Public Works and Government Services Canada

Requisition No: EZ108-180444

DRAWINGS & SPECIFICATIONS
Issued For Tender

Replace Dock Sill Guard Rails
Project No.: R.090420.001

October 2017

APPROVED BY:

Regional Manager — Date: 2017 OCT 05

Construction Safety Coordinator — Date: 2017.10.04.

TENDER:

Project Manager — Date: 2017-10-03

Real Property Services Branch, Professional and Technical Services, Pacific Region
Room 219 - 800 Burrard Street, Vancouver, B.C., V6Z 0B9

SPECIFICATIONS **# of Pages**

END OF SECTION

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PROVINCE OF BRITISH COLUMBIA
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2017/10/02
FOR DIVISION 1 SPECIFICATIONS ONLY

PROFESSIONAL ENGINEER
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Oct 2/2017
for structural only

PART 1– GENERAL

1.1 CODES, BYLAWS, STANDARDS

.1 Perform work in accordance with the National Building Code of Canada (NBC) 2015 (as applicable), and other indicated Codes, Construction Standards, WorkSafeBC, Canadian Labour Code, and/or any other Code or Bylaw of local application.

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

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

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

1.2 DESCRIPTION OF WORK

.1 Work under this Contract covers the supply and installation of new guard rails and modifications to areas where deficiencies exist in the existing system; including the supply and installation of new steel stairs, removal and disposal of condemned ladders, installation of vertical ladders supplied by Canada, the supply and installation of vertical ladders, and the supply, installation, and certification of fall arrest anchors. The work is located along the north, east, and south sides of the dry-dock, located at the Esquimalt Graving Dock, 825 Admirals Road, Victoria, B.C.

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

.1 Modification of existing guard rails.

.2 Supply and installation of galvanized steel guard rails to replace existing damaged sections.

.3 Supply, installation, and certification of fall arrest anchors at the top of each vertical ladder on the long, north and south sides of the dry-dock. Anchor covers to be surface flush.

.4 Supply and installation of new handrails and chain guards.

.5 Removal and disposal of condemned ladders.

.6 Installation of vertical ladders supplied by Canada.

.7 Supply and installation of vertical ladders.

.8 Supply and installation of guardrails and handrails at main graving dock stairwell.

.3 "Green" requirements:

.1 Use materials/products containing highest percentage of recycled and recovered materials practicable - consistent with maintaining cost effective satisfactory levels of competition.

.2 Adhere to waste reduction requirement for reuse or recycling of waste materials, thus diverting materials from landfill.

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.

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 sixteen (16) 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.
.19 Other documents as specified.

1.12 REGULATORY REQUIREMENTS

.1 Furnish inspection certificates in evidence that the work installed conforms with the requirements of the authority having jurisdiction.

.2 Comply with conditions as stated in the Standard Acquisition Clauses and Conditions (SACC) Manual.

1.13 OWNER OCCUPANCY

.1 During the entire construction period, the owner will occupy adjacent areas for execution of normal operations.

.2 Co-operate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Owner usage of adjacent areas. In the event of a conflict the contractor will accommodate changes to their operations to minimize interference with owner operations.

1.14 CONTRACTOR'S USE OF SITE

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

.2 Contractors work site is indicated on the drawings.

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

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

.5 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 Comply with all Esquimalt Graving Dock security restrictions,

.6 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.

.7 Avoid obstructing 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.

.6 During flooding, dewatering, or vessel movements within the graving dock, the Contractor shall adjust work schedule accordingly so to not impact graving dock operations conducted by the Owner. Areas within the scope of work may be flooded during these operations. Refer to Appendix C Drydock Bookings Summary.

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

1.16 WORK BY OTHERS

.1 Co-operate with other Contractors on site in carrying out their respective works and carry out instructions from the Departmental Representative.

.2 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.

1.17 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.

1.18 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.

1.19 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.

1.20 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.

1.21 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.

1.22 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.

.3 Refer to Specification Sections 05 12 23 – Structural Steel, 05 50 00 – Metal Fabrications, and 05 51 29 – Metal Stairs and Ladders for testing and inspections requirements where fall arrest anchors are set in stone.

1.26 AS-BUILT DOCUMENTS

.1 The Departmental Representative will provide 2 sets of drawings, 2 sets of specifications, and 2 copies of the original AutoCAD files for "as-built" purposes.

.2 As work progresses, record changes in red ink. Maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.

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

.2 Do not dispose of waste into water courses, storm or sanitary sewers.

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

.4 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 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: name and number of project and date of exposure indicated.

.3 Progress and Final Photographs to be submitted on a compact disc (CD).

.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

PART 1– GENERAL

1.1 APPROVALS

.1 Approval of shop drawings and samples: refer to Section 01 11 55 – General Instructions.

1.2 GENERAL

.1 This Section specifies general requirements and procedures for the Contractor's submissions of shop drawings, product data, samples and other requested submittals to Departmental Representative for review. Additional specific requirements for submissions are specified in individual technical sections.

.2 The term “shop drawings” means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by contractor to illustrate details of a portion of work.

.3 Where specified in the Contract document, submit drawings stamped and signed by professional engineer registered or licensed in the Province of British Columbia of Canada.

.4 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.5 Present shop drawings, product data and samples in SI Metric units.

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

.7 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submissions.

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

.9 Contractor's responsibility for deviations in submission from requirements of Contract documents is not relieved by Departmental Representative's review of submission unless Departmental Representative gives written acceptance of specific deviations.

.10 Make any changes in submissions which Departmental Representative may require consistent with Contract documents and resubmit as directed by Departmental Representative. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.11 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with the Work.

.12 Do not proceed with work until relevant submissions are reviewed and approved by the Departmental Representative.

1.3 SUBMISSION REQUIREMENTS

.1 Coordinate each submission with the requirements of the work and the Contract documents. Individual submissions will not be reviewed until all related information is available.

.2 Allow (5) five days for Departmental Representative's review of each submission, unless noted otherwise.

.3 Accompany submissions with transmittal letter, in duplicate, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Identification and quantity of each shop drawing, product data and sample.

.5 Other pertinent data.

.4 Submissions shall include:

.1 Date and revision dates.

.2 Project title and number.

.3 Name and address of:

.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

.4 Contractor's stamp, signed by Contractor's authorized representative, certifying approval of submissions, verification of field measurements and compliance with Contract documents.

.5 Details of appropriate portions of work as applicable:

.1 Fabrication.

.2 Layout, showing dimensions (including identified field dimensions) and clearances.

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.5 After Departmental Representative's review, distribute copies.

1.4 SHOP DRAWINGS

.1 Shop drawings: original drawings or modified standard drawings provided by Contractor to illustrate details of portions of work which are specific to project requirements.

.2 Maximum sheet size: 850 x 1050 mm.

.3 Submit 1 digital file of shop drawings for each requirement requested in the specification sections and/or as requested by the Departmental Representative.

.4 Cross-reference shop drawing information to applicable portions of the Contract documents.

1.5 SHOP DRAWINGS REVIEW

.1 Review of shop drawings by the Departmental Representative is for the sole purpose of ascertaining conformance with the general concept.

.2 This review shall not mean that the Departmental Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with Contractor submitting same.

.3 This review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and Contract documents.

.4 Without restricting the generality of the foregoing, the Contractor is responsible for:

.1 Dimensions to be confirmed and correlated at the job site.

.2 Information that pertains solely to fabrication processes or to techniques of construction and installation.

.3 Coordination of the work of all sub-trades.

1.6 PRODUCT DATA

.1 Product data: manufacturers' catalogue sheets, MSDS sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products or any other specified information.

.2 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative

.1 Report signed by authorized official for testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accordance with specified requirements.

.2 Testing must have been within three (3) years of date of contract award for project.

.3 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer’s letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

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

.4 Submit electronic copies of manufacturer’s instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installations of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.5 Submit copies of manufacturer’s field reports for requirements requested in specification Sections and as requested by Departmental Representative.

.6 Documentation of the testing and verification action taken by manufacturer’s representative to confirm compliance with manufacturer’s standards or instructions.

.7 Submit electronic copies of Operation and Maintenance data for requirements requested in specification Sections and as requested by Departmental Representative.

.8 Delete information not applicable to project.

.9 Supplement standard information to provide details applicable to project.

.10 Cross-reference product data information to applicable portions of Contract documents.

.11 Submit 1 electronic copy of product data.

END OF SECTION 01 33 01

PWGSC Update on Asbestos Use

Effective April 1, 2016, all Public Works and Government Services Canada (PWGSC) contracts for new construction and major rehabilitation will prohibit the use of asbestos-containing materials. Further information can be found at https://www.tpsgc-pwgsc.gc.ca/comm/vedette-features/2016-04-19-00-eng.html

PART 1– GENERAL

1.1 REFERENCES

.1 Government of Canada.

.1 Canada Labour Code - Part II

.2 Canada Occupational Health and Safety Regulations.

.2 National Building Code of Canada (NBC):

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

.3 Canadian Standards Association (CSA) as amended:

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

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

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

.4 CSA Z1006-16 – Management of Work In Confined Space

.4 National Fire Code of Canada 2010 (as amended)

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

.5 American National Standards Institute (ANSI):

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

.6 Province of British Columbia:

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

.2 Occupational Health and Safety Regulation

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

.8 Appendix D – “Assessment of Lead in Paint Hand Railings and Dock Sill Guardrails”, SNC Lavalin Report dated July 10, 2017.

1.2 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.

1.3 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.

1.4 SUBMITTALS

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

.1 Work effected by submittal shall not proceed until review is complete.

.2 Submit the following:

.1 Site Specific Health and Safety Plan.

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

.3 Copies of incident and accident reports.

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

.5 Copy of Contractors' Construction Safety Manual

.3 Emergency Procedures.

.4 The Departmental Representative will review the Contractor's Site Specific Project Health and Safety Plan and Emergency Procedures, and provide comments to the Contractor within 5 (five) 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 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.

1.5 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, Territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.6 HEALTH AND SAFETY COORDINATOR

.1 The contractor shall appoint a 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 Health and Safety Plan.

.3 Be on site during execution of work.

1.7 GENERAL CONDITIONS

.1 Provide safety barricades and lights around Contractor's Work Site (as required) and the Contractor Off-Site Offload Facility (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 sites.

.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 work sites against entry.

1.8 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.

1.9 PROJECT/SITE CONDITIONS

.1 The Esquimalt Graving Dock is a dry dock and ship repair facility. It is an industrial site wherein industrial, manufacturing, fabrication, heavy construction, and like works are conducted by a variety of contractors and sub-trades for a variety of owners and sub-trades for a variety of owners and/or PWGSC.

.2 Work at site will involve a number of hazards known to PWGSC as noted in the Preliminary Hazard Assessment Form. This site may involve contact with hazardous and/or toxic materials and substances such as, but not limited to:

.1 Waste sandblast grit.

.2 Paint spray, including solvents and mineral spirits.

.3 Contaminated soils and debris

.4 Asbestos

.5 Lead paints and other paints containing toxic substances such as arsenic and carcinogens.

.3 Other safety hazards or risks which may be encountered include, but are not limited to:

.1 Contact with traveling and mobile cranes, forklifts, manlifts and other motorized vehicles.

.2 Overhead hazards such as that created by material transported by cranes.

.3 Fall hazards.

.4 Drowning hazards.

.5 Confined space hazards.

.6 Electrical hazards.

.7 Contact with operating mechanical, electrical, electronic, pneumatic, thermal, and hydraulic machinery and equipment.

.8 Fire hazards.

1.10 REGULATORY REQUIREMENTS

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

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

1.11 WORK PERMITS

.1 Obtain specialty permits related to project before start of work.

1.12 FILING OF NOTICE

.1 The Prime Contractor is to complete and submit a Notice of Project as required by Provincial authorities.

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

1.13 HEALTH AND SAFETY PLAN

.1 Conduct a site-specific hazard assessment for the Contractor's Work Site and the Contractors' Off-Site Offload Facility, (as required) based on a review of Contract documents, required work, and both project work sites. Identify any known and potential health risks and safety hazards.

.2 Develop, implement, and enforce a Site Specific Project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:

.1 Primary requirements:

.1 Contractor's safety policy.

.2 Identification of applicable compliance obligations.

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

.4 General safety rules for project.

.5 Job-specific safe work, procedures.

.6 Inspection policy and procedures.

.7 Incident reporting and investigation policy and procedures.

.8 Occupational Health and Safety Committee/Representative procedures.

.9 Occupational Health and Safety meetings.

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

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

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

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

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

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

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

.3 Develop the Site Specific project health and 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 Specific Project Health and Safety Plan as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review of the contractors' Site Specific Project Health and Safety Plan by Public Services and Procurement Canada (PWGSC) shall not relieve the

Contractor of responsibility for errors or omissions in final Site Specific Project Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

1.14 EMERGENCY PROCEDURES

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

.1 Designated personnel from own company.

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

.3 Local emergency resources.

.4 Departmental Representative and other PWGSC staff as required.

.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 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 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.

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

1.15 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the 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 MSDS and WHMIS documents as per Section 01 33 00 – Submittal Procedures.

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

1.16 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 – WorkSafeBC 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.

1.17 PERSONNEL HEALTH, SAFETY, AND HYGIENE

.1 Training: ensure personnel entering Site are trained in accordance with specified personnel training requirements. Training session must be completed by Health and Safety Officer.

.2 Levels of Protection: establish levels of protection for each Work area based on planned activity and location of activity.

.3 Personal Protective Equipment:

.1 Furnish site personnel with appropriate PPE as specified above. Ensure that safety equipment and protective clothing is kept clean and maintained.

.2 Develop protective equipment usage procedures and ensure that procedures are strictly followed by site personnel; include following procedures as minimum:

.3 Ensure prescription eyeglasses worn are safety glasses and do not permit contact lenses on site within work zones.

.4 Ensure footwear is steel-toed safety shoes or boots and is covered by rubber overshoes when entering or working in potentially contaminated work areas.

.5 Dispose of or decontaminate PPE worn on site at end of each workday.

.6 Decontaminate reusable PPE before reissuing.

.7 Ensure site personnel have passed respirator fit test prior to entering potentially contaminated work areas.

.8 Ensure facial hair does not interfere with proper respirator fit.

