of the washroom block;
- A large block of rock was observed at the foot of the cut rock face. The block was around 1 m x 1 m x 0.75 m and had a rock bolt protruding from one side. The origin of this rock could not be determined from within the cut rock face;
- The recorded joint sets indicate that there was significant opportunity for wedge failures to occur in this area;
- Typical dip/strike readings noted;

  Set 1 – Strike 300-320°, dip 50-70° to South West

Set 2 – Strike 220-260°, dip 40-60° to South East

- The recorded joint planes in the north cut face were moderately to steeply dipping out of the face towards the washroom block;
- Mesh and rock bolts were observed in the north cut face. It was likely that this was installed to hold back one particular block and it did not cover the entire slope face;
- The area behind the rear of the North Side Standby Generator Building stradled Area 3 and 4. The building was located within 1 m of the cut rock slope and at the east side of the building was almost touching the rock face. The bedrock face was observed to be irregular in shape with groundwater seepage from the joints and moss growth on the surface. Due to access restrictions, WSP was unable to observe this area in any detail.

4.4.1 AREA 3 – 2019 OBSERVATIONS

The following observations were noted:

- The New Main Substation (North Side) had been constructed. It was noted that the cut rock slope immediately north of the building had been cut, scaled, bolted and meshed (by others) and not buried behind the building as originally understood;
- The area around the public washrooms (to the west and north of the building) remained fenced off. In addition, a continuous line of heavy concrete blocks had been placed around the west and north of the building, in between the building and the cut rock face. The blocks were threaded together via a steel cable along the top attached to the wire eyelets at the top of the blocks;
- No significant changes to the cut rock face were observed.

4.5 AREA 4

The rock cuts in this area were typically around 8 m in height in the west rising up to around 12m behind the Pumphouse Building before reducing to around 8 m to the east of the Pumphouse Garage building. An historical failure occurred in early 2017 immediately north of the VSL Electrical Workshop (east of the Main Substation). At the time of our walkover there was a temporary concrete block wall that had been installed (by others) as a rockfall hazard mitigation.

For the purpose of this report the area from the Main Substation east to the edge of the Pumphouse will be discussed separately (as the western area) from the remainder (the eastern area).

Western area – observations include:

- The cut slope typically comprised similar bedrock to that observed in other areas with a steep soil slope above and frequent heavy vegetation, including mature Arbutus trees;
- The bedrock was observed to be highly fractured with intersecting joint sets creating potential wedge failures;
- Typical dip/strike readings noted;

Set 1 – Strike 300-320°, dip 50-70° to South West

Set 2 – Strike 220-260°, dip 40-60° to South East

- In a number of locations the soil above the bedrock appeared to be sitting atop a sloping bedrock surface, sloping towards the south;
- WSP understands the rockfall occurrence in 2017 involved a block that contained a previously installed rock bolt;
- Localised zones of groundwater seepage were observed from the joints in the face on the lower slope;
- A number of large unstable blocks were observed around what appeared to be the previous (2017) failure zone;
- A number of rock bolts of unknown length were observed installed in the rock face.

Eastern area – observations include:

- The rock mass in this area appeared to be more massive and less frequently jointed than the rock observed immediately to the west. The joints observed were typically tightly closed with less groundwater noted;
- A number of rock bolts of unknown depth were evident throughout this area, a number of which had no face plate or bolt and were heavily corroded;
- A heavy gauge rock mesh was in place along a lot of the north face that terminated typically around 3 m above the height of the base of the rock cut;
- Localised vegetation was observed from the rock face;
- Evidence of previous rock fall was observed immediately north of the Pumphouse Garage with rock fragments up to 0.3 m in diameter noted;
- An existing concrete duct bank appeared to have been recently completed. It was not known if any rock bolts were installed during these works;
- Another area of rock mesh had been historically installed to the east of the Pumphouse Garage Building. The mesh had been installed in what appears to be square patches and only covered a localized area of the slope and terminated around 3 m above the base of the rock cut;
- At the south end of Pumphouse Garage there was a compressed gas storage cage immediately at the base of the rock slope. The rock slope at this location was less steep at around 50°-60°; and
- A number of utilities were observed running up the slope behind the Pumphouse Garage.

4.5.1 AREA 4 – 2019 OBSERVATIONS

The following observations were noted:

- Immediately east of the historical rockfall site a new cabin/trailer was observed;
- Around 10 m east of the cabin/trailer a new workbench was observed in close proximity to the cut rock face;
- No significant changes to the cut rock face were noted.

5 GEOTECHNICAL CONSIDERATIONS

5.1 GENERAL

It was evident that certain areas of the cut rock face give cause for concern with respect to rockfall hazard. Given the recent rockfall event (2017) and possibly others (immediately west of washroom) that have occured during static (or at least very low seismic) conditions, it is reasonable to assume that other rockfall events are possible in the near term, especially during a medium to large seismic event. Although no instrumentation was, or has been installed, triggers for rock displacement could also be associated with localized build up of pore water pressure and expansion due to ice buildup during the winter months.

WSP has undertaken a detailed visual review of the site conditions and our considerations provided below are based on our field observations. We have provided a visual summary plan (Figure 7) showing areas of our assessed low/medium/high risk areas to assist PWGSC in prioritising any future rockfall hazard mitigation works. These risk colour zones are provided as a general indicator only with the following criteria being used;

- Green (low risk) – no or low risk from rockfall due to size of cut slope, geometry, and WSP's interpretation of land-use below;
- Amber (medium risk) – increased potential for rockfall based on our visual review of the cut slope including rock mass structure, condition and geometry of rock, and WSP's interpretation of the land use below;
- Red (high risk) – further increased potential for rockfall based on our visual review of the cut slope including rock mass structure, condition and geometry of rock, and WSP's interpretation of the land use below (proximity of buildings to cut face, frequency of person access to area immediately below slope, etc.).

In addition we have provided a number of typical rock mesh installation details for preliminary design and costing use. A detailed design for any mesh installation will be required in due course.

WSP has had discussions with PWGSC in relation to the challenging access that exists at the site due to existing buildings, and our recommendations are provided with those considerations included. We have assumed that all works will require the use of hand tools due to access limitations. We have excluded the areas in Area 1 and Area 3 that are to be developed during site works in 2018. The following preliminary recommendations are provided for the intent of obtaining Class C pricing (copy of Advicas Class C Pricing Report is appended).

5.1.1 2019 PHASE 2 CONSIDERATIONS

Any additional or changed considerations based on our 2019 observations are provided at the end of each section below.

Note – we have now included some preliminary comment with respect to the proposed North Landing Wharf Substation Replacement and the Replacement Main Substation North Side as requested by PWGSC.

5.2 AREA 1

The following are recommended in relation to rockfall mitigation:

- Removal of loose boulders on existing slope on western end of site;
- Placement of 25 m length of single height concrete blocks (e.g. lock-block or similar) along rear of trash area;
- Installation of high strength galvanized steel rockfall mesh from immediately west of EGD Electrical Shop Washroom to end of Area 1.

  This work would include the following (includes 20% contingency on mesh and rope);

  a. 350 m^2 of Geobrugg 4 mm Tecco Mesh (or equivalent) including connector clips
  b. 80 m of 19 mm dia. galvanized steel wire rope (top and base rope)
  c. 40 m of 8 mm dia. galvanized steel wire rope (top thread rope)
  d. Installation of 19 mm galvanized wire rope anchors at approx. 3 m centres to a depth of 2 m embedment (2.5 m total length) = 11 anchors
  e. Contingency - Allow for 3 additional #10 galvanized bar rock anchors 3 m long.
  f. Installation of #8 galvanized bar along base rope to a depth of 1 m embedment (1.5 m total length) = allow 6 anchors/plates/nuts
  g. 17 galvanized 19 mm shackles

  For local overhang area:

  a. Additional 40 m 19 mm galvanized steel wire rope
  b. Installation of #10 galvanized bar at to a depth of 3 m embedment (3.5 m total length) = 4 anchors/plates/nuts
  c. 4 galvanized 19 mm shackles

Note – another option for consideration is to keep the existing mesh and use a larger aperture mesh over the top which would utilise the higher strength of a larger aperture mesh – e.g. Geobrugg Spider S4-230 - which would provide moderate cost savings on both the mesh price and install. The existing mesh would be used to contain smaller rock fragments and the higher strength mesh would contain larger blocks. WSP can discuss this further with PWGSC, if requested.

5.2.1 AREA 1 - 2019 CONSIDERATIONS

- The area immediately behind the existing EGD Electrical Shop was not included in our review above (Phase 1). Based on a cursory review of the proposed rockfall hazard mitigation proposed by others, WSP is of the opinion that the proposed approach seems in line with a typical industry approach. We are unable to comment on the

suitability of the approach as the final cut rock face would need to be reviewed and assessed. WSP recommends that we review the completed work during the detailed design phase and incorporate any necessary tie-in details at that time.

- No other changes are recommended for Area 1 and the original recommendations are still valid. The hazard zone plan (Figure 7) and the Hazard Zone Plan with Temporary Mitigation Strategy (Figure 7a) shows a reduction in hazard behind the EGD Electrical Shop.

5.3 AREA 2

The following are recommended in relation to rockfall mitigation:

- Installation of high strength galvanized steel rockfall mesh from end of Area 1 to immediately east of the EGD Sea Can Garage and Storage Area.

  This would include the following (includes 20% contingency on mesh and rope):

  a. 750 m^2 of Geobrugg 4 mm Tecco Mesh (or equivalent) including connector clips
  b. 140 m of 19 mm dia. galvanized steel wire rope (top and base rope)
  c. 70 m of 8 mm dia. galvanized steel wire rope (top thread rope)
  d. Installation of 19 mm galvanized wire rope anchors at approx. 3 m centres to a depth of 2 m embedment (2.5 m total length) = 20 anchors
  e. Contingency – allow for 6 additional #10 galvanized Bar rock anchors 3 m long.
  f. Installation of #8 galvanized bar along base rope to a depth of 1 m embedment (1.5 m total length) = allow 10 anchors/plates/nuts
  g. 17 galvanized 19 mm shackles

  For local overhang area:

  a. Additional 50 m 19 mm galvanized steel wire rope
  b. Installation of #10 galvanized bar at to a depth of 3 m embedment (3.5 m total length) = 4 anchors/plates/nuts
  c. 4 galvanized 19 mm shackles

Note – as above, another option for consideration is to keep the existing mesh and use a larger aperture mesh over the top which would utilise the higher strength of a larger aperture mesh – e.g. Geobrugg Spider S4-230 - which would provide moderate cost savings on both the mesh price and install. The existing mesh would be used to contain smaller rock fragments and the higher strength mesh would contain larger blocks. WSP can discuss this option further with PWGSC, if requested.

5.3.1 AREA 2 – 2019 CONSIDERATIONS

- No significant changes or observations were noted in Area 2;

- The gas storage area and associated pipes should be removed from below the rock face until the recommended rockfall mitigation measures are implemented.

- No other changes are recommended for Area 2 and the original recommendations are still valid. The areas on our risk map could be reduced via some temporary simple mitigation work – i.e. the installation of fencing to keep personnel out of the hazard area. The risk to personnel would be reduced, however the original risk would still exist with respect to buildings and infrastructure.