.4 Heat Stress/Cold Stress:

.1 Implement heat stress or cold stress monitoring program as applicable and include in site-specific Health and Safety Plan.

.5 Personnel Hygiene and Personnel Decontamination Procedures. Provide minimum as follows:

.1 Suitable containers for storage and disposal of used disposable PPE.

.2 Potable water and suitable sanitation facility.

.6 Emergency and First-Aid Equipment:

.1 Locate and maintain emergency and first-aid equipment in appropriate location on site including first-aid kit to accommodate number of site personnel; portable emergency eye wash; 9 kg ABC type dry chemical fire extinguishers as required.

1.18 ASBESTOS HAZARD

.1 Modifications to spray- or trowel-applied asbestos surfaces can be hazardous to health.

.2 Removal and handling of asbestos will be performed as per WorkSafeBC Regulations Part 6 Substance Specific Requirements Asbestos and all applicable regulations.

.3 Effective April 1, 2016, all Public Works and Government Services Canada (PWGSC) contracts for new construction and major rehabilitation prohibits the use of asbestos-containing materials.

1.19 REMOVAL OF LEAD-CONTAINING PAINTS

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

.1 Some existing guard rails and handrails identified for replacement contain lead based paints (LBP). Refer to Appendix D “Assessment of Lead in Paint”, SNC Lavalin Report dated July 10, 2017.

.2 Complete removal, disposal, and handling of existing guard rails and handrails containing LBP in accordance with WorkSafeBC Regulations Part 6 Substance Specific Requirements for Lead and all applicable regulations.

.3 Contractor to provide all disposal certificates, receipts, and other applicable documentation for removal and disposal of existing guardrails and handrails containing LBP in accordance with requirements.

1.20 ELECTRICAL SAFETY REQUIREMENTS

.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 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.

1.21 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.

1.22 OVERLOADING

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

1.23 SCAFFOLDING

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

1.24 RESTRICTED ACCESS

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

1.25 POWDER-ACTUATED DEVICES

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

1.26 FIRE SAFETY AND HOT WORK

.1 Coordinate all hot work with PWGSC Departmental Representative through the contractors' hot work permit system.

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

.3 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.

1.27 FIRE SAFETY REQUIREMENTS

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

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

1.28 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.

1.29 UNFORESEEN HAZARDS

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

1.30 POSTED DOCUMENTS

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

.1 Site Specific Health and Safety Plan.

.2 Sequence of work.

.3 Emergency procedures.

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

.5 Notice of Project.

.6 Floor plans or site plans.

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

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

.9 Material Safety Data Sheets (MSDS).

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

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

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

1.31 MEETINGS

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

.2 All personnel employed by the contractor and its subcontractors shall attend the mandatory EGD Safety Orientation presentation prior to performing Work at the EGD Work Site.

1.32 CORRECTION OF NON-COMPLIANCE

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

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

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

END OF SECTION 01 35 33

PART 1– GENERAL

1.1 REFERENCES

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

.2 Appendix D – Assessment of Lead in Paint – Hand Railings and Dock Sill Guardrails.

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

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

.7 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.

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

.9 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.

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

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 Contractor to provide all disposal certificates, receipts, and other applicable documentation for removal and disposal of existing guardrails and handrails containing 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 Collect handle, store on-site, and transport off-site, salvaged materials in separated condition.

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

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

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

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

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

.11 Conduct daily cleaning operations as work progresses.

.12 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.

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 Place of Work, allow access to such Work whenever it is in progress.

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

.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.

.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.

.3 A 3rd party welding and inspection Company paid by the Contractor shall provide six field inspection reviews, including non-destructive weld tests and provide to the Departmental Representative a detailed report of each site review. Each report shall include a summary of their findings, conclusions and any recommendations required of all field welding inspected.

.4 Refer to Specification Sections 05 12 23 – Structural Steel, 05 50 00 – Metal Fabrications, and 05 51 29 – Metal Stairs and Ladders for additional Quality Control reporting requirements.

1.7 TESTS

.1 Provide all test results and test report to the Departmental Representative.

END OF SECTION 01 45 00

PART 1– GENERAL

1.1 ACCESS AND DELIVERY

.1 Only the designated entrance may be used for access to the site. The designated entry and exit will be via the Esquimalt Graving Dock Main gate on Admirals Road, along the North Main Entrance Roadway, and along the north side of the dry dock. Access to the south side of the dock will be via the South Jetty Road and along the South side of the dock.

.2 Vehicular movement in and out of the Esquimalt Graving Dock will pass through check points and be monitored by Commissionaires. All Contractor's and Subcontractor's staff must carry current photo identification and an EGD Contractor's Pass.

.3 Contractor is required to use only the designated entrance to access the work site, for deliveries to site, and as the exit for offsite disposal.

.1 Maintain for duration of contract.

.2 Make good damage resulting from Contractor's use.

.4 Use of the Esquimalt Graving Dock facility will be granted to the Contractor through the Departmental Representative.

.1 The contractor's work site is to be used for loading and unloading purposes.

.2 Parking for Contractor's staff is NOT permitted. Comply with parking restrictions at site. Unauthorized vehicles will be towed at the Contractor's expense.

.3 Rail mounted cranes have Right of Way at all times. Do not block or impede crane travel in any manner, without the expressed written permission of the Departmental Representative.

.5 Provide and maintain access roads, sidewalk crossing ramps and construction runways as may be required for access to the work. All roadways and walkways outside of the Contractor's work site must be kept clear of materials and equipment at all times.

.6 Provide and maintain competent flag operators, traffic signals, barricades and flares, lights or lanterns as may be required to perform work and protect other users of the Esquimalt Graving Dock.

1.2 STORAGE FACILITIES

.1 Storage space will be limited to the contractor's laydown area as identified on the drawings.

1.3 POWER

.1 Electrical power may be obtained at site for use during duration of the work free of charge.

.1 Contractor shall provide 48 hours written notice to the Departmental Representative requesting use of electrical power at site.

1.4 AIR

.1 Compressed air may be obtained at site for use during duration of the work free of charge.

.1 Contractor shall provide 48 hours written notice to the Departmental Representative requesting use of compressed air at site.

1.5 WATER SUPPLY

.1 Water supply may be obtained at site for use during duration of the work free of charge.

.1 Contractor shall provide 48 hours written notice to the Departmental Representative requesting use of water at site.

1.6 CRANE SERVICES

.1 Crane services may be obtained at site for use during duration of the work free of charge.

.2 Contractor shall provide 48 hours written notice to the Department Representative requesting use of crane services at site.

.3 Contractor is responsible to provide qualified rigger(s) and spotter(s), all required rigging and associated equipment required below the hook necessary to perform lifts.

1.7 REMOVAL OF TEMPORARY FACILITIES

.1 Remove temporary facilities from site when directed by the Departmental Representative.

1.8 SIGNS AND NOTICES

.1 Signs and notices for safety and instruction shall be in both official languages or graphic symbols conforming to CAN/CSA-Z321.

.2 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or when directed by Departmental Representative.

END OF SECTION 01 51 00

PART 1– GENERAL

1.1 REFERENCE

.1 Canadian Standards Association (CSA International)

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary barriers, guards and enclosures in order to execute work.

.1 Where removal of existing guard rails is required for execution of the work, temporary guard rails must be installed. At no time shall any guard rail be removed and left open without temporary guard rails installed.

.2 Rail mounted cranes have Right of Way at all times. Temporary barriers, guards and enclosures must not block or impede crane travel in any manner, without the expressed written permission of the Departmental Representative.

.2 Remove from site all such work after use.

1.3 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.4 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

1.5 FIRE ROUTES

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.6 PROTECTION FOR OFF SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.7 PROTECTION OF EXISTING PROPERTY

.1 Provide protection for finished and partially finished property and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

END OF SECTION 01 56 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 Provide 1 set of CD's in AutoCAD 2013 file format with all as-built information on the CD's.

.5 Submit to the Departmental Representative.

1.5 WARRANTIES, BONDS, TEST REPORTS, 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 Warranties, Bonds, Test Results, 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.

.7 Retain warranties and bonds until time specified for submittal.

1.6 COMPLETION

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

.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 RELATED SECTIONS

.1 05 50 00 – Metal Fabrications

.2 05 51 29 – Metal Stairs and Ladders

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A36/A36M-14, Standard Specification for Carbon Steel.

.2 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black, and Hot Dipped, Zinc Coated, Welded and Seamless.

.3 ASTM A123/A123M-15, Standard Specification for Zinc (Hot Dip Galvanized) coating on Iron and Steel Products.

.4 ASTM A143/A143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.5 ASTM A276/A276M-17, Standard Specification for Stainless Steel Bars and Shapes.

.6 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.

.7 ASTM F593-17, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.8 ASTM F3125/F3125M-15a Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.9 ASTM F1554-15e2, Standard Specification for Anchor Bolts, Steel 36, 55 and 105 ksi Yield Strength.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-85.10-99, Protective Coatings for Metals.

.2 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 Canadian Institute of Steel Construction (CISC).

.1 Handbook of the Canadian Institute of Steel Construction.

.4 Canadian Standards Association (CSA International)

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

.2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA S16-14, Limit States Design of Steel Structures.

.4 CAN/CSA-S136-16, North American Specifications for the Design of Cold Formed Steel Structural Members.

.5 CSA W47.1-09(R2014), Certification of Companies for Fusion Welding of Steel.

.6 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.

.7 CSA W55.3-08(R2014), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.8 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.

.5 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers.

.1 Systems and Specifications Manual, Volume 2, 2008 Edition.

.2 NACE No. 3/SSPC SP-6-16, Commercial Wet Abrasive Blast Cleaning.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit adhesive anchor product information for anchor installation in concrete and stone for review and approval by Departmental Representative. Provide anchor design resistance tables demonstrating that adhesive meets design loads indicated on drawings. Product information to include suitability for installation in concrete and stone, exterior exposure, and exposure to marine environment.

.3 Shop Drawings:

.1 Submit shop drawings for review by Departmental Representative. Do not proceed with fabrication until receiving reviewed shop drawings.

.2 Submit shop drawings showing assemblies, components and connections. Indicate materials, core thicknesses, finishes, connection details, joints, method of anchorage, penetrations, supports, reinforcement, details, and accessories, as applicable.

.4 Erection drawings:

.1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:

.1 Description of methods.

.2 Sequence of erection.

.3 Type of equipment used in erection.

.5 Source Quality Control Submittals:

.1 Upon request, submit copy of mill test reports 2 weeks prior to fabrication of structural steel.

.1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.

.2 Provide mill test reports certified by metallurgists qualified to practise in the Province of British Columbia, Canada.

.6 Fabricator Reports:

.1 Fabricator shall submit proof of welding certification prior to start of work.

.2 Upon request, provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.

.3 Storage and Handling Requirements:

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse by manufacturer of padding, crates, packaging materials, and pallets in accordance with Section 01 35 43 – Environmental Procedures.

PART 2- PRODUCTS

2.1 MATERIALS

.1 Steel plates: to CSA G40.20/G40.21, Grade 300W.

.2 Steel sections: to CSA G40.20/G40.21, Grade 350W.

.3 Hollow structural steel (HSS) sections: to CSA G40.20/G40.21, Grade 350W, Class C.

.4 Steel Pipe Sections: to ASTM A53 Grade B (Yield strength = 240 MPa).

.5 Structural Bolts: to ASTM F3125, A325 Type 1 Hot-dipped galvanized.

.6 Through Bolts: to ASTM A276 Type 316 Stainless steel (Tensile strength = 620 MPa).

.7 Anchor bolts: to ASTM F593 Type 316 Stainless steel (Tensile strength = 690 MPa).

.8 Welding materials: to CSA W48 Series and CSA W59 and certified by Canadian Welding Bureau.

.9 Hot dip galvanizing: galvanize all steel to ASTM A123, minimum zinc coating of 600 g/m^2.

.10 Chain to be Grade 30 low carbon steel. Hot-dipped galvanized.

.11 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA-A23.1/A23.2.

.1 Compressive strength: 50 MPa at 28 days.

.2 Net shrinkage at 28 days: maximum 5%.

.12 Adhesive Anchors:

.1 Concrete: Injectable two-component hybrid or epoxy adhesive.

.2 Stone: Reinforced polyester resin and catalyst cartridge or a Portland cement-based expanding grout.

2.2 DESIGN

.1 All welded connections to be full strength, complete penetration welds unless noted otherwise on drawings.

.2 Fall arrest anchors see Section – 05 50 00 Metal Fabrications.

2.3 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with reviewed shop drawings.

.2 Continuously seal members by continuous welds.

.3 Fall arrest anchors see Section – 05 50 00 Metal Fabrications.

.4 Provide shop modifications to repair existing guard rails only. Site modification not permitted.

2.4 FINISHES

.1 Galvanizing: hot dipped galvanizing with minimum zinc coating 600g/m^2 to ASTM A123.

PART 3 - EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16 and reviewed shop drawings.

.2 Welding: in accordance with CSA W59 and shall be performed by fabricators “fully approved” by the Canadian Welding Bureau.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.3 EXAMINATION

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

.1 Visually inspect substrate in presence of Departmental Representative.

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

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

3.4 CONNECTION TO EXISTING WORK

.1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Departmental Representative for direction before commencing fabrication.

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

3.5 MARKING

.1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

.2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.6 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.

.2 Field cutting or altering structural members not permitted except where noted on drawings or with approval of Departmental Representative.

.3 Field welding will not be permitted, except for locations indicated on drawings.

.4 Touch up galvanized coating field welded surfaces at completion of erection with cold galvanizing compound.

3.7 PROTECTION

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

.2 Repair damage to adjacent materials caused by steel erection.

3.8 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship will be arranged and paid for by the Contractor.

.2 Adhesive Anchors:

.1 Provide site specific load test results for anchors installed in stone using a Portland cement-based expanding grout demonstrating that the anchor strength meets design loads indicated on drawings.

.3 An independent welding and inspection Company shall provide three (3) shop reviews of fabrication, including non-destructive weld tests. Provide two (2) shop reviews of fabrication prior to hot-dipped galvanizing and one (1) shop review of hot-dipped galvanized assemblies. Each report shall include a summary of their findings, conclusions and any recommendations required of all field welding inspected.

.4 Submit detailed inspection report to Departmental Representative within one (1) week of completion of each inspection. Each report shall include a summary of their findings, conclusions and any recommendations.

3.9 FIELD PAINTING

.1 Clean and prepare existing steel surfaces connecting to new steel and paint with zinc rich paint containing 65% to 69% metallic zinc by total weight or minimum 93% zinc by weight in dry film. Touch up any damage to new steel with same.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with:

.1 Section 01 11 55 – General Instructions.

.2 Section 01 35 43 – Environmental Procedures

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION 05 12 23

PART 1– GENERAL

1.1 RELATED SECTIONS

.1 Section 05 12 23 – Structural Steel.

.2 Section 05 51 29 – Metal Stairs and Ladders.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A36/A36M-14, Standard Specification for Carbon Steel.

.2 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.3 ASTM A123/A123M-15, Standard Specification for Zinc (Hot Dip Galvanized) coating on Iron and Steel Products.

.4 ASTM A143/A143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.5 ASTM A269/A269M-15a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.6 ASTM A276/A276M-17, Standard Specification for Stainless Steel Bars and Shapes.

.7 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.

.8 ASTM A1016/A1016M-17, Standard Specification for General Requirements for Ferritic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes.

.9 ASTM F593-17, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.10 ASTM F3125/F3125M-15a Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.11 ASTM F1554-15e2, Standard Specification for Anchor Bolts, Steel 36, 55 and 105 ksi Yield Strength.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-85.10-99, Protective Coatings for Metals.

.2 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 CSA International

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

.2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA S16-14, Design of Steel Structures.

.4 CSA W47.1-09(R2014), Certification of Companies for Fusion Welding of Steel.

.5 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.

.6 CSA W55.3-08(R2014), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.7 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.5 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers.

.1 Systems and Specifications Manual, Volume 2, 2008 Edition.

.2 NACE No. 3/SSPC SP-6-16, Commercial Wet Abrasive Blast Cleaning.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit adhesive anchor product information for anchor installation in concrete and stone for review and approval by Departmental Representative. Provide anchor design resistance tables demonstrating that adhesive meets design loads indicated on drawings. Product information to include suitability for installation in concrete and stone, exterior exposure, and exposure to marine environment.

.3 Shop Drawings:

.1 Pipe railings: Submit shop drawings for review by Departmental Representative. Do not proceed with fabrication until receiving reviewed shop drawings.

.1 Indicate materials, component profiles, sizes, core thicknesses, connections, joints, anchorage, size and type of fasteners, accessories, and finishes. Include erection drawings, elevations, and details where applicable.

.2 Indicate welded connections using standard welding symbols include net weld lengths.

.2 Fall arrest anchors: Submit drawings sealed and signed by Professional Engineer registered or licensed in Province of British Columbia, Canada.

.1 Indicate component profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

.2 Indicate welded connections using standard welding symbols include net weld lengths.

.3 Upon request, submit design data and calculations.

1.4 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Portions of the structural steel design are delegated and paid by the Contractor to retain a Professional Engineer licenced in the Province of British Columbia, Canada. Submittals shall include sealed and signed shop drawings for the fall arrest anchors.

.1 Engineering Schedules S-B and S-C shall be forwarded to the Departmental Representative for review and approval as part of the delegated Engineer’s responsibility for their design, signed & sealed shop drawing submittals, certification of the fabrication and installation of the fall arrest anchors prior to acceptance by the Departmental Representative.

1.5 DELIVER, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse by manufacturer of padding, crates, packaging materials, and pallets in accordance with Section 01 34 43 – Environmental Procedures.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Steel plates: to CSA G40.20/G40.21, Grade 300W.

.2 Steel sections: to CSA G40.20/G40.21, Grade 350W.

.3 Hollow structural steel (HSS) sections: to CSA G40.20/G40.21, Grade 350W, Class C.

.4 Steel Pipe Sections: to ASTM A53 Grade B (Yield strength = 240 MPa).

.5 Fall arrest anchor assembly: to ASTM A1016, 316 Stainless Steel.

.6 Structural Bolts: to ASTM F3125, A325 Type 1 Hot-dipped galvanized.

.7 Through Bolts: to ASTM A276 Type 316 Stainless steel (Tensile strength = 620 MPa).

.8 Anchor bolts: to ASTM F593 Type 316 Stainless steel (Tensile strength = 690 MPa).

.9 Welding materials: to CSA W48 Series and CSA W59 and certified by Canadian Welding Bureau.

.10 Hot dip galvanizing: galvanize all steel to ASTM A123, minimum zinc coating of 600 g/m^2.

.11 Chain to be Grade 30 low carbon steel. Hot dipped galvanized.

.12 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA-A23.1/A23.2.

.1 Compressive strength: 50 MPa at 28 days.

.2 Flowable, 15 MPa at 24 hours.

.3 Net shrinkage at 28 days: maximum 5%.

.13 Adhesive Anchors:

.1 Concrete: Injectable two-component hybrid or epoxy adhesive.

.2 Stone: Reinforced polyester resin and catalyst cartridge or a Portland cement-based expanding grout.

2.2 FALL ARREST SYSTEM DESIGN

.1 Reference Standards

.1 Comply with all safety requirements as per current printed edition of WorkSafe BC Occupational Health and Safety Regulations and industry standards.

.2 Design:

.1 Steel anchor assembly to be designed for an ultimate load capacity in any direction required to resist a fall of at least 22 kN (5 000 lbs).

.3 Certification and Field Reviews:

.1 Design fall arrest anchor components and site inspect installation under direct supervision of Professional Structural Engineer experienced in design of this Work and licensed in the Province of British Columbia, Canada.

.2 Engineering Schedules S-B and S-C shall be forwarded to the Departmental Representative for review and approval as part of the delegated Engineer's responsibility for their design, signed & sealed shop drawing submittals, certification of the fabrication and installation of the fall arrest anchor assembly prior to acceptance by the Departmental Representative.

.4 Qualifications:

.1 Welder's qualifications: welders certification to CSA W55.3

.1 Employ qualified and licensed welders possessing certificates for each procedure to be performed.

.2 Welding company certification: certified for fusion welding of steel structures to CSA W47.1

.3 Manufacturer Qualifications: company specializing in manufacturing products specified in this section with minimum 3 years documented experience.

2.3 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with reviewed shop drawings.

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

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

.4 Continuously seal members by continuous welds. Grind smooth and flush.

.5 Provide shop modifications to repair existing guard rails only. Site modification not permitted.

2.4 FINISHES

.1 Galvanizing: hot dipped galvanizing with minimum zinc coating 600g/m^2 to ASTM A123.

2.5 PIPE RAILINGS

.1 Steel pipe: 48mm nominal outside diameter pipe of hollow structural steel, wall thickness, formed to shapes and sizes as indicated on drawings.

.2 Galvanize all pipe railings after fabrication.

PART 3- EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16 and reviewed shop drawings.

.2 Welding: in accordance with CSA W59 and shall be performed by fabricators "fully approved" by the Canadian Welding Bureau.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.3 EXAMINATION

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

.1 Visually inspect substrate in presence of Departmental Representative.

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

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

3.4 CONNECTION TO EXISTING WORK

.1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Departmental Representative for direction before commencing fabrication.

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

3.5 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Exposed fastening devices to match finish and be compatible with material through which they pass.

.4 Make field connections with bolts to CSA S16.

.5 Field cutting or altering structural members not permitted except where noted on drawings or with approval of Departmental Representative.

.6 Supply components for work by other trades in accordance with reviewed shop drawings and construction schedule.

.7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

3.6 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship will be arranged and paid for by the Contractor.

.2 An independent welding and inspection Company shall provide shop review of all fall arrest anchor assemblies, including non-destructive weld tests. Report shall include a summary of their findings, conclusions and any recommendations required of all field welding inspected.

.3 An independent welding and inspection Company shall provide three (3) shop reviews of fabrication, including non-destructive weld tests. Provide two (2) shop reviews of fabrication prior to hot-dipped galvanizing and one (1) shop review of hot-dipped galvanized assemblies. Each report shall include a summary of their findings, conclusions and any recommendations required of all field welding inspected.

.4 Submit detailed inspection report to Departmental Representative within one (1) week of completion of each inspection. Report shall include a summary of their findings, conclusions and any recommendations.

3.7 INSTALLATION OF PIPE RAILINGS

.1 Install pipe railings as indicated.

.2 Field welding will not be permitted, except for locations indicated on drawings.

.3 Touch up galvanized coating field welded surfaces at completion of erection with cold galvanizing compound.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with:

.1 Section 01 11 55 – General Instructions.

.2 Section 01 35 43 – Environmental Procedures.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 PROTECTION

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

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

END OF SECTION 05 50 00

PART 1– GENERAL

1.1 RELATED SECTIONS

.1 Section 05 12 23 – Structural Steel.

.2 Section 05 51 29 – Metal Stairs and Ladders.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/National Association of Architectural Metal Manufacturers (ANSI/NAAMM)

.1 ANSI/NAAMM MBG 531-15, Metal Bar Grating Manual.

.2 ASTM International

.1 ASTM A36/A36M-14, Standard Specification for Carbon Steel.

.2 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.3 ASTM A123/A123M-15, Standard Specification for Zinc (Hot Dip Galvanized) coating on Iron and Steel Products.

.4 ASTM A143/A143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.5 ASTM A276/A276M-17, Standard Specification for Stainless Steel Bars and Shapes.

.6 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.

.7 ASTM F593-17, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.8 ASTM F3125/F3125M-15a Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.9 ASTM F1554-15e2, Standard Specification for Anchor Bolts, Steel 36, 55 and 105 ksi Yield Strength.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-85.10-99, Protective Coatings for Metals.

.2 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.4 CSA International

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

.2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA S16-14, Design of Steel Structures.

.4 CSA W47.1-09(R2014), Certification of Companies for Fusion Welding of Steel.

.5 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.

.6 CSA W55.3-08(R2014), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.7 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.

.5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.6 National Association of Architectural Metal Manufactures (NAAMM)

.1 AMP 510-92, Metal Stair Manual.

.7 National Research Council Canada (NRC)

.1 National Building Code of Canada 2015 (NBC).

.8 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers.

.1 Systems and Specifications Manual, Volume 2, 2008 Edition.

.2 NACE No. 3/SSPC SP-6-16, Commercial Wet Abrasive Blast Cleaning.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit adhesive anchor product information for anchor installation in concrete and stone for review and approval by Departmental Representative. Provide anchor design resistance tables demonstrating that adhesive meets design loads indicated on drawings. Product information to include suitability for installation in concrete and stone, exterior exposure, and exposure to marine environment.

.3 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for stairs and include product characteristics, performance criteria, physical size, finish and limitations.

.4 Shop Drawings:

.1 Submit shop drawings for review by Departmental Representative. Do not proceed with fabrication until receiving reviewed shop drawings.

.2 Indicate construction details, sizes of steel sections and thickness of steel sheet.

1.4 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect ladders and stairs from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 35 43 – Environmental Procedures.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Steel sections: to CSA G40.20/G40.21, Grade 350W.

.2 Steel plate: to CSA G40.20/G40.21, Grade 300W.

.3 Hollow structural steel (HSS) sections: to CSA G40.20/G40.21, Grade 350W, Class C.

.4 Steel Pipe Sections: to ASTM A53 Grade B (Yield strength = 240 MPa).

.5 Metal bar grating: to ANSI/NAAMM MBG 531, steel, Type 30-102M, with checkered plate nosing, hot-dipped galvanized.

.6 Structural Bolts: to ASTM F3125, A325 Type 1 Hot-dipped galvanized.

.7 Through Bolts: to ASTM A276 Type 316 Stainless steel (Tensile strength = 620 MPa).

.8 Anchor bolts: to ASTM F593 Type 316 Stainless steel (Tensile strength = 690 MPa).

.9 Welding materials: to CSA W48 Series and CSA W59 and certified by Canadian Welding Bureau.

.10 Hot dip galvanizing: galvanize all steel to ASTM A123, minimum zinc coating of 600 g/m^2.

.11 Chain to be Grade 30 low carbon steel. Hot-dipped galvanized.

.12 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA-A23.1/A23.2.

.1 Compressive strength: 50 MPa at 28 days.

.2 Net shrinkage at 28 days: maximum 5%.

.13 Adhesive Anchors:

.1 Concrete: Injectable two-component hybrid or epoxy adhesive.

.2 Stone: Reinforced polyester resin and catalyst cartridge or a Portland cement-based expanding grout.

2.2 FABRICATION

.1 Detail and fabricate in accordance with NAAMM, Metal Stair Manual.

.2 Do welding work in accordance with CSA W59 unless specified otherwise.

.3 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.

.4 Accurately form connections with exposed faces flush:

.1 Make mitres and joints tight.

.2 Make risers of equal height.

.5 Grind or file exposed welds and steel sections smooth.

.6 Shop fabricate stairs in sections as large and complete as practicable.

2.3 PLATE/GRATING STAIRS

.1 Form steel grating treads and landings from metal bar grating to profile indicated and secure to stringers and supports as indicated. Form landings of steel grating and reinforce as required.

.2 Form stringers from C310x31.

2.4 PIPE/TUBING BALUSTRADES

.1 Construct balusters and handrails from steel tubing and steel pipe as detailed on drawings.

.2 Cap and weld exposed ends of balusters and handrails. Fabricate drain holes at low points.

.3 Terminate at abutting wall with end flange.

2.5 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m^2 to ASTM A123.

.2 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

PART 3 - EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16 and reviewed shop drawings.

.2 Welding: in accordance with CSA W59 and shall be performed by fabricators “fully approved” by the Canadian Welding Bureau.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.3 EXAMINATION

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

.1 Visually inspect substrate in presence of Departmental Representative.

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

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

3.4 INSTALLATION OF STAIRS

.1 Install in accordance with NAAMM, Metal Stair Manual.

.2 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.

.3 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.4 Field welding will not be permitted, except for locations indicated on drawings.

.5 Touch up galvanized coating field welded surfaces at completion of erection with cold galvanizing compound.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with:

.1 Section 01 11 55 – General Instructions.

.2 Section 01 35 43 – Environmental Procedures.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

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

.2 Repair damage to adjacent materials caused by metal stairs and ladders installation.