5.4 AREA 3

Due to the highly fractured nature of the rock in this area WSP is of the opinion that the risk to anchor/mesh installers from falling rock would be high and as such we propose an alternative solution in this area as described below.

- Installation of a 3-5m high reinforced concrete retaining wall with a total length of 45 m around the washroom building. This wall would be cast in place and backfilled with free draining angular gravel (e.g. 25 mm clear crush) with either a rear drain or 100 mm diameter weepholes on 3 m centres.
- For the existing Transformer building we would suggest that PWGSC review the risk to the existing rear wall of the building and, if necessary, look at reinforcing the existing wall via an internal buttress system or similar and/or backfilling the existing wall to mitigate against falling rock hazard.

Given the significant groundwater seepage observed in this area, WSP recommends that the existing storm drainage system above the rock cut be reviewed to see if any water is leaking to ground. If the water observed is groundwater flow through the bedrock it may be necessary to install some additional drainage to help alleviate water pressure.

5.4.1 AREA 3 – 2019 CONSIDERATIONS

- The rock stabilisation works directly behind (to the north) the new Replacement Main Substation (North Side) appears to have mitigated the rockfall hazard to acceptable levels. WSP notes that the mesh connections and cut finish along the base of the mesh are not to a standard that WSP would typically propose, however this is unlikely to be a significant issue at this location.

- The recent rockfall hazard mitigation works directly west and north of the PWGSC washroom have reduced the rockfall hazard. The barrier fencing has eliminated personnel entry and has therefore reduced the risk to life safety to low. For the rockfall hazard in relation to the building, the installed temporary concrete block system should significantly reduce but not altogether mitigate the rockfall risk. As a minimum, WSP recommends that the steel rope securing the blocks is pulled taught so the the effectiveness of the 'barrier' is increased by maximising the mass effect of the blocks. The installed block wall will likely reduce any proposed impact that could occur due to rockfall, however PWGSC should anticipate some potential damage to the building in the event of a large rockfall – e.g. following a large seismic event.

5.5 AREA 4

The following are recommended in relation to rockfall mitigation:

- Installation of high strength galvanized steel rockfall mesh for the entire length of the exposed rock face.

This would include the following (includes 20% contingency on mesh and rope) :

a. 1500 m^2 of Geobrugg 4 mm Tecco Mesh (or equivalent) including connector clips

b. 320 m of 19 mm dia. galvanized steel wire rope (top and base rope)

c. 160 m of 8 mm dia. galvanized steel wire rope (top thread rope)

d. Installation of 19 mm galvanized wire rope anchors at approx. 3 m centres to a depth of 2 m embedment (2.5 m total length) = 50 anchors

e. Contingency – allow for 15 additional #10 galvanized Bar rock anchors 3 m long.

f. Installation of #8 galvanized bar along base rope to a depth of 1m embedment (1.5 m total length) = allow 25 anchors/plates/nuts

g. 50 galvanized 19 mm shackles

Note – WSP can discuss local variations to the mesh design with PWGSC to mitigate against localized soil failures in the area of the 2017 rockfall, if requested.

For preliminary purposes we have assumed that the mesh can be extended locally up the slope to cover the exposed soil that was observed above the rock cut. Given the localised extent of these areas this should not significantly affect the Class C costing provided.

5.5.1 AREA 4 – 2019 CONSIDERATIONS

- The cabin/trailer should be removed from below the rock face;
- The work bench should be removed from below the rock face;
- The hazard rating to personnel could be reduced if fencing is installed to prevent personnel gaining access between the PWGSC Garage Extension Building and the cut rock face. However, the original risk to the structure still exists;
- The remainder of our original recommendations are still valid.

6 PHASED APPROACH

PWGSC has asked WSP to consider a phased approach to the rockfall hazard mitigation works. We have shown in the sections above that the risk to personnel could be significantly reduced by eliminating access to areas close to the rock face through the use of fencing. However, there will still be a risk to the buildings and infrastructure, most notably the gas tanks and lines in Area 2. Should PWGSC accept this then this may be considered an acceptable approach to deal with the higher risk sections identified first. We note that any damage to the gas tanks and lines could result in explosion and/or fire which would pose a high risk to personnel safety and surrounding infrastructure. The recommendations made in each section above are summarized in the table below, along with the current risk rating each area.

Table 1: Summary of recommendations for each area

Area	Recommendations	Current Risk Rating
1	Remove loose boulders on existing slope on western end of site	Low
	Place 25 m long single height row of concrete blocks (e.g. lock-block or similar) along rear of trash area;	Moderate (low after redevelopment and mitigation measures in place)
	Install a high strength galvanized steel rockfall mesh from immediately west of EGD Electrical Shop Washroom to end of Area 1.	High (low for personnel if access is restricted)
	Rockfall mitigation measures behind the existing EGD Electrical Shop have been proposed by others. WSP should review the proposed detailed design and incorporate any necessary tie-in details.	
2	Install a high strength galvanized steel rockfall mesh from end of Area 1 to immediately east of the EGD Sea Can Garage and Storage Area. Risk in some areas could be reduced with some simple measures e.g. temporary fencing to prevent access to hazard area (this would not reduce the risk to buildings/infrastructure), relocating gas storage area and associated pipes away from the rock face.	High (low for personnel if access is restricted)
3	Review existing storm drainage system above the rock cut for water leaking to ground. If the seepage from the face is groundwater then drainage measures should be considered	Moderate
	Pull tight the steel rope securing the lock blocks around the washroom.	Moderate
4	Install a high strength galvanized steel rockfall mesh for the entire length of the exposed rock face.	High (low behind Garage Extension Building if access is restricted)

	Remove cabin/trailer from below the rock face.	High
	Remove work bench from below the rock face.	High
	Install fencing to prevent access between the PWGSC Garage Extension Building and the cut rock face. (risk to structure would remain).	High

In terms of financial savings, WSP considers that a phased approach to the rockfall hazard mitigation works may incur some relatively small cost increases, primarily related to additional mobilization costs and annual inflation costs of materials. This will be confirmed via the Advicas report.

In terms of cost savings through geographical grouping of works, we are of the opinion that the cost savings of such an approach would be negligible.

7 FUTURE GEOTECHNICAL WORK

This report is presented to the Client for review and consideration. We anticipate the following geotechnical work moving forward through the project:

- Provision of detailed design drawings for use in tender package (prepared by WSP civil);
- Input into tender package and review of tender drawings (prepared by WSP civil); and
- Construction phase support such as field reviews and summary letter report.

We understand that the above would be undertaken as part of the next phase of works and WSP will provide a separate proposal defining our scope of works and estimated costs to carry out this work.

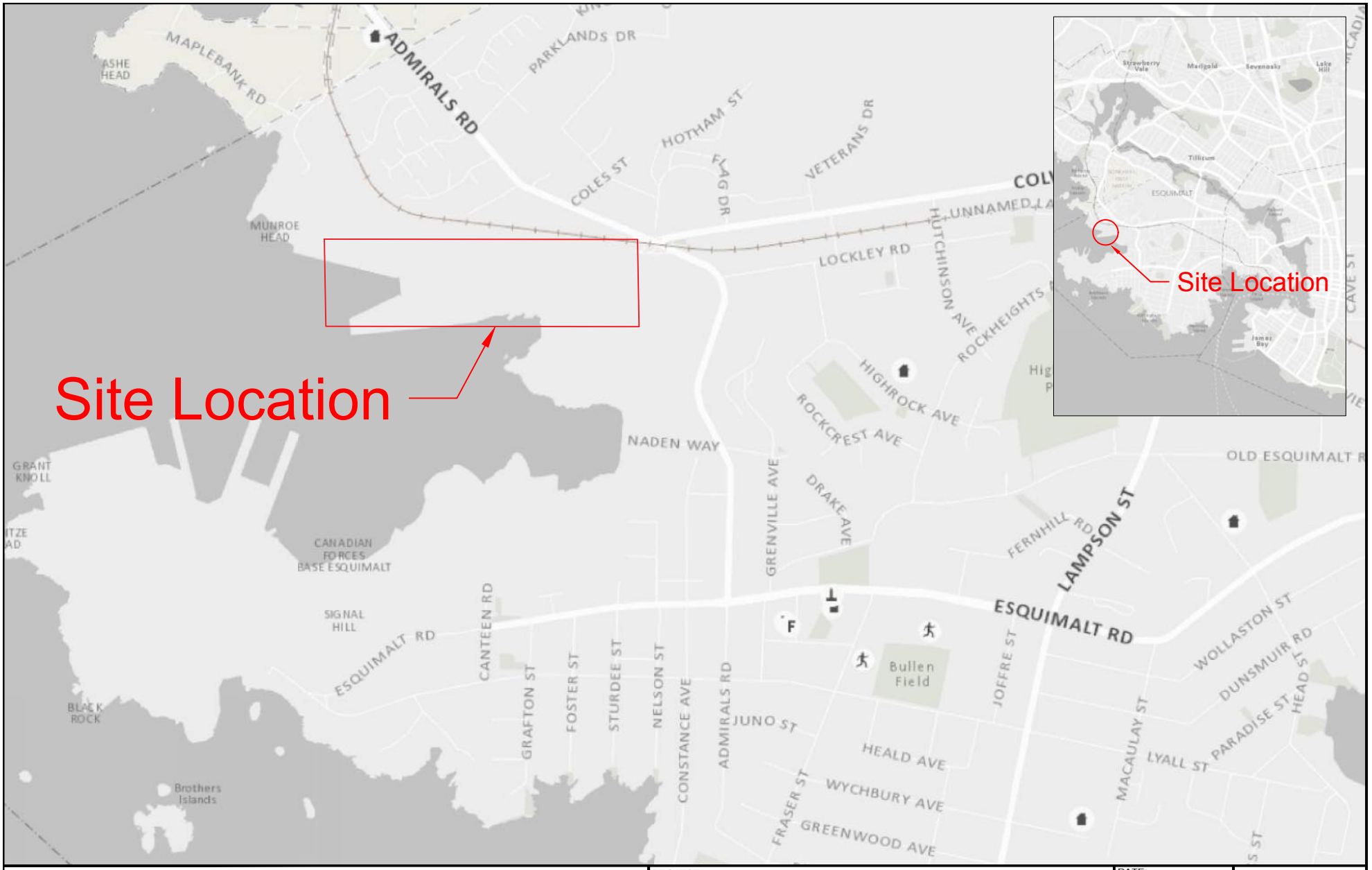
8 CLOSURE

This report has been prepared in accordance with our contract with PWGSC (Standing Offer Agreement EZ899-170242/002/TPV dated 2017-01-01 to 2019-12-31) and the attached WSP Terms of Reference for Geotechnical Reports. Where there is conflict between our contract and the Terms of Reference, the contract terms shall govern. We trust the information enclosed within this report meets your requirements, if you have any questions or require further information, please do not hesitate to contact the undersigned.

This document represents an electronic version of the original hard copy document, sealed, signed and dated by Russell Scott, P.Eng. and retained on file. The content of the electronically transmitted document can be confirmed by referring to the original hard copy on file.