END OF SECTION 05 51 29

APPENDIX A

PRELIMINARY HAZARD ASSESSMENT FORM

Project Number:	**R.090420.001**
Location:	**Esquimalt Graving Dock**
Date:	August 1, 2017
Name of Departmental Representative:	Jon Siska, Project Manager
Name of Client:	EGD-EAS-IAM
Name of Client Project Co-ordinator	Stafford Bingham

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		
Blasting	X		X		
Construction Equipment	X		X		
Pedestrian Traffic (site personnel, tenants, visitors, public)	X		X		
Multiple Employer Worksite	X		X		
Electrical Hazards					
Contact With Overhead Wires		X		X	
Live Electrical Systems or Equipment	X		X		
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		
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	
Suspended / Mobile Work Platforms	X		X		
Other:	X		X		Overhead cranes in operational area
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	
Designated Substance Present		X		X	
Chemicals Used in work	X		X		Active ship repair facility
Lead in paint	X		X		Lead paints see report attached
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					
Risk of Assault	X		X		Multiple employer workplace
Other:	X		X		No unauthorized entry to site.
Other Hazards					

Other Compliance and Permit Requirements[1]	YES	NO	Notes / Comments[2]
Is a Building Permit required?		X	
Is an Electrical permit required?	X		Required for any electrical work on site
Is a Plumbing Permit required?			N/A
Is a Sewage Permit required?			N/A
Is a Dumping Permit required?			No dumping allowed on site
Is a Hot Work Permit required?	X		
Is a Permit to Work required?		X	
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.

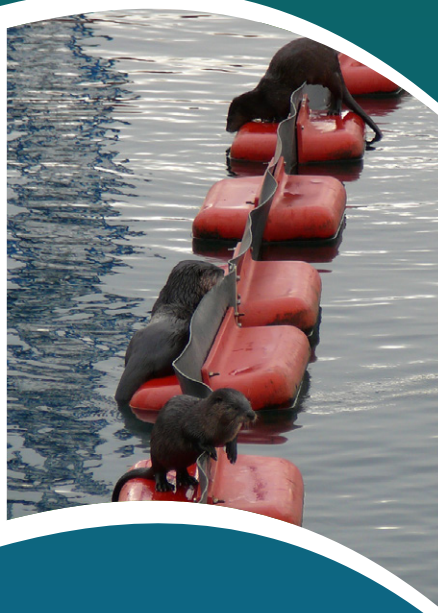
(2) TBD means To Be Determined by Service Provider.

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
Esquimalt Graving Dock

Environmental Best Management Practices



Prepared by:
Public Services and Procurement Canada
Environmental Services

October 2016
Version: 05

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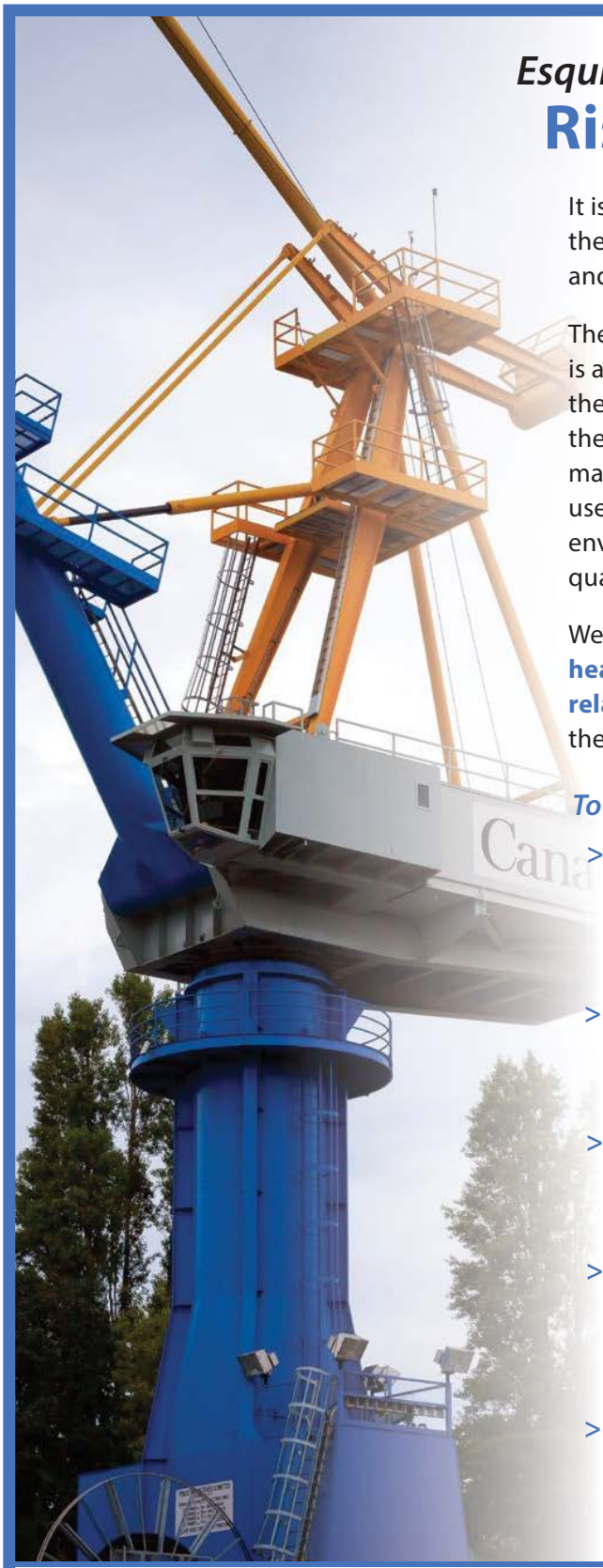
OVERVIEW

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
Strategy Sector

David Latoski
Operations Manager
Esquimalt Graving Dock
Engineering Assets
Strategy Sector

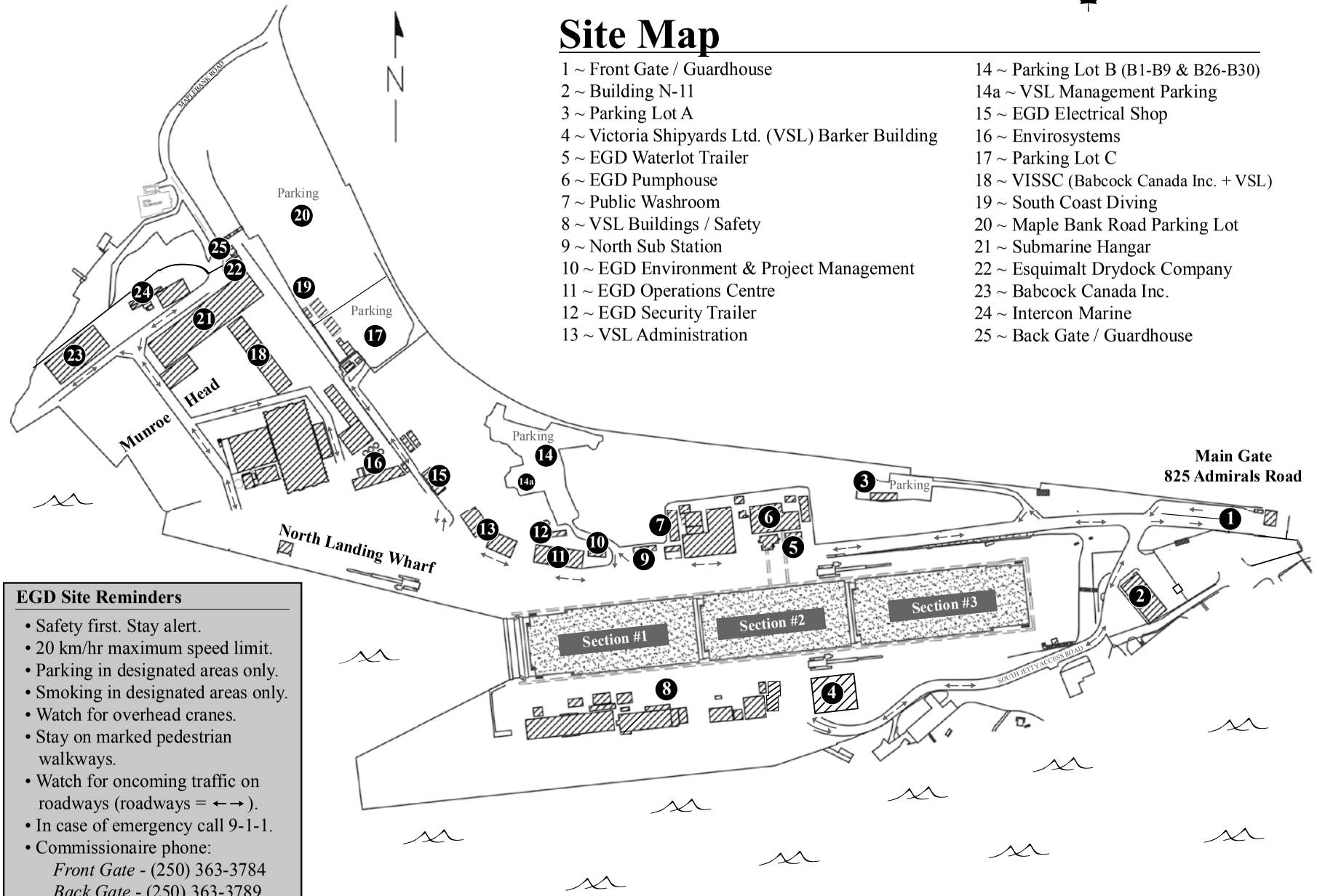
Canada

August 2015

EGD
Esquimalt Graving Dock

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

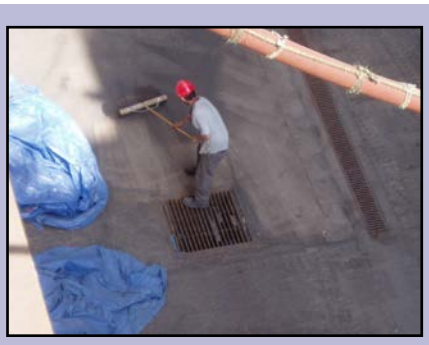
- Cover trench drains and tunnel grates in work areas with filter cloth. Replace the cloth as required.
- Manage waste grit by sweeping it into central areas, away from trenches, tunnel grates and dock floor traffic.
- Remove waste grit from work areas as soon as possible.
- Store all waste grit in appropriate 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.



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.

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.

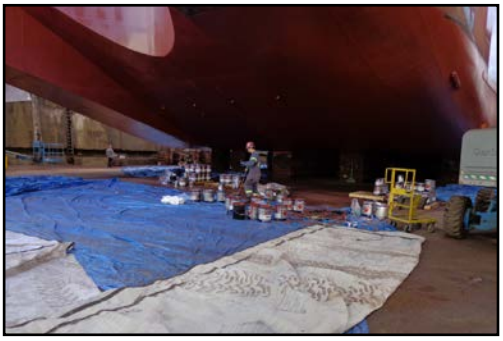
ADEQUATE containment on stablizer pocket doors.

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.

Environmental Best Management Practices

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.

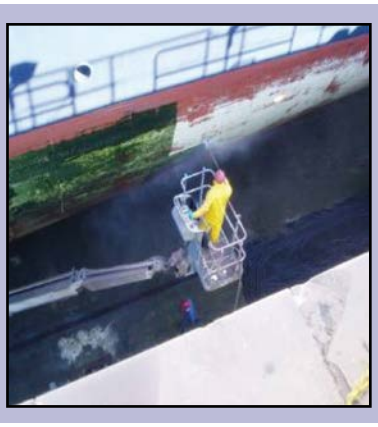
General Refuse

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.

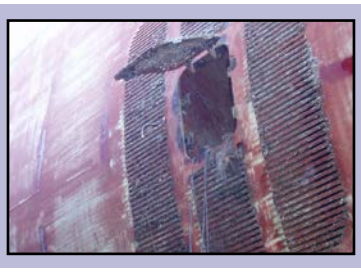
Sea chests

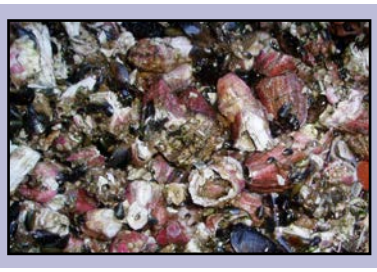
- All biological material removed from sea chests must be contained, covered and disposed of appropriately.
- Material must be stored away from direct sunlight/heat and disposed of as soon as possible, to avoid nuisance odour pollution.

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.

Environmental Best Management Practices

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.*

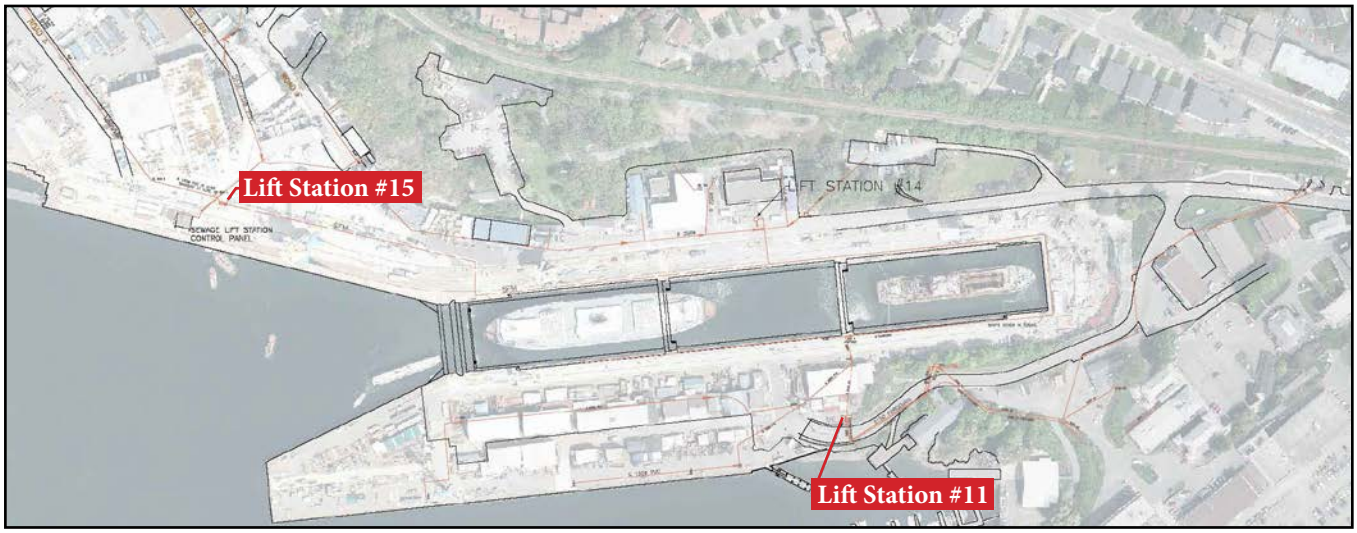
Only utilize spotlights when necessary.

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*).

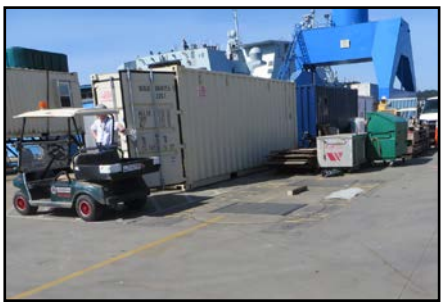
Access to the Sanitary Sewer

- 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.

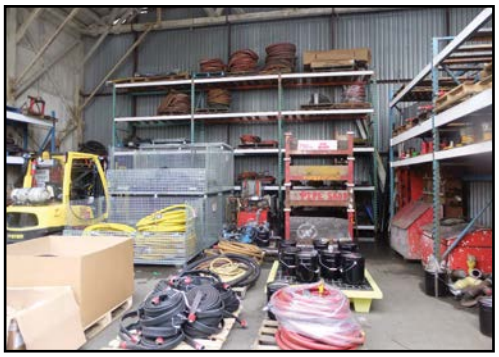
Storage

- 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

Drydock Bookings Summary provided for reference only.
Confirmed booking dates are subject to change.
Confirmed booking dates will be confirmed at Contract award.

Government of Canada | Gouvernement du Canada

Canada

Public Works and Government Services Canada

Bookings Summary

Drydock

VESSEL	SECTION	DOCKING DATES	BOOKING DATE
VSL 21.7M DND DRYDOCK CAISSON	**3**	**AUG 10, 2017 - OCT 4, 2017**	**JUL 27, 2017@10:05**
VSL 237M Zaandam	tentative	Sep 6, 2017 - Sep 29, 2017	Nov 5, 2015@14:54
VSL 258M NORWEGIAN SUN	tentative	Sep 13, 2017 - Oct 12, 2017	Dec 14, 2015@14:54
EDC 140M QUEEN OF COQUITLAM	**2 & 3**	**OCT 9, 2017 - OCT 31, 2017**	**JUN 13, 2013@09:04**
BCF 130M Queen of Nanaimo	tentative	Oct 9, 2017 - Oct 31, 2017	Sep 13, 2017@10:26
BCF 107M Salish Eagle	tentative	Oct 9, 2017 - Oct 31, 2017	Aug 31, 2017@14:28
VSL 289.51M STAR PRINCESS	tentative	Oct 13, 2017 - Nov 1, 2017	Aug 24, 2015@08:38
VSL 118M HMNZS TE MANA	tentative	Nov 1, 2017 - Nov 27, 2017	Aug 29, 2016@08:38
EDC 89.84M QUINSAM	**3**	**NOV 1, 2017 - NOV 21, 2017**	**MAY 3, 2017@17:05**
BCF 75.4M Northern Sea Wolf	tentative	Nov 2, 2017 - Nov 24, 2017	Sep 7, 2017@17:06
EDC 124M FRPD 309	tentative	Nov 15, 2017 - Dec 15, 2017	Jun 10, 2016@16:07
VSL 289.51M STAR PRINCESS	**1 & 2 & 3**	**NOV 27, 2017 - DEC 20, 2017**	**NOV 1, 2016@14:08**
VSL 105M Northern Eagle	tentative	Dec 1, 2017 - Dec 22, 2017	Mar 28, 2016@08:57
VSL 289.51M STAR PRINCESS	tentative	Dec 4, 2017 - Dec 23, 2017	Oct 18, 2016@07:31
BCF 96M Queen of Capilano	tentative	Jan 2, 2018 - Jan 11, 2018	Dec 8, 2016@17:17
BCF 140M Queen of Oak Bay	tentative	Jan 6, 2018 - Jan 19, 2018	Jan 26, 2016@18:09
VSL 256M NORTH STAR	**1 & 2 & 3**	**JAN 18, 2018 - FEB 23, 2018**	**FEB 21, 2017@09:44**
VSL 280.59M pride of america	tentative	Feb 19, 2018 - Mar 15, 2018	Jul 29, 2016@10:07
EDC 124M FRPD 309	**2 & 3**	**FEB 24, 2018 - MAR 27, 2018**	**JUL 24, 2017@08:19**
VSL 118M HMNZS TE MANA	tentative	Feb 24, 2018 - Mar 23, 2018	Mar 3, 2017@14:06
BCF 102.4M ISLAND SKY	**1**	**FEB 26, 2018 - MAR 12, 2018**	**SEP 6, 2017@09:13**
VSL 258M NORWEGIAN SUN	**1 & 2 & 3**	**MAR 27, 2018 - APR 25, 2018**	**AUG 16, 2016@07:58**

APPENDIX D

Assessment of Lead in Paint

Hand Railings and Dock Sill Guardrails, Esquimalt Graving Dock - 825 Admirals Road, Esquimalt, BC, PSPC Project # R.090420.001

July 10, 2017

Project No.: 647993

Prepared for:

Public Services and Procurement Canada

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SNC·LAVALIN

Executive Summary

On behalf of Public Services and Procurement Canada (PSPC), SNC-Lavalin Inc. (SNC-Lavalin) has completed an assessment of lead in paint (the "assessment") of the various hand railings and dock sill guards at the PSPC Esquimalt Graving Dock (EGD), Esquimalt, BC (the "Site"). SNC-Lavalin understands that the purpose of the work was to assess lead concentrations in painted surfaces prior to removal and off-site disposal of the railings.

The assessment was completed by SNC-Lavalin on June 26, 2017. A total of 16 representative paint samples were collected and submitted for laboratory analysis of total lead concentrations. One paint sample was also collected and submitted for laboratory analysis of leachable lead via the toxicity characteristic leachate procedure (TCLP). This report provides the analytical results for the samples collected by SNC-Lavalin during the assessment and disposal options.

Based on the results of the assessment, lead-based paints were identified to be present on the hand railings and sill guard railings and require specific procedures for: handling; abatement; demolition; and disposal.

All samples analyzed contained concentrations of total lead greater than 600 mg/kg. All similarly painted surfaces at the Site should be considered as containing/suspected of being lead-based paint.

The analytical result for the sample analyzed for leachable lead contained a concentration greater than the regulatory standard. It should be noted that the substrate (metal hand rail) was not included in the sample submitted for analysis.

Recommendations

Federal and provincial guidelines limit lead concentrations in paint to 90 mg/kg for high risk individuals (i.e., pregnant women and children), and any concentrations that exceed this limit would be considered a lead-containing paint. WorkSafeBC has released a document *Safe Work Practices for Handling Lead*[1] that identifies the hazards posed by lead and provides direction on methods that should be used to control exposure. It also provides basic information regarding development and implementation of an exposure control plan and safe work procedures. The contractor responsible for the abatement or removal of the handrails/guard rails would be required to file a Notice of Project Lead (NOPL) and to develop and implement an exposure control plan and safe work procedures prior to any work being completed. Documentation should be provided by the abatement contractor and retained by PSPC to verify compliance with the applicable regulations.

There is the potential for lead exposure for high risk individuals in the event that lead-containing paint with lead concentrations >90 mg/kg is burned and/or becomes airborne during renovation, deconstruction/demolition activities such as cutting, grinding, etc. Therefore, these individuals should be excluded from the work area whenever lead-containing paint is being disturbed by work activities to minimize potential lead exposure. If handrails/guard rails can be removed intact without removal of paint from painted surfaces, the handrails/guardrails can be disposed of at a metal recycler as per the BC Ministry of Environment, Guideline to Managing Lead-Containing Construction and Demolition Waste in

[1] Available at: https://www.worksafebc.com/en/resources/health-safety/books-guides/safe-work-practices-handling-lead

BC[2]. If lead-based paint is to be removed from metal surfaces, collected paint waste would need to be treated as hazardous waste for disposal according to the concentration of leachable lead.

All paints found at the Site of similar colours as those identified to be lead-containing paint should be considered lead-containing.

A detailed summary and recommendations for the management of the lead-based paint identified is presented in Tables 1 and 2 of Sections 4 and 6, respectively. Laboratory analytical report is presented in Appendix II.

[2] Guideline to Management Lead-Containing Construction and Demolition Waste in BC, BC Ministry of Environment, Version 1.0, January 2015.

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In-Text Tables

Appendices

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1 Introduction

On behalf of Public Services and Procurement Canada (PSPC), SNC-Lavalin Inc. (SNC-Lavalin) has completed an assessment of lead in paint (the "assessment") of selected hand and sill guard railings at the PSPC Esquimalt Graving Dock (EGD), 825 Admirals Road, Esquimalt, BC (the "Site"). SNC-Lavalin understands that the purpose of the work was to assess lead concentrations in painted surfaces prior to removal and disposal of the railings.

The PSPC project number is R.090420.001 and the task authorization number is CTA EZ113-150642/003/PWY.

2 Scope of Work and Methodology

The work was completed in general accordance with SNC-Lavalin's proposal *Replace Dock Sill Guardrails, Lead Based Paint Assessment, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC, Project # R.090420.001*, dated June 14, 2017.

On June 26, 2017, SNC-Lavalin personnel collected representative paint samples from select surfaces of selected hand and sill guard railings. The samples were submitted for laboratory analysis of total lead. One sample was also submitted for waste classification (leachability).

The following sections outline the specific protocols followed when completing the survey.

Lead in Paint

Different paint colours may contain different concentrations of lead; therefore, SNC-Lavalin personnel inspected select areas of hand and sill guard railings to determine primary paint colour(s) that had been applied to the surfaces. The approach was to try to obtain samples from structures that may need to be cut or ground during removal. Factory painted metal surfaces are not sampled as the paint is applied in thin layers, making it difficult to obtain a sufficient amount of paint to analyze. SNC-Lavalin personnel were only able to collect one sample from a hand railing for analysis of leachable lead due to the mass of paint required for analysis.

One June 26, 2017, a total of eight (8) samples were collected from hand railings in the Dock Bottom stairwell, the Middle Penstock and the Main Penstock. An additional eight (8) samples were collected from the sill guard railings surrounding the graving dock. Samples were collected by physically scraping paint chips from the surface using hand tools. Approximately 1 g of paint chips were collected into sealable sample bags and labelled for laboratory submission.

Sample HR-P2-LEACH was collected for analysis of leachable lead by Toxicity Characteristic Leaching Procedure (TCLP). The sample contained less than 100 g of paint chips. While less than the recommended 100 g for TCLP analysis per Reference Method EPA 1311 R1992, the 100 g is intended to include the paint and the underlying substrate (i.e., the hand railing). Analysis of TCLP leachable lead was completed with a notation that the analytical result is reported with greater uncertainty.

Samples were submitted to Maxxam Analytics in Burnaby, BC (Maxxam) for analysis in accordance with the applicable regulations. Maxxam is accredited by CALA, and a copy of their accreditations is presented in Appendix III. Analysis of bulk samples for determination of lead concentration was performed using

Inductively Coupled Plasma, Mass Spectrometry (ICP-MS) procedures. The waste characterization of samples was performed using TCLP.

3 Regulatory Framework

Federal and provincial regulations require that hazardous building materials, including lead in paint, be properly identified and managed to prevent potential exposure to workers. In addition, a more intrusive survey is required to identify materials of concern prior to renovations, salvage, or demolition of a building or structure. These materials must be properly controlled, removed, and/or disposed of at a suitably permitted facility in accordance with the applicable federal and provincial regulations. The following federal and provincial regulations relate to lead containing paint:

Federal

Various Regulations made under the *Canadian Environmental Protection Act* (CEPA), 1999, S.C. 1999, c. 33, last amended on December 21, 2016, including specialized handling and/or disposal requirements for materials including lead. Regulations include the following:

- *Canada Labour Code, Part II*, R.S.C., 1985, c. L-2, last amended January 3, 2016.
- *Canada Occupational Health and Safety Regulations*, SOR/86-304, last amended June 14, 2016.
- *Surface Coating Materials Regulations,* SOR/2016-193[3], requires the concentration of total lead and total mercury present in a surface coating material to be not more than 90 mg/kg and 10 mg/kg, respectively. SNC-Lavalin notes that requirements for total arsenic are not addressed in this regulation.
- *Human Resources Social Development Canada* (HRSDC)*, Canada Labour Code Part II*, Canada Occupational Health and Safety Regulations, Part X, Hazardous Substances, as amended, requires that all hazardous substances in the workplace, including lead in paint, be identified and controlled to minimize potential exposure to workers. Under the Canada Labour Code Part II definitions, a "hazardous substance" includes a controlled product and a chemical, biological, or physical agent that, by reason of a property that the agent possess, is hazardous to the safety or health of a person exposed to it.

Provincial

- *WorkSafeBC Occupational Health and Safety Regulation* (OHSR)*,* BC Reg. 296/97, includes amendments up to B.C. Reg. 9/2017, May 1, 2017 requires that hazardous materials, including lead, that may be handled, disturbed, or removed during demolition must be identified and removed or safely contained prior to demolition. In addition, a copy of the observation report identifying these materials must be available at the work site. The requirements for the management of indoor air quality are also included.
- *Hazardous Waste Regulation* (HWR)*,* B.C. Reg. 63/88, including amendments up to B.C. Reg. 179/2016, requires all Hazardous Wastes (HW) must be properly managed and disposed of.