APPENDIX

A FIGURES



Base drawing obtained from CRD Atlas

PROJECT:	Esquimalt Graving Dock - Slope Assessment North Side
CLIENT:	PWGSC
TITLE:	Site Location Plan

DATE:	JAN 2018
DESIGN BY:	RJP
DRAWN BY:	RJP
CHECKED BY:	RDS
SCALE:	NTS
PROJECT No.:	171-08146-00
FIGURE NO.:	1

WSP Canada Inc.
Victoria, BC V8Z 6R4
T: 250.475.1000 F: 250.475.2211
www.wsp.com

R.091150.001 Rock Slope Assessment North Side – Areas of Concern

Drawing provided by PWGSC

PROJECT: Esquimalt Graving Dock - Slope Assessment North Side

CLIENT: PWGSC

TITLE: Site Plan

DATE: JAN 2018

DESIGN BY: RJP

DRAWN BY: RJP

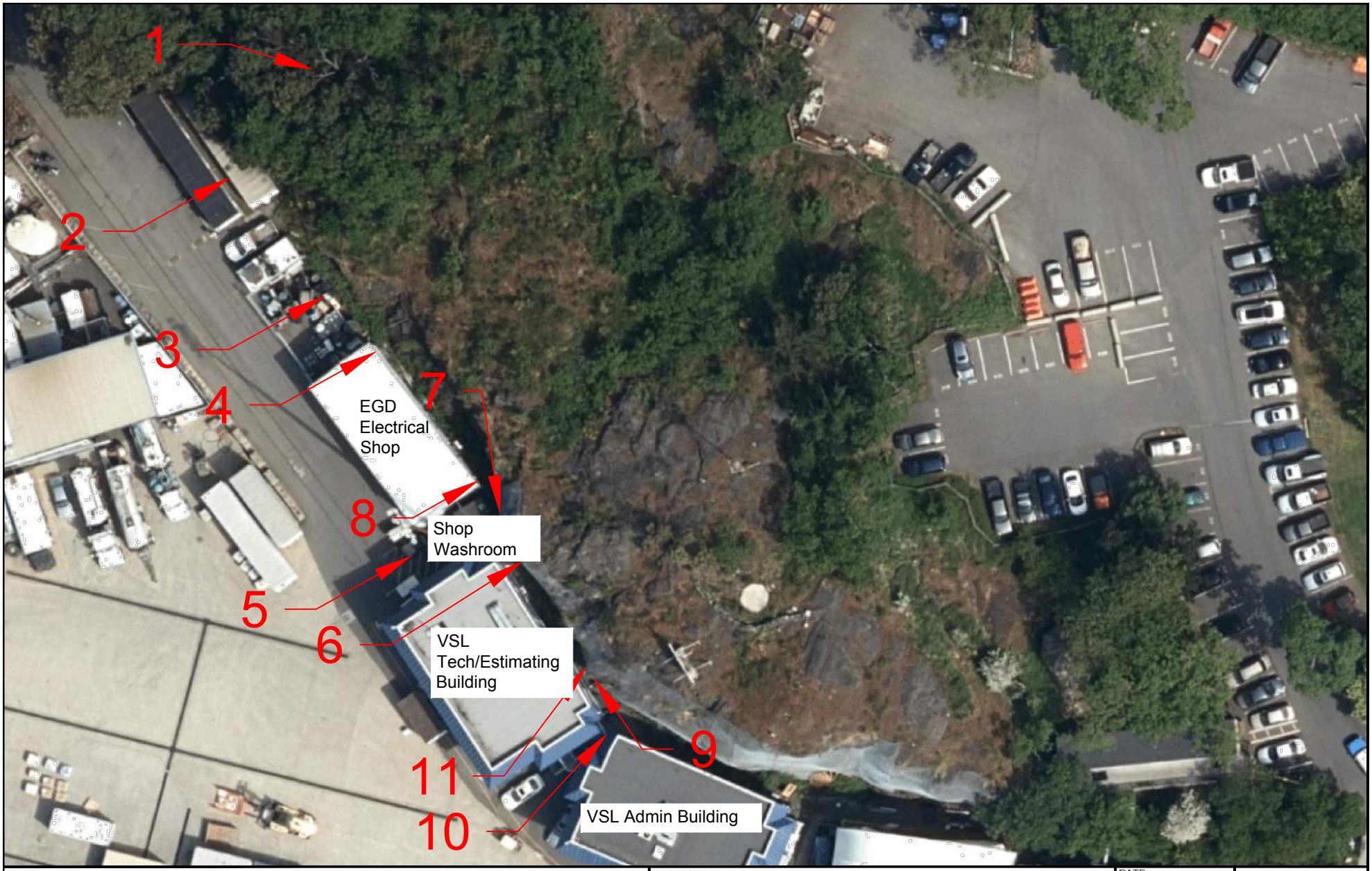
CHECKED BY: RDS

SCALE: NTS

PROJECT No.: 171-08146-02

FIGURE NO.: 2

WSP Canada Inc.
Victoria, BC V8Z 6R4
T: 250.475.1000 F: 250.475.2211
www.wsp.com



Base drawing from CRD Atlas retrieved on February 1, 2018 from https://maps.crd.bc.ca/Html5Viewer/?viewer=public

PROJECT: EGD Slope Assessment Northside

CLIENT: PWGSC

TITLE: Photo Locations for Area 1

DATE: FEB 2018

DESIGN BY: RDS

DRAWN BY: RJP

CHECKED BY: RDS

SCALE: NTS

PROJECT No.: 171-08146-02

FIGURE NO.: 3

WSP Canada Inc.
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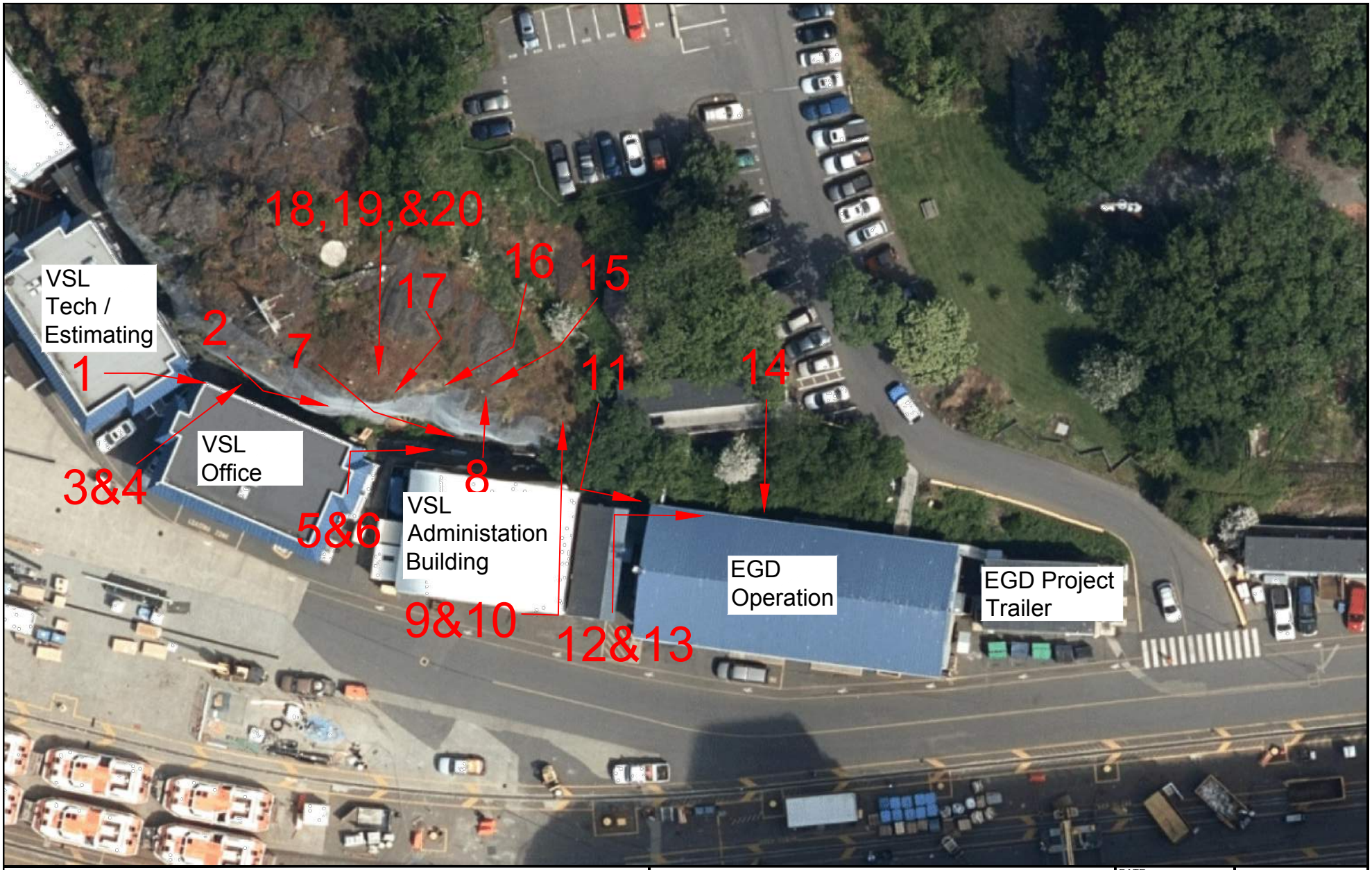

Base drawing from CRD Atlas retrieved on February 8, 2018 from https://maps.crd.bc.ca/Html5Viewer/?viewer=public

PROJECT:	EGD Slope Assessment Northside
CLIENT:	PWGSC
TITLE:	Photo Locations for Area 2

DATE:	FEB 2018
DESIGN BY:	RDS
DRAWN BY:	BPK
CHECKED BY:	RDS
SCALE:	NTS
PROJECT No.:	171-08146-02
FIGURE NO.:	4

WSP Canada Inc.
Victoria, BC V8Z 6R4
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Base drawing from CRD Atlas retrieved on February 6, 2018 from https://maps.crd.bc.ca/Html5Viewer/?viewer=public

PROJECT: EGD Slope Assessment Northside

CLIENT: PWGSC

TITLE: Photo Locations for Area 3

DATE: FEB 2018

DESIGN BY: RDS

DRAWN BY: RJP

CHECKED BY: RDS

SCALE: NTS

PROJECT No.: 171-08146-02

FIGURE NO.: 5

WSP Canada Inc.
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Base drawing from CRD Atlas retrieved on February 8, 2018 from https://maps.crd.bc.ca/Html5Viewer/?viewer=public

PROJECT: EGD Slope Assessment Northside

CLIENT: PWGSC

TITLE: Photo Locations for Area 4

DATE: FEB 2018

DESIGN BY: RDS

DRAWN BY: BPK

CHECKED BY: RDS

SCALE: NTS

PROJECT No.: 171-08146-02

FIGURE NO.: 6

WSP Canada Inc.
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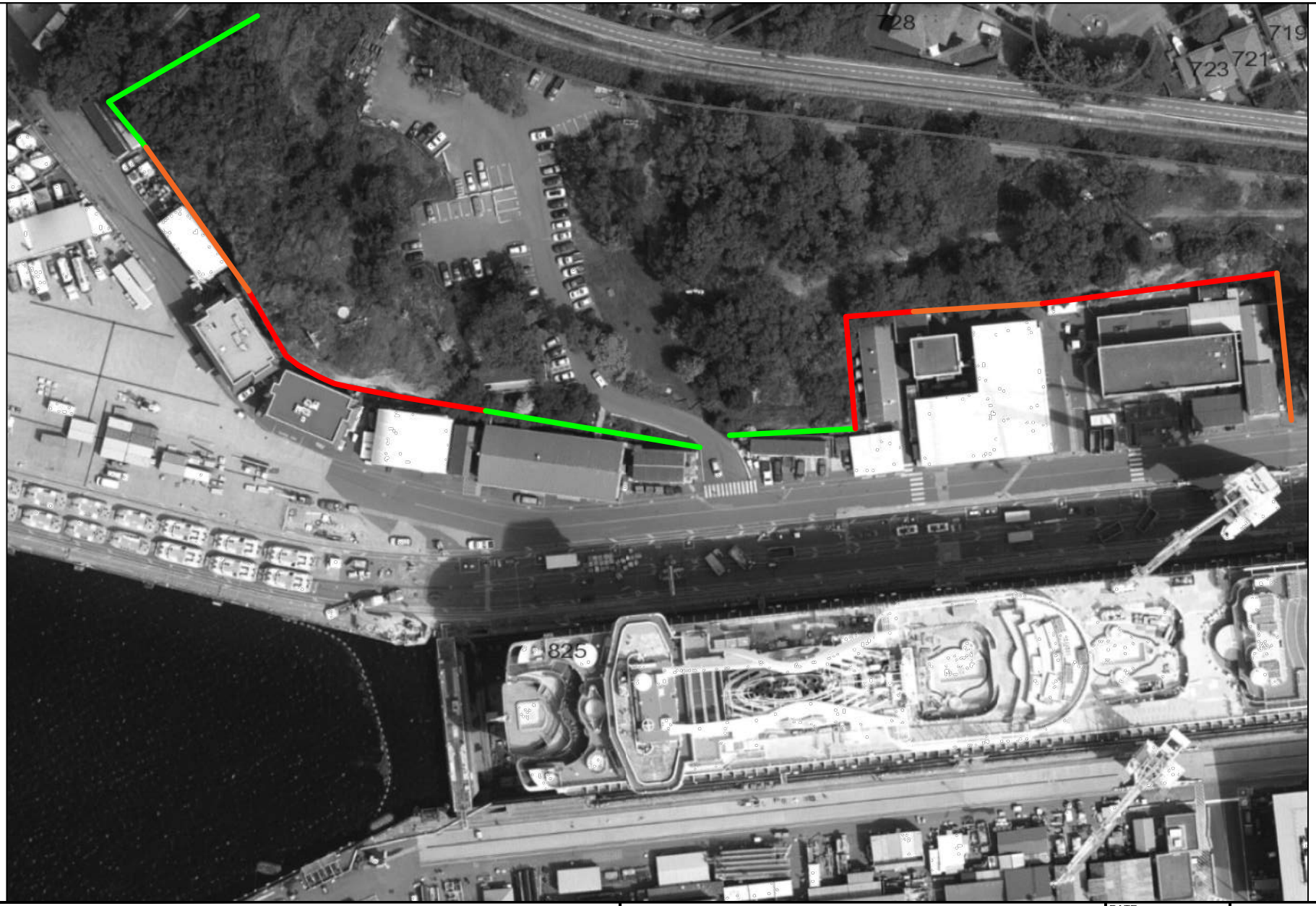

LEGEND

- HIGH RISK ZONE
- MODERATE RISK ZONE
- LOW RISK ZONE

Base drawing from CRD Atlas retrieved on February 14, 2018 from https://maps.crd.bc.ca/Html5Viewer/?viewer=public

PROJECT: Esquimalt Graving Dock - Slope Assessment North Side

CLIENT: PWGSC

TITLE: ROCK SLOPE HAZARD ZONES - UPDATED 2019

DATE: MAR 2019

DESIGN BY: RDS

DRAWN BY: BPK

CHECKED BY: RDS

SCALE: NTS

PROJECT No.: 171-08146-02

FIGURE NO.: 7

WSP Canada Inc.
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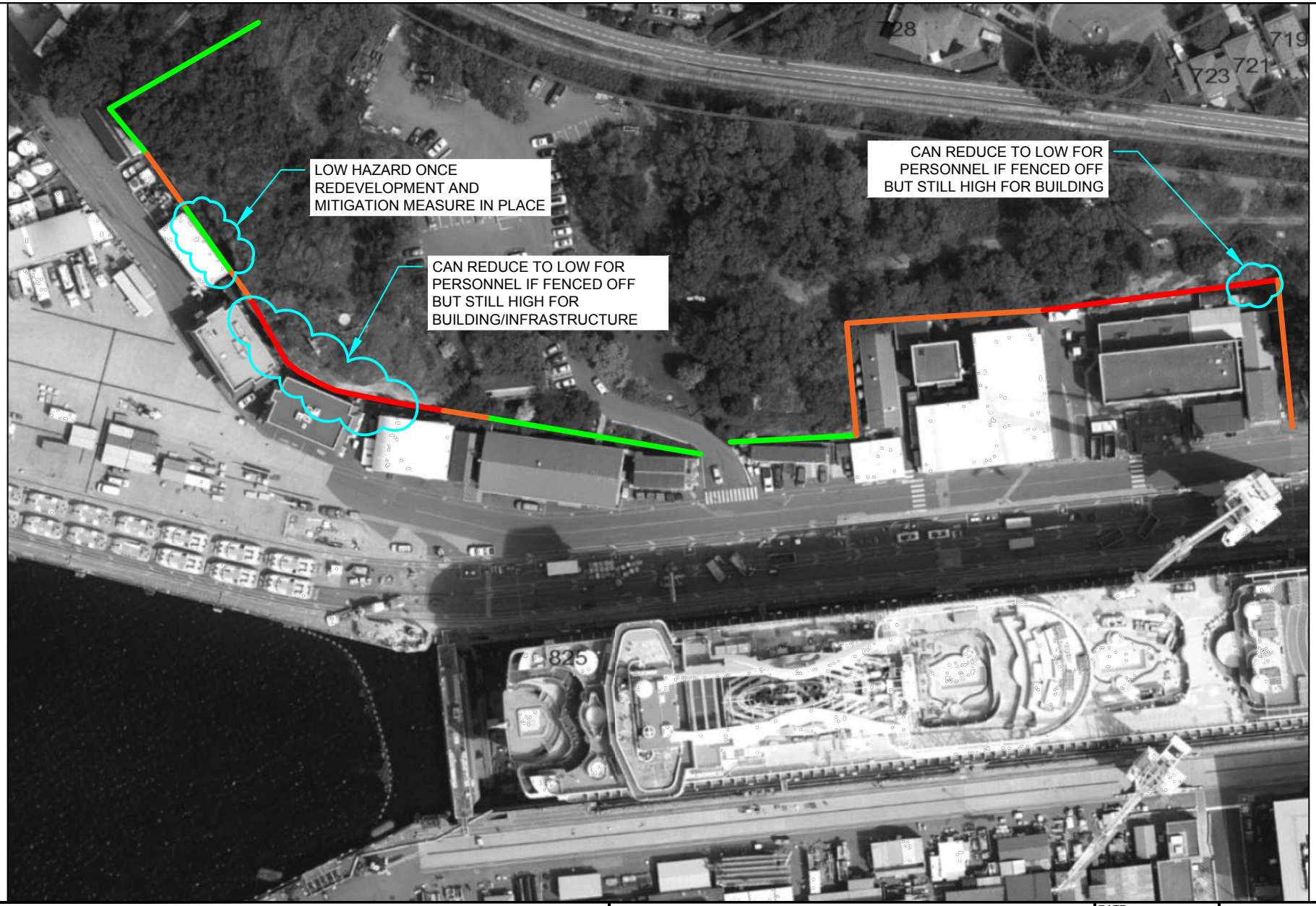

LEGEND

- HIGH RISK ZONE
- MODERATE RISK ZONE
- LOW RISK ZONE

Base drawing from CRD Atlas retrieved on February 14, 2018 from https://maps.crd.bc.ca/Html5Viewer/?viewer=public

PROJECT: Esquimalt Graving Dock - Slope Assessment North Side

CLIENT: PWGSC

TITLE: ROCK SLOPE HAZARD ZONES - UPDATED 2019
POTENTIAL REVISIONS IF TEMPORARY MITIGATION MEASURES ADOPTED

DATE: MAR 2019
DESIGN BY: RDS
DRAWN BY: BPK
CHECKED BY: RDS
SCALE: NTS
PROJECT No.: 171-08146-02
FIGURE NO.: 7a

WSP Canada Inc.
Victoria, BC V8Z 6R4
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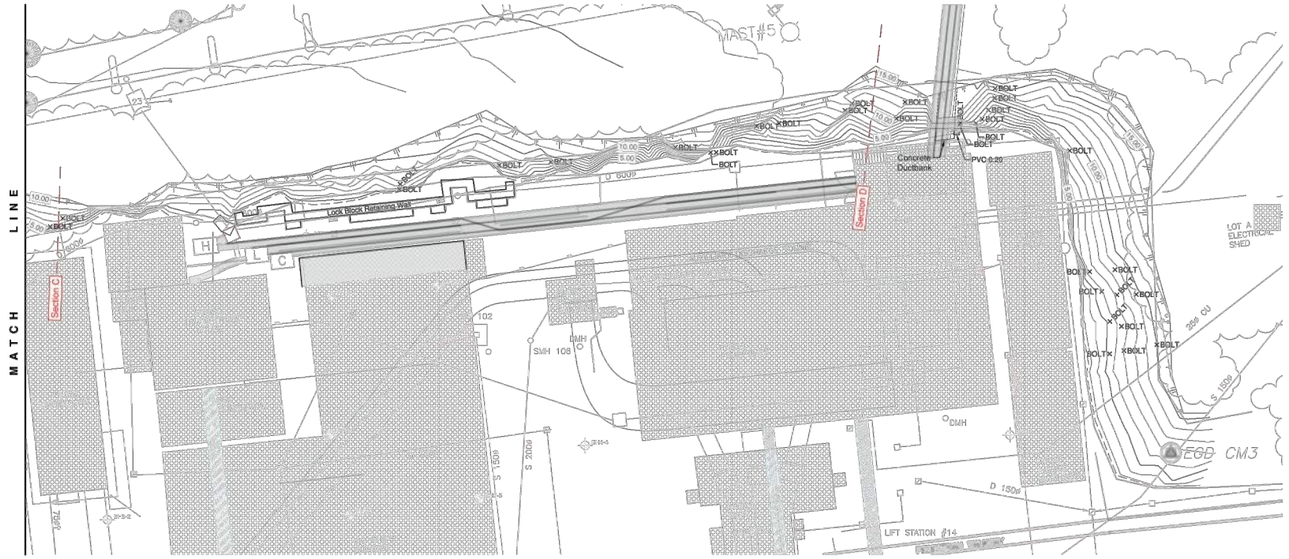

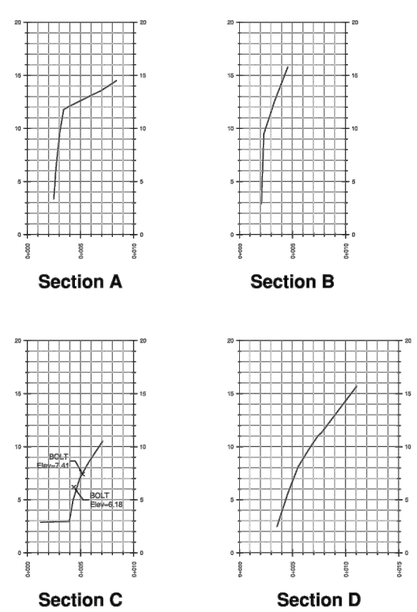

5 2.5 0 5 10 15

The intended plot size of this plan is 864mm in width by 560mm in height (D size) when plotted at a scale of 1:250

All distances are in metres and decimals thereof.