[3] Available at http://laws-lois.justice.gc.ca/PDF/SOR-2016-193.pdf

Lead Paint

Federal and provincial guidelines limit lead concentrations in paint to 90 mg/kg for high risk individuals (i.e., pregnant women and children), and any concentrations that exceed this limit would be considered a lead-containing paint. WorkSafeBC has released a document *Safe Work Practices for Handling Lead*[4] that identifies the hazards posed by lead and provides direction on methods that should be used to control exposure. It also provides basic information regarding development and implementation of an exposure control plan and safe work procedures. Improper removal of paint resulting in airborne lead concentrations that exceed 50% of the airborne lead exposure limit of 0.05 mg/m^3 would trigger the requirement for an employer to file a NOPL and the development and implementation of an exposure control plan and safe work procedures prior to any work being completed.

According to the BC Ministry of Environment, Guideline to Managing Lead-Containing Construction and Demolition Waste in BC[5], painted metallic demolition components are not characterized as hazardous waste so long as the paint is not removed from the painted surfaces. If painted metallic materials can be removed intact without removal of paint from painted surfaces, they can be disposed of at a metal recycler. If lead-based paint is to be removed from metal surfaces, collected paint waste would need to be treated as hazardous waste for disposal if the lead paint is found leachable with a concentration in excess of the regulated standard of 5 mg/L in the HWR.

4 Results

Details of the results for the paint samples are presented in Table 1, below. Suspect lead paint samples collected from the hand railings were given prefix “HR-” to differentiate them from samples collected from the sill guard railings, which were given the prefix “SGR-”.

Table 1: Detailed Inventory of Suspected Lead-Based Paint Samples – Hand and Sill Guard Railings, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC

Identified Lead-Based Paint Description*	Photo
Main Penstock Building Entrance Hand Rail: › Paint colour: Yellow over yellow, red, and grey › Substrate: Metal › Approximate Extent: Full surface of both hand rails › Analytical Result (**Sample HR-P1**): **41,300 mg/kg** total lead › Condition: Good, no visible damage › Recommendation: See Table 2	

[4] Available at: https://www.worksafebc.com/en/resources/health-safety/books-guides/safe-work-practices-handling-lead
[5] Guideline to Management Lead-Containing Construction and Demolition Waste in BC, BC Ministry of Environment, Version 1.0, January 2015.

Middle Penstock Building West Entrance Hand Rail: › Paint colour: Yellow over grey, black, and orange › Substrate: Metal › Approximate Extent: Full surface of both hand rails › Analytical Results: • (**Sample HR-P2**): **58,300 mg/kg** total lead • (**Sample HR-P2-LEACH**): **62.9 mg/L** leachable lead › Condition: Good, no visible damage › Recommendation: See Table 2	
Middle Penstock Building Entrance East Entrance: › Paint colour: Yellow over grey, black, and orange › Substrate: Metal › Approximate Extent: Full surface of both hand rails › Analytical Result (**Sample HR-P3**): **54,000 mg/kg** total lead › Condition: Good, no visible damage › Recommendation: See Table 2	
Dock Bottom Middle Stairwell Exterior Guardrail: › Paint colour: Yellow with older layers of limited extent › Substrate: Metal › Approximate Extent: Full surface of guardrail › Analytical Result (**Sample HR-P4**): **42,600 mg/kg** total lead › Condition: Moderate; some areas stripped by use (no evidence of flaking) › Recommendation: See Table 2	
Dock Bottom Middle Stairwell Exterior Hand Rail: › Paint colour: Yellow over 2 generations of grey, orange, and black › Substrate: Metal › Approximate Extent: Full surface of hand rail › Analytical Result (**Sample HR-P5**): **132,000 mg/kg** total lead › Condition: Moderate; some flaking and areas stripped by use › Recommendation: See Table 2	
Dock Bottom Middle Stairwell Interior Hand Rail (Upper Landing): › Paint colour: Yellow over red › Substrate: Metal › Approximate Extent: Full surface of hand rail › Analytical Result (**Sample HR-P6**): **48,300 mg/kg** total lead › Condition: Moderate; some flaking and areas stripped by use. › Recommendation: See Table 2	

Dock Bottom Middle Stairwell Interior Barrier Rail (Upper Landing): › Paint colour: Yellow over grey, black, and orange › Substrate: Metal › Approximate Extent: Full surface of barrier rail › Analytical Result (**Sample HR-P7**): **164,000 mg/kg** total lead › Condition: Good; some flaking › Recommendation: See Table 2	
Dock Bottom Middle Stairwell Interior Hand Rail (Lower Landing): › Paint colour: Yellow over white › Substrate: Metal › Approximate Extent: Full surface of hand rail › Analytical Result (**Sample HR-P8**): **37,700 mg/kg** total lead › Condition: Poor; substantial flaking › Recommendation: See Table 2	
East Graving Dock, Westernmost Sill Guard Rail, North Side: › Paint colour: Yellow over grey and red › Substrate: Metal › Approximate Extent: Full surface of sill guard rail › Analytical Result (**Sample SGR-P1**): **7,750 mg/kg** total lead › Condition: Good; some flaking on upper surface › Recommendation: See Table 2	
West Graving Dock, Easternmost Sill Guard Rail, North Side: › Paint colour: Yellow over grey and red › Substrate: Metal › Approximate Extent: Full surface of sill guard rail › Analytical Result (**Sample SGR-P2**): **8,990 mg/kg** total lead › Condition: Good; except poor where section is missing. › Recommendation: See Table 2	
West Graving Dock, Sill Guard Rail East of Fire Department Connection, North Side: › Paint colour: Yellow over grey and red › Substrate: Metal › Approximate Extent: Full surface of sill guard rail › Analytical Result (**Sample SGR-P3**): **8,380 mg/kg** total lead › Condition: Good; limited damage › Recommendation: See Table 2	

West Graving Dock, Sill Guard Rail West of Fire Department Connection, North Side: › Paint colour: Yellow over grey and red. › Substrate: Metal › Approximate Extent: Full surface of sill guard rail › Analytical Result (**Sample SGR-P8**): **12,100 mg/kg** total lead › Condition: Good, limited damage › Recommendation: See Table 2	
West Graving Dock, East Sill Guard Rail Adjacent Barker Building, South Side: › Paint colour: Grey over red › Substrate: Metal › Approximate Extent: Full surface of sill guard rail › Analytical Result (**Sample SGR-P4**): **25,500 mg/kg** total lead › Condition: Poor; significantly damaged › Recommendation: See Table 2	
West Graving Dock, West Sill Guard Rail Adjacent Barker Building, South Side: › Paint colour: Grey over red › Substrate: Metal › Approximate Extent: Full surface of sill guard rail › Analytical Result (**Sample SGR-P5**): **24,300 mg/kg** total lead › Condition: Poor; significantly damaged › Recommendation: See Table 2	
West Graving Dock, East Sill Guard Rail Adjacent Painters Compound, South Side: › Paint colour: Yellow over grey and red › Substrate: Metal › Approximate Extent: Full surface of sill guard rail › Analytical Result (**Sample SGR-P6**): **7,410 mg/kg** total lead › Condition: Poor; significantly damaged › Recommendation: See Table 2	
West Graving Dock, West Sill Guard Rail Adjacent Painters Compound, South Side: › Paint colour: Grey over red › Substrate: Metal › Approximate Extent: Full surface of sill guard rail › Analytical Result (**Sample SGR-P7**): **25,300 mg/kg** total lead › Condition: Poor; significantly damaged › Recommendation: See Table 2	

* **Bold** – indicates lead concentration greater than 90 mg/kg but less than 600 mg/kg.
* **Bold and underlined** – indicates lead concentration greater than or equal to 600 mg/kg.

5 Quality Assurance/Quality Control

Procedures

Quality Assurance/Quality Control (QA/QC) measures were undertaken to ensure unbiased and representative sample collection and accuracy of the laboratory analyses. Details of the QA/QC program are summarized below:

- Use of trained and experienced personnel.
- Implementation of SNC-Lavalin Inc.'s (SNC-Lavalin's) preferred operating procedures (POPs).
- Documentation of all field activities.
- Sample collection in a manner appropriate for the prevention of cross-contamination and other field sampling errors, using appropriate decontaminated sampling tools, equipment and contaminant-free containers appropriate to the subsequent analyses.
- Chain-of-custody documentation for sample submission.
- Use of appropriately accredited laboratories for analysis of the samples.
- Procedures to confirm accurate transcription of laboratory data into tables.
- Review of laboratory QA performance to confirm results are acceptable.

Laboratory internal quality control measures are provided in the appended analytical report.

6 Summary and Recommendations

Based on the results of the survey, there are surfaces coated with lead-based paint on the hand and sill guard railings requiring specific procedures for: handling; abatement; demolition; and disposal, as outlined below in Table 2. Select photographs, with the sample locations included, are presented in Appendix I. The laboratory analytical report is included in Appendix II.

A summary of the lead-based paints identified on the hand and sill guard railings is included in Table 2, below:

Table 2: Summary Table of Lead-Based Paints Identified on the Hand and Sill Guard Railings, Esquimalt Graving Dock, 825 Admirals Road, Esquimalt, BC

Description and Location	Recommendations
LEAD CONTAINING PAINTS – HAND RAILINGS	
Total Lead in Paint › **Yellow (HR-P1)**, main penstock building entrance (Photo 1). › **Yellow (HR-P2)**, middle penstock building west entrance hand rail (Photo 2). › **Yellow (HR-P3)**, middle penstock building east entrance hand rail (Photo 3). › **Yellow (HR-P4)**, dock bottom middle stairwell exterior guard rail (Photo 4). › **Yellow (HR-P5)**, dock bottom middle stairwell exterior hand rail (Photo 4). › **Yellow (HR-P6)**, dock bottom middle stairwell interior hand rail, upper landing (Photo 5). › **Yellow (HR-P7)**, dock bottom middle stairwell interior guard rail, upper landing (Photo 5). › **Yellow (HR-P8)**, dock bottom middle stairwell interior hand rail, lower landing (Photo 6).	Federal and provincial guidelines limit lead concentrations in paint to 90 mg/kg for high risk individuals (i.e., pregnant women and children), and any concentrations that exceed this limit would be considered a lead-containing paint. WorkSafeBC has released a document Safe Work Practices for Handling Lead[6] that identifies the hazards posed by lead and provides direction on methods that should be used to control exposure. It also provides basic information regarding development and implementation of an exposure control plan and safe work procedures. WorkSafeBC suggests that improper removal of paint resulting in airborne lead concentrations that exceed 50% of the airborne lead exposure limit of 0.05 mg/m^3 would trigger the requirement for an employer to file a NOPL and the development and implementation of an exposure control plan and safe work procedures prior to any work being completed. If required, the abatement contractor should file a NOPL with WorkSafeBC prior to any lead abatement work taking place. Documentation should be provided by the abatement contractor and retained by PSPC to verify compliance with the applicable regulations. There is the potential for lead exposure for high risk individuals in the event that lead-containing paint with lead concentrations >90 mg/kg is burned and/or becomes airborne during renovation, deconstruction/demolition activities such as cutting, grinding, etc. Therefore, these individuals should be excluded from the work area whenever lead-containing paint is being disturbed by work activities to minimize potential lead exposure to these individuals. All paints found at the Site of similar colours as those identified to be lead-containing paint should be considered lead-containing.
LEAD CONTAINING PAINTS – SILL GUARD RAILINGS	
Total Lead in Paint › **Yellow (SGR-P1)**, west graving dock, westernmost sill guard rail, north side (Photo 7). › **Yellow (SGR-P2)**, east graving dock, westernmost sill guard rail, north side (substantially similar to Photo 7). › **Yellow (SGR-P3)**, east graving dock, east of fire department connection, north side (substantially similar to Photo 7). › **Yellow (SGR-P8)**, east graving dock, west of fire department connection, north side (substantially similar to Photo 7). › **Grey (SGR-P4)**, east graving dock, adjacent Barker Building,	Federal and provincial guidelines limit lead concentrations in paint to 90 mg/kg for high risk individuals (i.e., pregnant women and children), and any concentrations that exceed this limit would be considered a lead-containing paint. WorkSafeBC has released a document Safe Work Practices for Handling Lead[6] that identifies the hazards posed by lead and provides direction on methods that should be used to control exposure. It also provides basic information regarding development and implementation of an exposure control plan and safe work procedures. WorkSafeBC suggests that improper removal of paint resulting in airborne lead concentrations that exceed 50% of the airborne lead exposure limit of 0.05 mg/m^3 would trigger the requirement for an employer to file a NOPL and the development and implementation of an exposure control plan and safe work procedures prior to any work being completed. If required, the abatement contractor should file a NOPL with WorkSafeBC prior to any lead abatement work taking place. Documentation should be provided by the abatement contractor and retained by PSPC to verify compliance with the applicable regulations. There is the potential for lead exposure for high risk individuals in the event that lead-containing paint with lead concentrations >90 mg/kg is burned and/or

[6] Available at: https://www.worksafebc.com/en/resources/health-safety/books-guides/safe-work-practices-handling-lead

Description and Location	Recommendations
eastern access, south side (Photo 8). › **Grey (SGR-P5)**, east graving dock, adjacent Barker Building, western access, south side (substantially similar to Photo 8). › **Grey (SGR-P6)**, east graving dock, adjacent Painters Compound, eastern access, south side (substantially similar to Photo 8). › **Grey (SGR-P7)**, east graving dock, adjacent Painters Compound, western access, south side (substantially similar to Photo 8).	becomes airborne during renovation, deconstruction/demolition activities such as cutting, grinding, etc. Therefore, these individuals should be excluded from the work area whenever lead-containing paint is being disturbed by work activities to minimize potential lead exposure to these individuals. All paints found at the Site of similar colours as those identified to be lead-containing paint should be considered lead-containing.
LEACHABLE LEAD IN PAINT	
Leachable Lead in Paint › **Yellow (HR-P2)**, middle penstock building west entrance hand rail (Photo 2).	The waste generated from removal of paint and surface coatings may be hazardous. If handrails/guard rails can be removed intact without removal of paint from painted surfaces, the handrails/guardrails can be disposed of at a metal recycler and would not be characterized as hazardous waste. If lead-based paint is to be removed from metal surfaces, collected paint waste should be treated as hazardous waste for disposal according to the concentration of leachable lead (62.9 mg/L) greater than the HW standard (5 mg/L). Additional leachate analysis (TCLP) may be required for disposal of collected paint removed from surfaces.

- All relevant waste disposal documentation should be provided by the qualified contractors and retained by PSPC.
- A Notice of Project – Lead (NOPL) and Safe Work Procedures (included with the NOPL) must be submitted to WorkSafeBC and a copy retained by PSPC.

7 Notice to Reader

This report has been prepared by SNC-Lavalin Inc. (SNC-Lavalin) for Canada, who has been party to the development of the scope of work for this project and understands its limitations. Copyright of this report vests with Her Majesty the Queen in Right of Canada. This report was prepared in accordance with a services contract between SNC-Lavalin and Canada, including General Conditions 2035 of the Standard Acquisition Clauses and Conditions (SACC) Manual.

This report is intended to provide information to Canada to assist it in making business decisions. SNC-Lavalin is not a party to the various considerations underlying the business decisions, and does not make recommendations regarding such business decisions.

The findings, conclusions and recommendations in this report have been developed in a manner consistent with the level of skill normally exercised by environmental professionals currently practising under similar conditions in the area. The findings contained in this report are based, in part, upon information provided by others. If any of the information is inaccurate, modifications to the findings, conclusions and recommendations may be necessary.

The findings, conclusions and recommendations presented by SNC-Lavalin in this report reflect SNC-Lavalin's best judgement based on the site conditions at the time of the site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. They have been prepared for specific application to this site and are based, in part, upon visual observation of the site, subsurface investigation at discrete locations and depths, and specific analysis of specific materials as described in this report during a specific time interval. Substances other than those described may exist within the site, reported substance parameters may exist in areas of the site not investigated, and concentrations of substances greater or less than those reported may exist between sample locations.

The findings and conclusions of this report are valid only as of the date of this report. If site conditions change, new information is discovered, or unexpected site conditions are encountered in future work, including excavations, borings, or other studies, the findings, conclusions and/or recommendations of this report should be re-evaluated. It is recommended that users of this report should engage a suitably qualified professional to assist in interpreting the significance, if any, of the findings.

Appendix I

Photographs

Photograph 1: Lead-based yellow paint on the main Penstock Building entrance hand railing. Sample HR-P1.

Photograph 2: Lead-based yellow paint on the west entrance hand railing to the middle Penstock Building. Sample HR-P2.

Photograph 3: Lead-based yellow paint on the east entrance hand railing to the middle Penstock Building. Sample HR-P3.

Photograph 4: Lead-based yellow paint on the hand and guard rails at the dock bottom middle stairwell entrance. Samples HR-P4 and HR-P5.

Photograph 5: Lead-based yellow paint on the hand and guard rails in the dock bottom middle stairwell. Samples HR-P6 and HR-P7.

Photograph 6: Lead based yellow paint on the hand rail at the lower landing of the dock bottom middle stairwell. Sample HR-P8

Photograph 7: Lead-based yellow paint on the sill guard railing on the north side of the west graving dock. Sample SGR-P1. Sample SGR-P2, P3, and P8 similar (photo not provided).

Photograph 8: Lead-based grey paint on the sill guard rail on the south side of the east graving dock. Sample SGR-P4. Sample SGR-P5, P6, and P7 similar (photo not provided).

Appendix II

Laboratory Analytical Report

Your Project #: 647993
Site Location: EGD, ESQUIMALT, BC
Your C.O.C. #: G123097, G123098

Attention:Doug McMillan

SNC-LAVALIN INC.
BURNABY, ENVIRONMENT DIVISION
8648 COMMERCE COURT
BURNABY, BC
CANADA V5A 4N6

Report Date: 2017/06/29
Report #: R2405324
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B751526
Received: 2017/06/26, 17:55

Sample Matrix: PAINT
Samples Received: 17

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
ICP-AES Metals in TCLP Leachate	1	2017/06/29	2017/06/29	BBY7SOP-00018	EPA 6010c R3 m
Elements by ICP-AES (acid extr. solid)	16	2017/06/27	2017/06/27	BBY7SOP-00018	EPA 6010c R3 m
TCLP pH Measurements (<100g sample used)	1	N/A	2017/06/29	BBY7SOP-00020	EPA 1311 R1992 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your Project #: 647993
Site Location: EGD, ESQUIMALT, BC
Your C.O.C. #: G123097, G123098

Attention:Doug McMillan

SNC-LAVALIN INC.
BURNABY, ENVIRONMENT DIVISION
8648 COMMERCE COURT
BURNABY, BC
CANADA V5A 4N6

Report Date: 2017/06/29
Report #: R2405324
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B751526
Received: 2017/06/26, 17:55

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
VJ Oco, Burnaby Project Manager
Email: VOco@maxxam.ca
Phone# (604)639-8422

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B751526
Report Date: 2017/06/29

SNC-LAVALIN INC.
Client Project #: 647993
Site Location: EGD, ESQUIMALT, BC
Sampler Initials: MA

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		RJ5146	
Sampling Date		2017/06/26 13:15	
COC Number		G123097	
	UNITS	**HR-P2-LEACH**	**QC Batch**
TCLP Extraction Procedure			
Initial pH of Sample	pH	6.94	8679218
pH after HCl	pH	1.37	8679218
Final pH of Leachate	pH	5.33	8679218
pH of Leaching Fluid	pH	4.93	8679218

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Maxxam Job #: B751526
Report Date: 2017/06/29

SNC-LAVALIN INC.
Client Project #: 647993
Site Location: EGD, ESQUIMALT, BC
Sampler Initials: MA

LEAD IN PAINT CHIPS (PAINT)

Maxxam ID		RJ5138	RJ5139	RJ5140	RJ5141	RJ5142	RJ5143	RJ5144		
Sampling Date		2017/06/26 09:40	2017/06/26 09:53	2017/06/26 10:00	2017/06/26 10:15	2017/06/26 10:20	2017/06/26 10:30	2017/06/26 10:35		
COC Number		G123097	G123097	G123097	G123097	G123097	G123097	G123097		
	UNITS	HR-P1	HR-P2	HR-P3	HR-P4	HR-P5	HR-P6	HR-P7	RDL	QC Batch
Total Metals by ICP										
Total Lead (Pb)	mg/kg	41300	58300	54000	42600	132000	48300	164000	3.0	8677212
RDL = Reportable Detection Limit										

Maxxam ID		RJ5145	RJ5147	RJ5148	RJ5149	RJ5150		RJ5151		
Sampling Date		2017/06/26 10:42	2017/06/26 11:30	2017/06/26 11:40	2017/06/26 11:55	2017/06/26 12:10		2017/06/26 12:20		
COC Number		G123097	G123097	G123098	G123098	G123098		G123098		
	UNITS	HR-P8	SGR-P1	SGR-P2	SGR-P3	SGR-P4	RDL	SGR-P5	RDL	QC Batch
Total Metals by ICP										
Total Lead (Pb)	mg/kg	37700	7570	8990	8380	25500	3.0	24300 (1)	6.0	8677212
RDL = Reportable Detection Limit										
(1) Detection limits raised due to insufficient sample volume.										

Maxxam ID		RJ5152		RJ5153		RJ5154		
Sampling Date		2017/06/26 12:30		2017/06/26 12:45		2017/06/26 12:55		
COC Number		G123098		G123098		G123098		
	UNITS	SGR-P6	RDL	SGR-P7	RDL	SGR-P8	RDL	QC Batch
Total Metals by ICP								
Total Lead (Pb)	mg/kg	7410	3.0	25300 (1)	9.0	12100	3.0	8677212
RDL = Reportable Detection Limit								
(1) Detection limits raised due to insufficient sample volume.								

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Maxxam Job #: B751526
Report Date: 2017/06/29

SNC-LAVALIN INC.
Client Project #: 647993
Site Location: EGD, ESQUIMALT, BC
Sampler Initials: MA

TCLP LEAD BY ICP (PAINT)

Maxxam ID		RJ5146		
Sampling Date		2017/06/26 13:15		
COC Number		G123097		
	UNITS	**HR-P2-LEACH**	**RDL**	**QC Batch**
Metals				
LEACHATE Lead (Pb)	mg/L	62.9	0.30	8680612
RDL = Reportable Detection Limit				

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Maxxam Job #: B751526
Report Date: 2017/06/29

SNC-LAVALIN INC.
Client Project #: 647993
Site Location: EGD, ESQUIMALT, BC
Sampler Initials: MA

GENERAL COMMENTS

Sample RJ5146 [HR-P2-LEACH] : Insufficient sample received to use standard sample weight (100g) for TCLP extraction as per Reference Method EPA 1311 R1992. The uncertainty of the analysis may be increased.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B751526
Report Date: 2017/06/29

QUALITY ASSURANCE REPORT

SNC-LAVALIN INC.
Client Project #: 647993
Site Location: EGD, ESQUIMALT, BC
Sampler Initials: MA

			Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8677212	Total Lead (Pb)	2017/06/27			<3.0	mg/kg	NC	35	91	80 - 120
8680612	LEACHATE Lead (Pb)	2017/06/29	101	75 - 125	<0.30	mg/L				

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam
A Bureau Veritas Group Company

CHAIN OF CUSTODY RECORD

G123097
BBY FCD-00077/07
Page 1 of 2

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5, Toll Free (800) 665-8566

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: SNC-Lavalin Inc.	Company Name:	Quotation #: SNC-Lavalin Pricing	☐ Regular, TAT 5 days (Most analyses)
Contact Name: Doug McMillan / Aaron Hall	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 8648 Commerce Court Burnaby, BC PC: V5A 4N6	Address: PC:	Project #: 647993	Rush TAT (Surcharges will be applied)
Phone: 604-515-5151	Phone: aaron.hall@snclavalin.com	Site Location: EGD, Esquimalt, BC	☐ Same Day ☒ 2 Days
Email: doug.mcmillan@snclavalin.com	Email:	Site #:	☐ 1 Day ☐ 3 Days
		Sampled By: MAH	Date Required:
			Rush Confirmation #:

Regulatory Criteria	Special Instructions
☐ BC CSR Soil ☐ BC CSR Water	☐ Return Cooler
☐ YK CSR Soil ☐ YK CSR Water	☐ Ship Sample Bottles (Please Specify)
☐ CCME (Specify) ☐ Other (Specify)	
<90 mg/kg	
☐ Drinking Water ☐ BC Water Quality	

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	BTEXS / VPH	BTEX / F1	PAH	EPH	Dissolved Metals	Dissolved Mercury	Total Metals	Total Mercury	Chloride	TSS	pH	Nitrite	Lead in Paint	Leachable Lead (TCLP)	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	COMMENTS
1	HR-P1	2017/06/26	0940	Paint													X		1		
2	HR-P2	2017/06/26	0953	Paint													X		1		
3	HR-P3	2017/06/26	1000	Paint													X		1		
4	HR-P4	2017/06/26	1015	Paint													X		1		
5	HR-P5	2017/06/26	1020	Paint													X		1		
6	HR-P6	2017/06/26	1030	Paint													X		1		
7	HR-P7	2017/06/26	1035	Paint													X		1		
8	HR-P8	2017/06/26	1042	Paint													X		1		LIMITED SAMPLE VOLUME (MASS)
9	HR-P2-LEACH	2017/06/26	1315	Paint														X	4		Please complete test with duplicate
10	SGR-P1	2017/06/26	1130	Paint													X		1		

LABORATORY USE ONLY

CUSTODY SEAL Y / N		COOLER TEMPERATURES
Present	Intact	
N/A		N/A

COOLING MEDIA PRESENT Y / N

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
M. Aaron Hall	2017/06/26	1755	PEDRO TACK	2017/06/26	17:55

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at

COC-1020

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Maxxam
A Bureau Veritas Group Company

CHAIN OF CUSTODY RECORD

G123098
BBY FCD-00077/07
Page 2 of 2

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5. Toll Free (800) 665-8566

Invoice Information

Company Name: SNC-Lavalin Inc.
Contact Name: Doug McMillan / Aaron Hall
Address: 8648 Commerce Court
Burnaby, BC PC: V5A 4N6
Phone: 604-515-5151
Email: doug.mcmillan@snclavalin.com

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
PC:
Phone: aaron.hall@snclavalin.com
Email:

Project Information (where applicable)

Quotation #: SNC-Lavalin Pricing
P.O. #/ AFE#:
Project #: 647993
Site Location: EGD, Esquimalt, BC
Site #:
Sampled By: MAH

Turnaround Time (TAT) Required

☐ Regular TAT 5 days (Most analyses)
PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Rush TAT (Surcharges will be applied)
☐ Same Day ☒ 2 Days
☐ 1 Day ☐ 3 Days
Date Required:
Rush Confirmation #:

Regulatory Criteria

☐ BC CSR Soil ☐ BC CSR Water
☐ YK CSR Soil ☐ YK CSR Water
☐ CCME (Specify) ☐ Other (Specify)
< 90mg/kg
☐ Drinking Water ☐ BC Water Quality

Special Instructions

☐ Return Cooler
☐ Ship Sample Bottles (Please Specify)

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	Sample Identification	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	Lead in Paint	Leachable Lead (TCLP)	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	SGR-P2	2017/06/26	1140	Paint	X		1	
2	SGR-P3	2017/06/26	1155	Paint	X		1	
3	SGR-P4	2017/06/26	1210	Paint	X		1	
4	SGR-P5	2017/06/26	1220	Paint	X		1	
5	SGR-P6	2017/06/26	1230	Paint	X		1	
6	SGR-P7	2017/06/26	1245	Paint	X		1	
7	SGR-P8	2017/06/26	1255	Paint	X		1	
8								
9								
10								

Analysis Requested columns: MTBE; VOC / BTEX / VPH; VOC / BTEX / F1; LEPH/HEPH/PAH; F2 - F4; Preserved?; Filtered?; Dissolved Metals; Preserved?; Filtered?; Dissolved Mercury; Field Preserved?; Total Metals; Field Preserved?; Total Mercury; Sulphate; Fluoride; Chloride; COD; BOD; TDS; TSS; Alkalinity; Conductivity; pH; Ammonia; Nitrate; Nitrite; BTEX / VPH; BTEX / F1; PAH; EPH; Dissolved Metals; Dissolved Mercury; Total Metals; Total Mercury; Chloride; TSS; pH; Nitrite