LEGEND

- denotes stubout
- denotes fence
- denotes top of bank
- denotes bottom of bank
- NMC denotes non-mountable curb
- denotes edge of pavement
- denotes edge of gravel
- denotes building outline
- denotes concrete pad
- x 5.21 denotes spot elevation

Date of Field Survey: November 6, 2017

Contour interval = 1.0 m.

Elevations are to geodetic datum.

Vertical Datum CGVD28 (HTV2.0).

Lot boundaries shown hereon are derived from ties to existing survey evidence and Land Title Office records. Lot boundaries are subject to change upon legal survey.

This plan represents the best information available at the time of survey. WSP Surveys (BC) Limited Partnership and its employees take no responsibility for the location of any underground conduits, pipes, or other facilities whether shown on or omitted from this plan. All underground installations should be located by the respective authorities prior to construction.

LEGEND:

REV. :	DESCRIPTION:	DATE : (M/D/YR)

PROJECT:
ESQUIMALT GRAVING DOCK - ROCK SLOPE ASSESSMENT
825 ADMIRALS RD, VICTORIA, BC

CLIENT:
PUBLIC WORKS GOVERNMENT SERVICES CANADA

TITLE:
TOPOGRAPHIC SURVEY

DATE: MAR 2018
DESIGN BY: RDS
DRAWN BY: BPK
CHECKED BY: RDS
SCALE: NTS
PROJECT No.: 171-08146-02
FIGURE NO.: 8

WSP Canada Ltd.
760 Enterprise Cres.,
Victoria, B.C. V8Z 6R4
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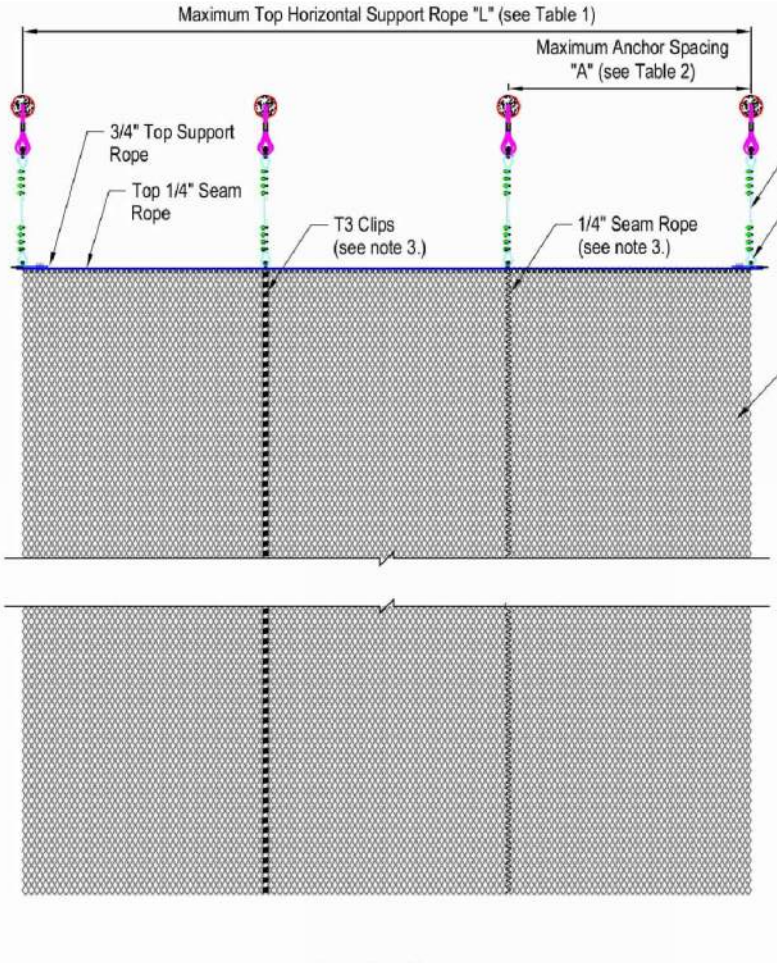

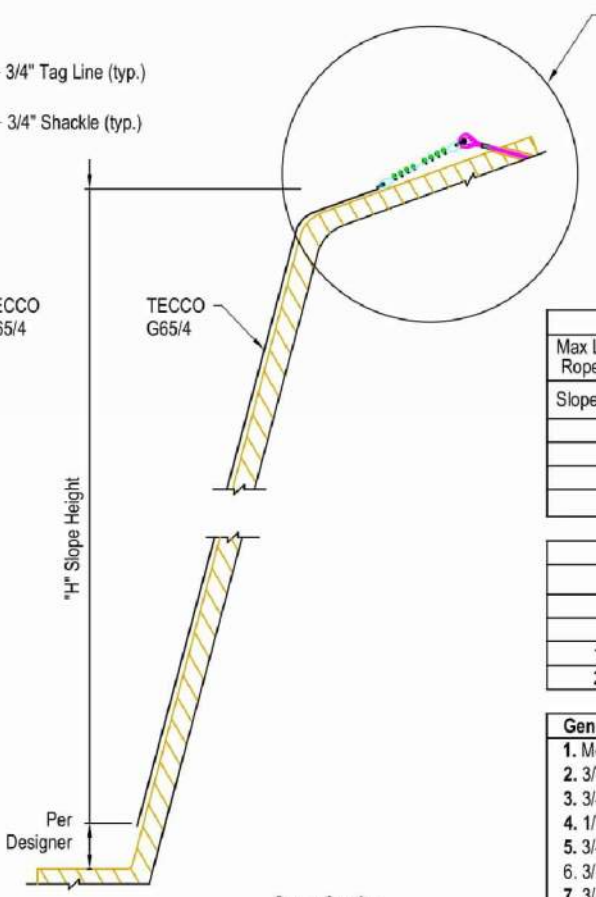

Table 1	
Max Length for Top Horizontal Support Rope Vs. Slope Height for Wire Mesh	
Slope Height H (ft)	Max Length L (ft)
50	150
100	75
200	40
300	25

Table 2	
Maximum Anchor Spacing	
H (ft)	A (ft)
0-100	50
100-200	35
200-300	20

General Components

1. Mesh -TECCO G65/4
2. 3/4" Top Support Rope
3. 3/4" Anchor Rope (Tag Line)
4. 1/4" Seam Rope
5. 3/4" Wire Rope Anchor
6. 3/4" Shackles
7. 3/4" Wire Rope Clips
8. 1/4" Wire Rope Clips
9. T3 Clips (2 per mesh)
10. 3/8" Shackle

Notes:

1. Maximum anchor spacing estimated as per Table 2 for a minimum allowable anchor capacity of 20,000 lbs. per WA-RD612.1 WireMesh (Muhunthan et al., 2005).
2. Maximum Top Support Rope length noted in Table 1. Attached to mesh with 1/4" seam rope.
3. Mesh panels to be vertically seamed with (2x) T3 Clips or 1/4" Seam Rope through each mesh opening.
4. When system has horizontal seams use 3/8" Shackles or 1/4" Seam Rope or loose TECCO spirals through each mesh opening to connnect mesh panels (per designer).

GEOBRUGG Safety is our nature

SYSTEM	TECCO Drape System	Drawn	11AUG17	JS	Drape-1003-US
DESCRIPTION	G65-4 mm Drape / Length: "L" ft / Height: "H" ft / Anchor Spacing: See "Table 1"	Checked	11AUG17		Sheet 1 of 2
		Revision	11AUG17	N/C	

LEGEND:

PROJECT: ESQUIMALT GRAVING DOCK - ROCK SLOPE ASSESSMENT
825 ADMIRALS RD, VICTORIA, BC

CLIENT: PUBLIC WORKS GOVERNMENT SERVICES CANADA

TITLE: TYPICAL ROCKFALL MESH INSTALLATION DRAWING - GEOBRUGG TECCO 4mm (EXAMPLE / EQUIVALENT)

DATE: MAR 2018
DESIGN BY: RDS
DRAWN BY: BPK
CHECKED BY: RDS
SCALE: NTS
PROJECT No.: 171-08146-02
FIGURE NO.: 9A

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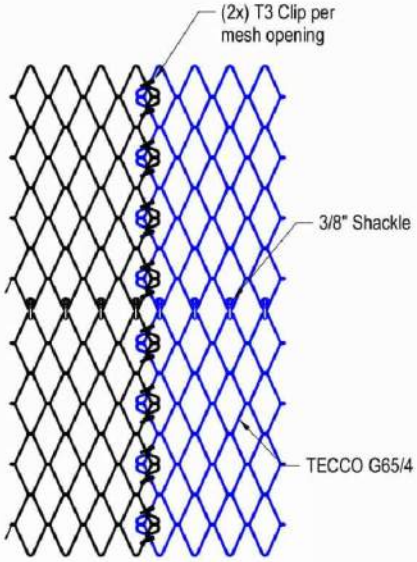
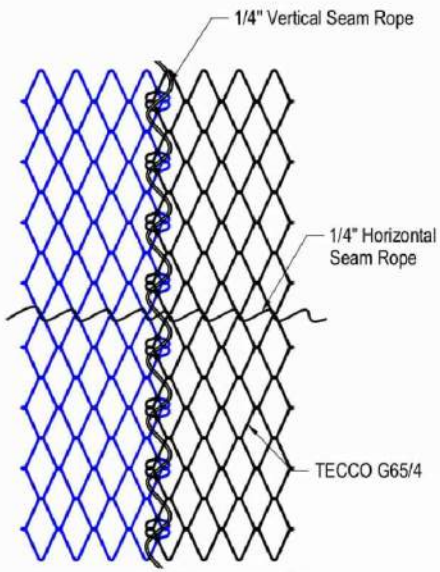
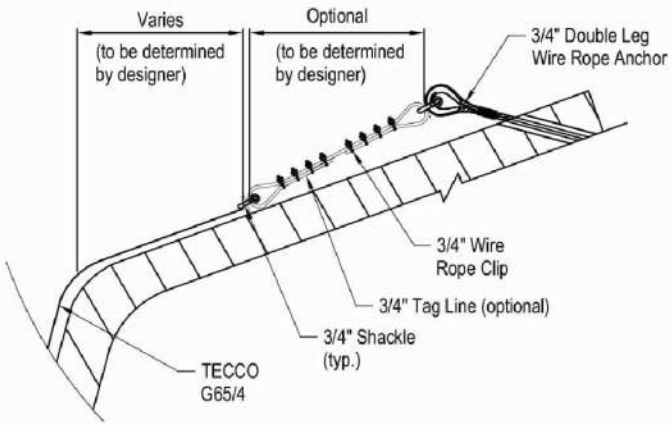


Vertical and Horizontal Seam Connection Detail with T3 clips and 3/8" Shackles

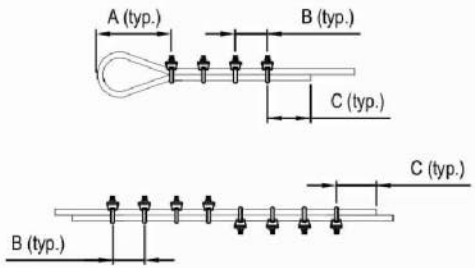


Vertical and Horizontal Seam Connection Detail with 1/4" seam rope

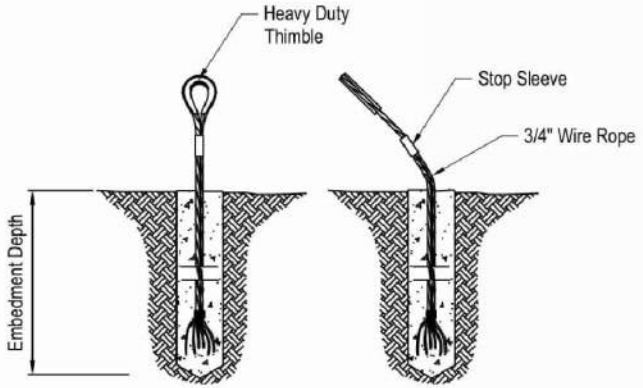


Detail A - Anchor/Mesh Attachment

Seam Connection Alternatives



Wire Rope Termination and Splicing Detail



Double Leg 3/4" Wire Rope Anchor

Note:
1. Distances A, B, C, and torque noted in the Wire Rope Termination and Splicing Detail to comply with manufacturers specifications.
2. Wire Rope Anchor embedment depth noted in the Double Leg 3/4" Wire Rope Anchor Detail is to be determined by designer.

GEOBRUGG Safety is our nature	SYSTEM	TECCO Drape System	Drawn 11AUG17 JS	Drape-1003-US
	DESCRIPTION	G65-4 mm Drape / Details	Checked 11AUG17	Sheet 2 of 2
			Revision 11AUG17 N/C	

LEGEND:

PROJECT: ESQUIMALT GRAVING DOCK - ROCK SLOPE ASSESSMENT
825 ADMIRALS RD, VICTORIA, BC

CLIENT: PUBLIC WORKS GOVERNMENT SERVICES CANADA

TITLE: TYPICAL ROCKFALL MESH INSTALLATION DRAWING - GEOBRUGG TECCO 4mm (EXAMPLE / EQUIVALENT)

DATE: MAR 2018
DESIGN BY: RDS
DRAWN BY: BPK
CHECKED BY: RDS
SCALE: NTS
PROJECT No.: 171-08146-02
FIGURE NO.: 9B

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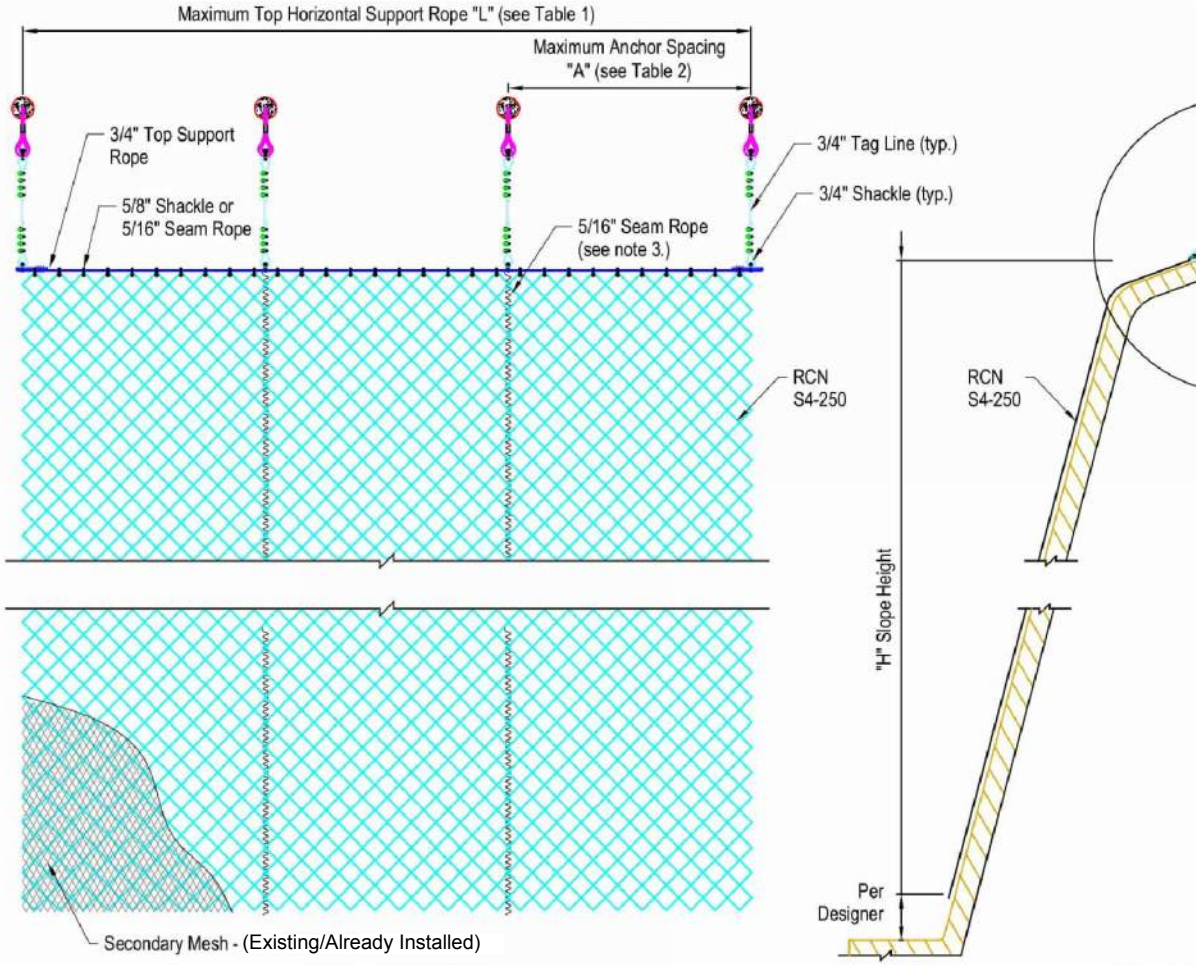

Table 1	
Max Length for Top Horizontal Support Rope Vs. Slope Height for Wire Mesh	
Slope Height H (ft)	Max Length L (ft)
50	150
100	75
200	40
300	25

Table 2	
Maximum Anchor Spacing	
H (ft)	A (ft)
0-100	50
100-200	35
200-300	20

General Components

1. Net - RCN S4-250
2. 3/4" Top Support Rope
3. 3/4" Anchor Rope (Tag Line)
4. 5/16" Seam Rope
5. 3/4" Wire Rope Anchor
6. 3/4" Shackles
7. 3/4" Wire Rope Clips
8. 5/16" Wire Rope Clips
9. 5/8" Shackle
10. Mesh backing - DELTAX G80/2

Notes:

1. Maximum anchor spacing estimated as per Table 2 for a minimum allowable anchor capacity of 20,000 lbs. per WA-RD612.1 Wire Mesh (Muhunthan et al., 2005).
2. Maximum Top Support Rope length noted in Table 1. Attached to mesh with 5/8" Shackle or 5/16" Seam Rope.
3. Net panels to be vertically seamed with 5/16" Seam Rope through each net opening.
4. When system has horizontal seams use 3/8" Shackles or 5/16" Seam Rope through each net opening to connnect mesh panels (per designer).
5. DELTAX G80/2 is recommended for secondary mesh backing of RCN Drape. The mesh backing is attached to RCN S4-250 panels with high tensile c-clips every 12" on center.

GEOBRUGG Safety is our nature

SYSTEM	ROLLED CABLE NET Drape System	Drawn	11AUG17	JS	Drape-1001-US
DESCRIPTION	S4-250 Drape / Length: "L" ft / Height: "H" ft / Anchor Spacing: See "Table 1"	Checked	11AUG17		Sheet 1 of 2
		Revision	11AUG17	IVC	

LEGEND:

PROJECT: ESQUIMALT GRAVING DOCK - ROCK SLOPE ASSESSMENT
825 ADMIRALS RD, VICTORIA, BC

CLIENT: PWGSC

TITLE: TYPICAL ROCKFALL MESH INSTALLATION DRAWING - GEOBRUGG SPIDER S4-230 (EXAMPLE / EQUIVALENT)

DATE: MAR 2018
DESIGN BY: RDS
DRAWN BY: BPK
CHECKED BY: RDS
SCALE: NTS
PROJECT No.: 171-08146-02
FIGURE NO.: 10A

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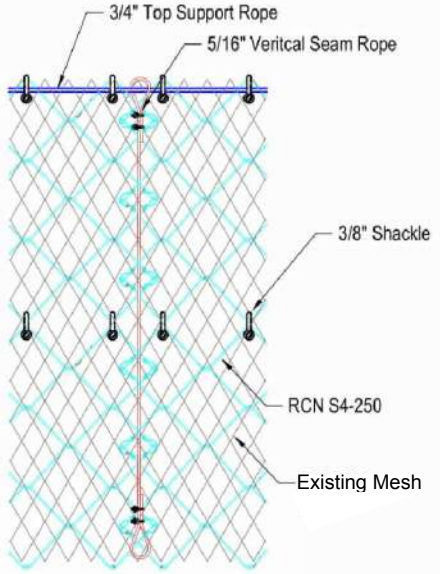
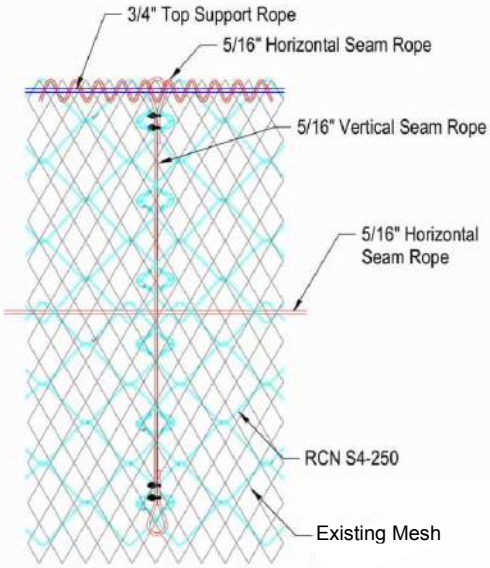
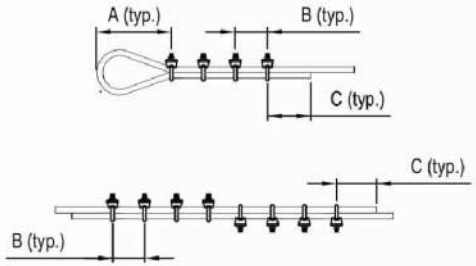


Vertical and Horizontal Seam Connection Detail with 5/16" Seam Rope and 3/8" Shackles

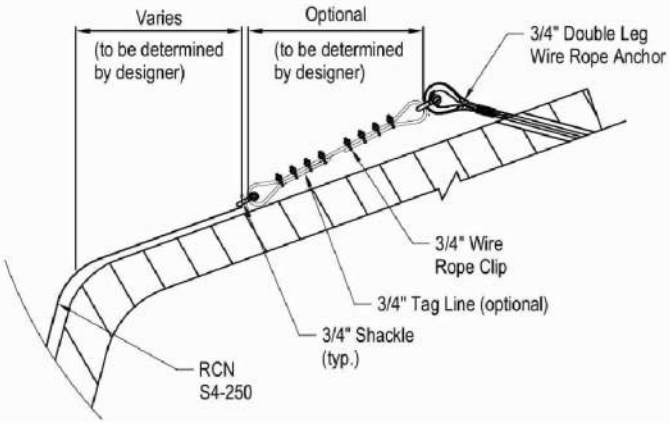


Vertical and Horizontal Seam Connection Detail with 5/16" Seam Rope

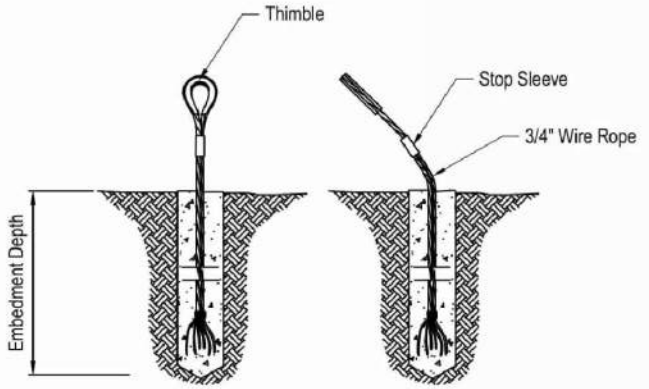
Seam Connection Alternatives



Wire Rope Termination and Splicing Detail



Detail A - Anchor/Mesh Attachment



Double Leg 3/4" Wire Rope Anchor

Note:
1. Distances A, B, C, and torque noted in the Wire Rope Termination and Splicing Detail to comply with manufacturers specifications.
2. Wire Rope Anchor embedment depth noted in the Double Leg 3/4" Wire Rope Anchor Detail is to be determined by designer.

GEOBRUGG Safety is our nature	SYSTEM	Rolled Cable Net Drape System	Drawn	11AUG17 JS	Drape-1001-US
	DESCRIPTION	S4-250 Drape / Details	Checked	11AUG17	
			Revision	11AUG17 N/C	Sheet 2 of 2

LEGEND:

PROJECT: ESQUIMALT GRAVING DOCK - ROCK SLOPE ASSESSMENT
825 ADMIRALS RD, VICTORIA, BC

CLIENT: PWGSC

TITLE: TYPICAL ROCKFALL MESH INSTALLATION DRAWING - GEOBRUGG SPIDER S4-230 (EXAMPLE / EQUIVALENT)

DATE: MAR 2018
DESIGN BY: RDS
DRAWN BY: BPK
CHECKED BY: RDS
SCALE: NTS
PROJECT No.: 171-08146-02
FIGURE NO.: 10B

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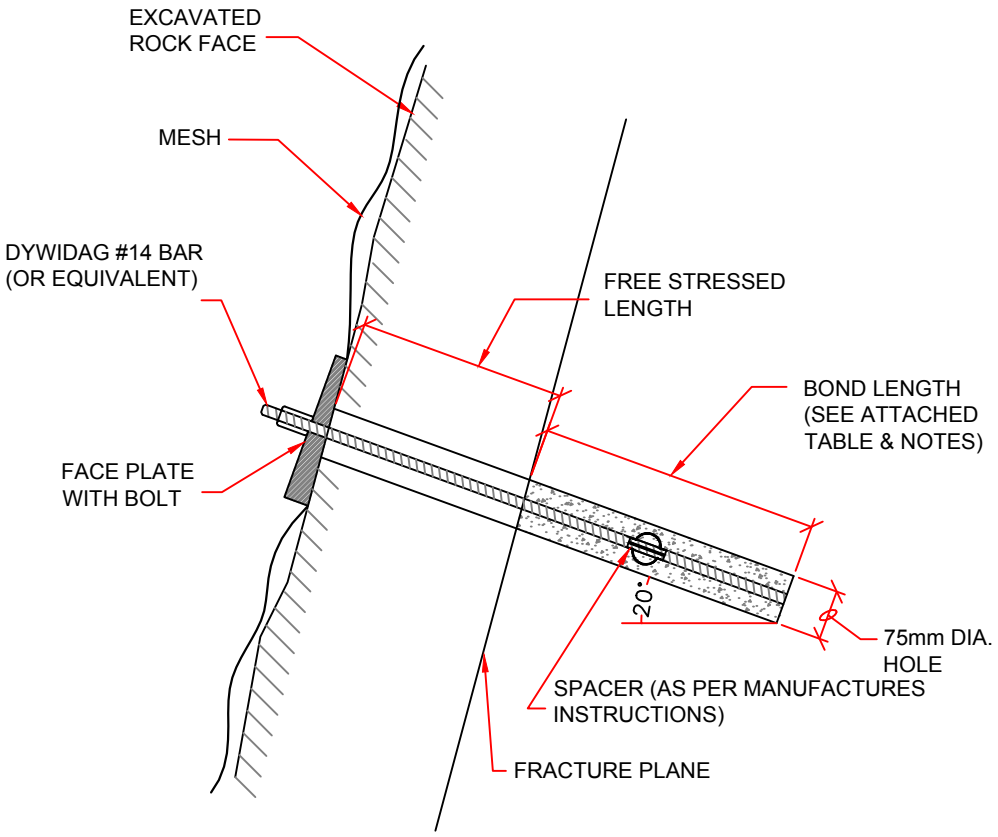
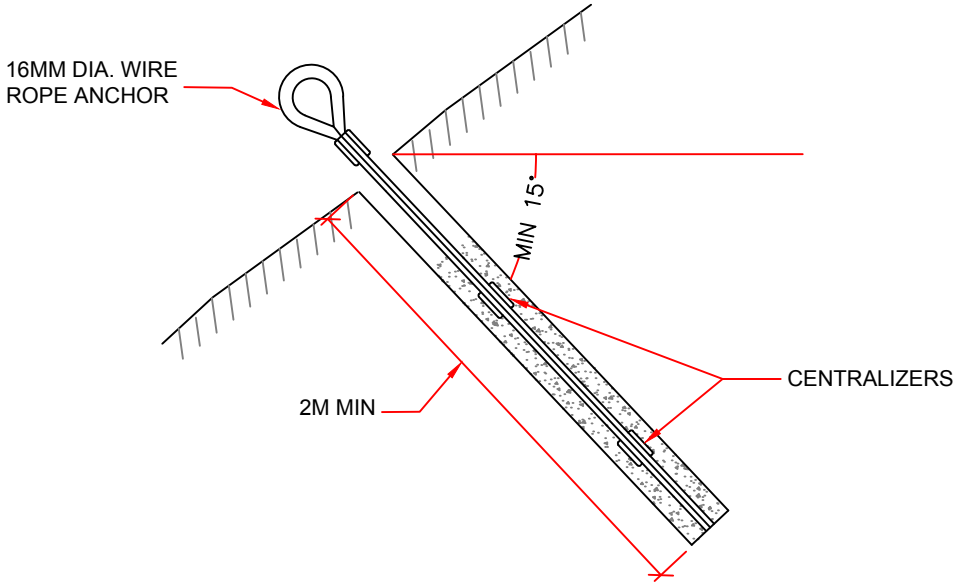


TYPICAL ROCK ANCHOR DETAIL



TYPICAL LATERAL WIRE ROPE ANCHOR DETAIL

LEGEND:

PROJECT:
ESQUIMALT GRAVING DOCK - ROCK SLOPE ASSESSMENT
825 ADMIRALS RD, VICTORIA, BC

CLIENT:
PUBLIC WORKS GOVERNMENT SERVICES CANADA

TITLE:
TYPICAL ROCK ANCHOR INSTALLATION DRAWING

DATE: MAR 2018
DESIGN BY: RDS
DRAWN BY: BPK
CHECKED BY: RDS
SCALE: NTS

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PROJECT No.: 171-08146-02

FIGURE NO.: 11

APPENDIX

D TERMS OF REFERENCE FOR GEOTECHNICAL REPORTS

TERMS OF REFERENCE FOR GEOTECHNICAL REPORTS ISSUED BY WSP CANADA INC.

1. STANDARD OF CARE

WSP Canada Inc. ("WSP") prepared and issued this geotechnical report (the "Report") for its client (the "Client") in accordance with generally-accepted engineering consulting practices for the geotechnical discipline. No other warranty, expressed or implied, is made. Unless specifically stated in the Report, the Report does not address environmental issues.

The terms of reference for geotechnical reports issued by WSP (the "Terms of Reference") contained in the present document provide additional information and caution related to standard of care and the use of the Report. The Client should read and familiarize itself with these Terms of Reference.

2. COMPLETENESS OF THE REPORT

All documents, records, drawings, correspondence, data, files and deliverables, whether hard copy, electronic or otherwise, generated as part of the services for the Client are inherent components of the Report and, collectively, form the instruments of professional services (the "Instruments of Professional Services"). The Report is of a summary nature and is not intended to stand alone without reference to the instructions given to WSP by the Client, the communications between WSP and the Client, and to any other reports, writings, proposals or documents prepared by WSP for the Client relative to the specific site described in the Report, all of which constitute the Report.

TO PROPERLY UNDERSTAND THE INFORMATION, OBSERVATIONS, FINDINGS, SUGGESTIONS, RECOMMENDATIONS AND OPINIONS CONTAINED IN THE REPORT, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WSP CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT AND ITS VARIOUS COMPONENTS.

3. BASIS OF THE REPORT

WSP prepared the Report for the Client for the specific site, development, building, design or building assessment objectives and purpose that the Client described to WSP. The applicability and reliability of any of the information, observations, findings, suggestions, recommendations and opinions contained in the Report are only valid to the extent that there was no material alteration to or variation from any of the said descriptions provided by the Client to WSP unless the Client specifically requested WSP to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information, observations, findings, suggestions, recommendations and opinions contained in the Report, or any component forming the Report, are for the sole use and benefit of the Client and the team of consultants selected by the Client for the specific project that the Report was provided. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION OR COMPONENT WITHOUT THE WRITTEN CONSENT OF WSP. WSP will consent to any reasonable request by the Client to approve the use of this Report by other parties designated by the Client as the "Approved Users". As a condition for the consent of WSP to approve the use of the Report by an Approved User, the Client must provide a copy of these Terms of Reference to that Approved User and the Client must obtain written confirmation from that Approved User that the Approved User will comply with these Terms of Reference, such written confirmation to be provided separately by each Approved User prior to beginning use of the Report. The Client will provide WSP with a copy of the written confirmation from an Approved User when it becomes available to the Client, and in any case, within two weeks of the Client receiving such written confirmation.

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TERMS OF REFERENCE FOR GEOTECHNICAL REPORTS ISSUED BY WSP CANADA INC. (continued)

5. INTERPRETATION OF THE REPORT

a. **Nature and Exactness of Descriptions**: The classification and identification of soils, rocks and geological units, as well as engineering assessments and estimates have been based on investigations performed in accordance with the standards set out in Paragraph 1 above. The classification and identification of these items are judgmental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations or assessments utilizing the standards of Paragraph 1 involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to changes over time and the parties making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or when the Client has special considerations or requirements, the Client must disclose them to WSP so that additional or special investigations may be undertaken, which would not otherwise be within the scope of investigations made by WSP or the purposes of the Report.

b. **Reliance on information**: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site investigation and field review and on the basis of information provided to WSP. WSP has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, WSP cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the report as a result of misstatements, omissions, misrepresentations or fraudulent acts of persons providing information.

c. **Additional Involvement by WSP**: To avoid misunderstandings, WSP should be retained to assist other professionals to explain relevant engineering findings and to review the geotechnical aspects of the plans, drawings and specifications of other professionals relative to the engineering issues pertaining to the geotechnical consulting services provided by WSP. To ensure compliance and consistency with the applicable building codes, legislation, regulations, guidelines and generally-accepted practices, WSP should also be retained to provide field review services during the performance of any related work. Where applicable, it is understood that such field review services must meet or exceed the minimum necessary requirements to ascertain that the work being carried out is in general conformity with the recommendations made by WSP. Any reduction from the level of services recommended by WSP will result in WSP providing qualified opinions regarding adequacy of the work.

6. ALTERNATE REPORT FORMAT

When WSP submits both electronic and hard copy versions of the Instruments of Professional Services, the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding upon WSP. The hard copy versions submitted by WSP shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancy, the hard copy versions shall govern over the electronic versions; furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed and sealed versions of the Instruments of Professional Services maintained or retained, or both, by WSP shall be deemed to be the overall originals for the Project.

The Client agrees that the electronic file and hard copy versions of Instruments of Professional Services shall not, under any circumstances, no matter who owns or uses them, be altered by any party except WSP. The Client warrants that the Instruments of Professional Services will be used only and exactly as submitted by WSP.

The Client recognizes and agrees that WSP prepared and submitted electronic files using specific software or hardware systems, or both. WSP makes no representation about the compatibility of these files with the current or future software and hardware systems of the Client, the Approved Users or any other party. The Client further agrees that WSP is under no obligation, unless otherwise expressly specified, to provide the Client, the Approved Users and any other party, or any or all of them, with specific software and hardware systems that are compatible with any electronic submitted by WSP. The Client further agrees that should the Client, an Approved User or a third party require WSP to provide specific software or hardware systems, or both, compatible with the electronic files prepared and submitted by WSP, for any reason whatsoever included but not restricted to an order from a court, then the Client will pay WSP for all reasonable costs related to the provision of the specific software or hardware systems, or both. The Client further agrees to indemnify and hold harmless WSP, its officers, directors, employees, agents, representative or sub-consultant, or any or all of them, against any claim or any nature whatsoever brought against WSP, whether in contract or in tort, arising or related to the provision or use or any specific software or hardware provided by WSP.

PHOTO TABLE

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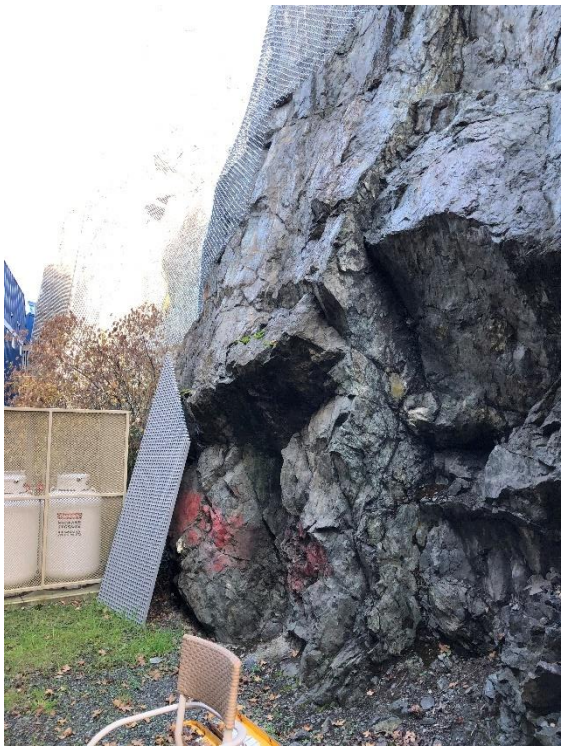	Photo 11: Insert description
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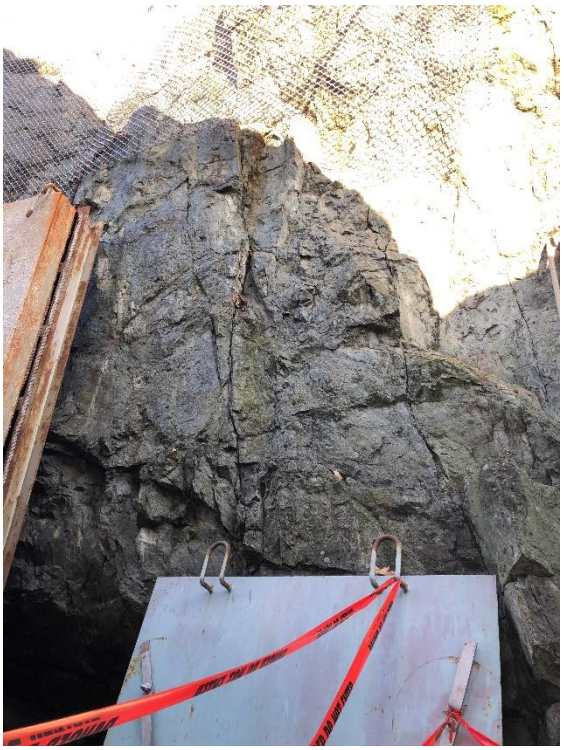	Photo 16: Insert description

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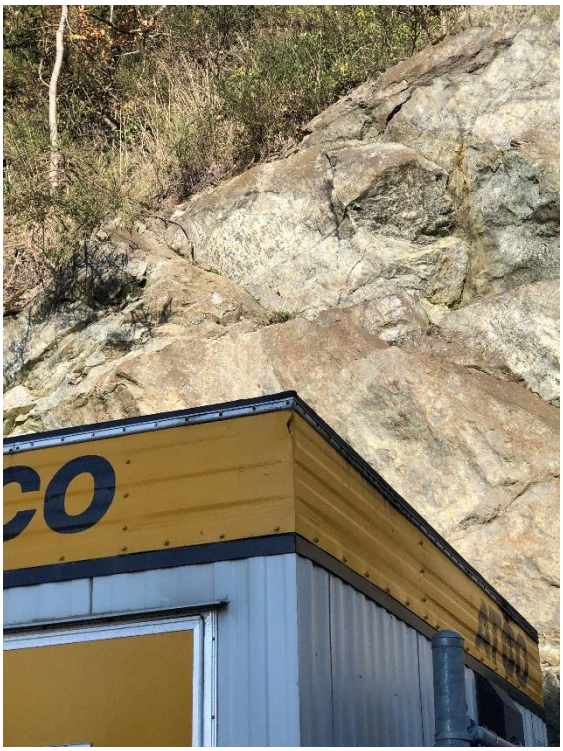	Photo 3: Insert description
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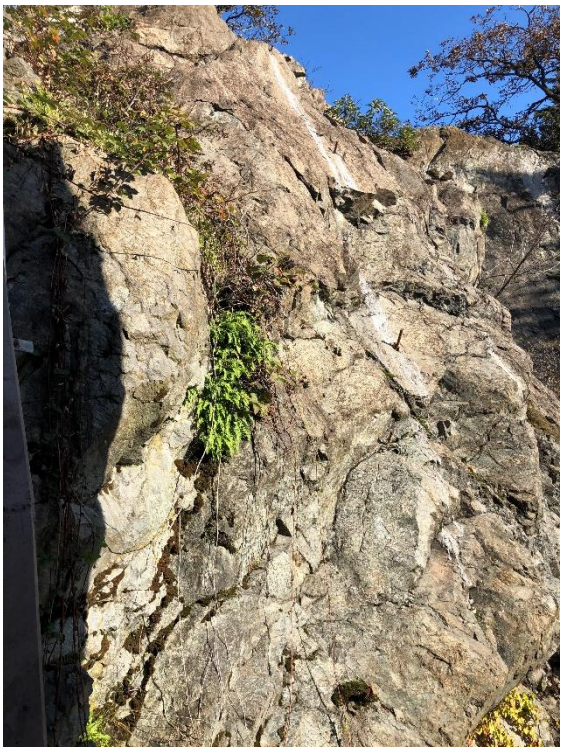	Photo 10: Insert description

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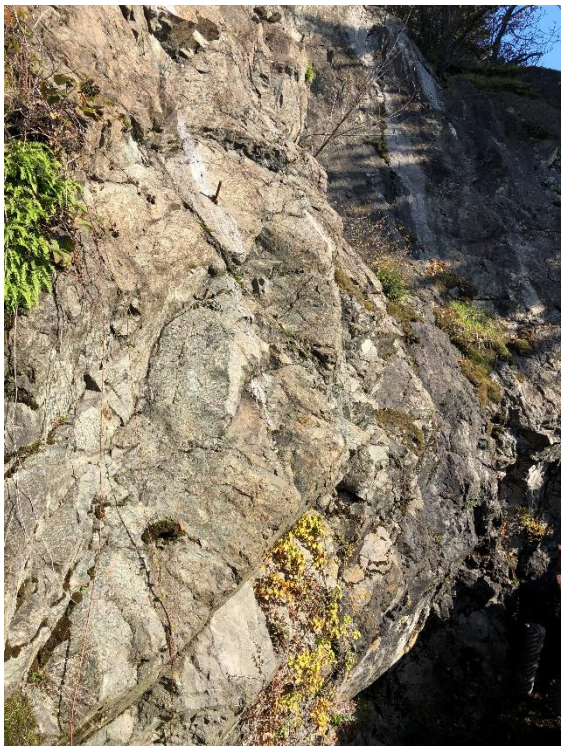
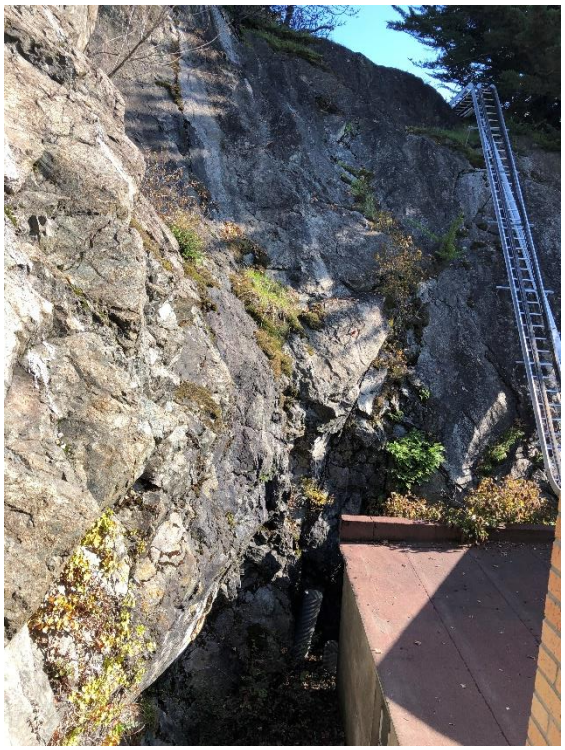
	Photo 11: Insert description
	Photo 12: Insert description

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