LABORATORY USE ONLY

CUSTODY SEAL Y / (N)

Present	Intact	COOLER TEMPERATURES
N/A		N/A

COOLING MEDIA PRESENT Y / (N)

COMMENTS

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
M. Aaron Hall	2017/06/26	1755	PEDRO TACK	2017/06/26	17:55

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Appendix III

Analytical Laboratory Accreditation

CALA

Canadian Association for
Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 2168
Laboratory Name: Maxxam Analytics (Burnaby, Canada Way)
Parent Institution: Maxxam Analytics International Corporation
Address: 4606 Canada Way Burnaby BC V5G 1K5
Contact: Mr. Ray Chapman-Chen
Phone: (604) 639-2619
Fax: (604) 731-2386
Email: rchen2@maxxam.ca

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served: All Interested Parties
Revised On: March 9, 2017
Valid To: August 11, 2019

Scope of Accreditation

Air (Inorganic)
Metals - Air Filter (183)
BBY7SOP-00002, BBY7SOP-00016; modified from EPA SW-846 6020A
ICP/MS - DIGESTION
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Chromium
Cobalt
Copper
Iron
Lead
Manganese
Molybdenum
Nickel
Phosphorous
Selenium
Silver
Strontium
Vanadium
Zinc

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The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at http://www.cala.ca/cala_directories.html

Air (Inorganic)
Metals - Occupational Health (Cassettes) (015)
BBY7SOP-00016, BBY7SOP-00018; modified from NIOSH 7303
ICP - DIGESTION
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Molybdenum
Nickel
Phosphorous
Potassium
Selenium
Silver
Sodium
Strontium
Sulphur
Tin
Titanium
Vanadium
Zinc
Zirconium

Air (Inorganic)
Total Particulates - Air (181)
BBY5SOP-00005; modified from BC MOE LAB MANUAL G, and EPA/600/R-94/038B
GRAVIMETRIC
Particulate>2.5 microns

Air (Organic)
Polycyclic Aromatic Hydrocarbons (PAH) - Air (281)
BBY8SOP-00027; PREPARATION: modified from BC MOE LAB MANUAL H: modified from EPA SW-846 8270D
GC/MS
Acenaphthene
Acenaphthylene
Anthracene
Benz(a)anthracene
Benzo(a)pyrene
Benzo(b&j)fluoranthene
Benzo(e)pyrene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Chrysene
Dibenz(a,h)anthracene

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Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
Naphthalene
Perylene
Phenanthrene
Pyrene

Air (Organic)
Volatile Hydrocarbons - Air (184)
BBY5SOP-00031; BC MOE LAB MANUAL SECTION H
GC/MS - THERMAL DESORPTION
VHv6-13/VPHv

Air (Organic)
Volatile Organic Compounds (VOC) - Air (180)
BBY5SOP-00031; modified from BC MOE LAB MANUAL SECTION H
GC/MS - THERMAL DESORPTION
1,1-Biphenyl
1,1-Dichloroethane
1,1-Dichloroethene
1,1-Dichloropropene
1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-tetrachloroethane
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3-Butadiene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,3,5-Trimethylbenzene
1,4-Dichlorobenzene
2-Butanone (MEK)
2-Chlorophenol
2-Chlorotoluene
2-Hexanone (MBK)
2,2-Dichloropropane
4-Chlorotoluene
4-isopropyltoluene (cymene)
4-Methyl-2-pentanone (MIBK)
Benzene
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Butyl Acetate
Carbon tetrachloride

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Chlorobenzene
Chloroethane
Chloroform
cis-1,2-Dichloroethene
cis-1,3-Dichloropropene
Dibromochloromethane
Dibromomethane
Dichlorodifluoromethane (Freon12)
Dichloromethane
Epichlorohydrin
Ethyl Benzene
Hexachlorobutadiene
Isobutanol
Isopropanol
Isopropylbenzene (cumene)
m/p-xylene
Methylcyclohexane
MTBE
n-Butylbenzene
n-Decane (c10)
n-Dodecane (c12)
n-Hexane (c6)
n-Propylbenzene (isocumene)
n-Tridecane (c13)
Naphthalene
Nitrobenzene
o-xylene
Phenol
sec-Butylbenzene
Styrene
t-Butylbenzene (dimethylethylbenzene)
Tetrachloroethene
Toluene
trans-1,3-Dichloropropene
Trichloroethene
Trichlorofluoromethane (Freon11)
Trichlorotrifluoroethane (Freon 113)
Vinyl Chloride

Leachate (Inorganic)
Cyanide - Leachates (304)
BBY6SOP-00004, BBY7SOP-00009; prep: modified from BC REG 63/88, SCHEDULE 4, PART 2 ANALYTICAL: modified from SM 4500 CN- O
COLOR - DISTILLATION
Cyanide (WAD)

Leachate (Inorganic)
Fluoride - Leachates (300)
BBY6SOP-00048, BBY7SOP-00009; PREP: modified from BC REG 63/88, SCHEDULE 4, PART 2; ANALYTICAL: modified from SM 4500 F-C
ION SELECTIVE ELECTRODE - (BC MLEP/MODIFIED WEP)
Fluoride

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Leachate (Inorganic)
Metals (BC MLEP/Modified SWEP) - Leachates (308)
BBY7SOP-00001, BBY7SOP-00009; prep: modified from BC REG 63/88, SCHEDULE 4, PART 2 AND ANALYTICAL: EPA SW846 METHOD 6020 B

ICP/MS
Antimony
Arsenic
Barium
Beryllium
Boron
Chromium
Copper
Lead
Mercury
Selenium
Silver
Thallium
Uranium
Zinc

Soil (Inorganic)
Hot Water Soluble Boron - Soil (301)
BBY7SOP-00006, BBY7SOP-00018; PREP: BC MOE LAB MANUAL SECTION C; ANALYTICAL: MODIFIED FROM USEPA SW-846 METHOD 6010 C

ICP/OES
Soluble Boron

Solids (Inorganic)
Chloride - Soil, Saturated Paste (185)
BBY6SOP-00011, BBY6SOP-00030; modified from SM 4500 Cl- E and modified from SSMA, CHAPTER 15, SECTION 15.2.1

AUTO COLOR - KONELAB
Chloride

Solids (Inorganic)
Conductivity - Sat Paste Extract (279)
BBY6SOP-00029; modified from SM 2510 B

CONDUCTIVITY METER
Conductivty

Solids (Inorganic)
Extractable Metals - Soil (303)
BBY6SOP-00030, BBY7SOP-00018; PREP: CARTER, M.R., CHAPTER 15, SECTION 15.2.1, 2008 ANALYTICAL: modified from USEPA SW-846 METHOD 6010 C

ICP/OES
Soluble Calcium
Soluble Magnesium
Soluble Potassium
Soluble Sodium
Soluble Sulphur

Solids (Inorganic)
Flashpoint - Soil (260)
BBY6SOP-00042; modified from ASTM D3828-12a

SETA FLASH CLOSED TESTER
Flashpoint C

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Solids (Inorganic)
Free Liquid - Soil, Waste (261)
BBY6SOP-00043; modified from EPA SW-846 9095B
VISUAL EXAMINATION
Free Liquid

Solids (Inorganic)
Hexavalent Chromium - Soil (302)
BBY6SOP-00015; modified from SM 3500 Cr B
COLORIMETRIC
Hexavalent Chromium

Solids (Inorganic)
Hot Water Soluble Boron - Soil (171)
BBY7SOP-00001, BBY7SOP-00006; modified from BC MOE LAB MANUAL C (PREPARATION) and modified from EPA SW-846 6020B (ANALYTICAL)
ICP/MS - EXTRACTION
Boron

Solids (Inorganic)
Leachable Metals - Soil (100% SOLID MATRICES ONLY) (187)
BBY7SOP-00001, BBY7SOP-00005; EPA SW-846 1311 (LEACH) and modified from EPA 6020B (ANALYSIS)
ICP/MS - TCLP
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Calcium
Chromium
Copper
Lead
Mercury
Molybdenum
Selenium
Silver
Thallium
Uranium
Zinc

Solids (Inorganic)
Lead - Paint (254)
BBY7SOP-00017, BBY7SOP-00018; modified from BC MOE LAB MANUAL SECTION C
ICP/OES - DIGESTION
Lead

Solids (Inorganic)
Mercury - Soil, Sediment (038)
BBY7SOP-00004, BBY7SOP-00012; modified from BC MOE LAB MANUAL SECTION C and EPA 245.7
COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION
Mercury

Solids (Inorganic)
Metals - Soil, Sediment (037)
BBY7 SOP-00004, BBY7-00018; modified from BC MOE LAB MANUAL SECTION C and modified from EPA SW -846 6010C
ICP - DIGESTION
Aluminum

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Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Molybdenum
Nickel
Phosphorus
Potassium
Selenium
Silver
Sodium
Strontium
Tin
Titanium
Vanadium
Zinc
Zirconium

Solids (Inorganic)
Metals - Soil, Sediment (116)
BBY6SOP-00007, BBY7SOP-00001; modified from EPA SW-846 6020B and modified from EPA 821-R-91-100
ICP/MS
Cadmium
Copper
Lead
Nickel
Zinc

Solids (Inorganic)
Mineral Oil and Grease - Soil (188)
BBY8SOP-00007; modified from BC MOE LAB MANUAL SECTION D
GRAVIMETRIC - EXTRACTION
Mineral Oil and Grease

Solids (Inorganic)
Moisture (%) - Soil (189)
BBY8SOP-00017; modified from ONTARIO MOE E3139
GRAVIMETRIC
Moisture (%)

Solids (Inorganic)
Nitrite/Nitrate+Nitrite - Soil, Leachate (190)
BBY6SOP-00010, BBY6WI-00009; modified from SM 4500-NO3- I
AUTO COLOR
Nitrate + Nitrite Nitrogen
Nitrite

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Solids (Inorganic)
Oil and Grease - Soil (191)
BBY8SOP-00006; modified from BC MOE LAB MANUAL SECTION D
GRAVIMETRIC - EXTRACTION
Total Oil and Grease

Solids (Inorganic)
pH - Saturated Paste Extract (278)
BBY6SOP-00025; modified from SM 4500-H+ B
pH METER
pH

Solids (Inorganic)
pH - Soil/Leachate (192)
BBY6SOP-00028; modified from SM 4500-H+ B and modified from BC MOE LAB MANUAL SECTION B
PH METER
pH

Solids (Inorganic)
Saturated Paste - Soil (193)
BBY6SOP-00030; modified from SOIL SAMPLING AND METHOD OF ANALYSIS, CHAPTER 15, SECTION 15.2.1
GRAVIMETRIC
Saturated Paste

Solids (Inorganic)
Sulfate - Soil (194)
BBY6SOP-00017, BBY6SOP-00030; modified from SOIL SAMPLING AND METHOD OF ANALYSIS, CHAPTER 15, SECTION 15.2.1
AUTO COLOR - KONELAB
Sulfate

Solids (Inorganic)
Sulphide - Soil (195)
BBY6SOP-00006, BBY6SOP-00007; modified from EPA 821-R-91-100 and modified from SM 4500 S2- D
SPECTROPHOTOMETRIC- METHYLENE BLUE
Acid Volatile Sulfide

Solids (Inorganic)
Total Metals - Soil (196)
BBY7SOP-00001, BBY7SOP-00004; modified from EPA SW-846 6020B and BC MOE LAB MANUAL SECTION C
ICP/MS - DIGESTION
Aluminum
Antimony
Arsenic
Barium
Bismuth
Cadmium
Calcium
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Molybdenum
Phosphorus
Potassium

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Selenium
Silver
Sodium
Strontium
Tellurium
Thallium
Tin
Titanium
Vanadium
Zinc
Zirconium

Solids (Organic)
BTEX - Soil (Unit# 25) (101)
BBY8SOP-00032; modified from EPA SW-846 8021B and EPA SW-846 5035
GC/PID - DIRECT INJECTION
Benzene
Ethylbenzene
m/p-xylene
o-xylene
Styrene
Toluene

Solids (Organic)
BTEX (Unit#378) - Soil, Sediment (297)
BBY8SOP-00046; BC MOE LAB MANUAL SECTION D
GC/PID - HEADSPACE
Benzene
Ethylbenzene
m/p-xylene
o-xylene
Toluene

Solids (Organic)
BTEX, MTBE, Styrene - Soil (198)
BBY8SOP-00010; modified from EPA SW-846 8260C and EPA SW-846 5021A and EPA SW-846 5035
GC/MS - HEADSPACE
Benzene
Ethylbenzene
m/p-xylene
Methyl t-butyl ether
o-xylene
Styrene
Toluene

Solids (Organic)
Extractable Petroleum Hydrocarbons (EPH) - Soil (202)
BBY8SOP-00029; modified from BC MOE LAB MANUAL D
GC/FID - EXTRACTION
EPH (C10-C19)
EPH (C19-C32)

Solids (Organic)
Extractable Petroleum Hydrocarbons (EPH) - Soil (Unit# 378) (273)
BBY8SOP-00029; modified from BC MOE LAB MANUAL SECTION D
GC/FID - EXTRACTION
EPH C10-19
EPH C19-C32

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Solids (Organic)
Extractable Petroleum Hydrocarbons (EPH) - Soil, Sediment (Unit#25) (099)
BBY8SOP-00029; modified from BC MOE LAB MANUAL SECTION D

GC/FID - EXTRACTION
EPH (C10-C19)
EPH (C19-C32)

Solids (Organic)
Leachable Polycyclic Aromatic hydrocarbons (PAH) -- Soil (100% SOLID MATRICES ONLY) (307)
BBY7SOP-00005, BBY8SOP-00021; PREP: modified from EPA SW846 8270 D AND ANALYTICAL: modified from EPA SW-846

GC/MS
1-Methylnaphthalene
1,4-Dimethylnaphthalene
2-Methylnaphthalene
3-Methylcholanthrene
7,12-Dimethylbenz (a) anthracene
9-Methylanthracene
9,10-Dimethylanthracene
Acenaphthene
Acenaphthylene
Acridine
Anthracene
Benz (c) phenanthrene
Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b&j) fluoranthene
benzo(e)fluoranthene
Benzo (e) pyrene
Benzo (g,h,i) perylene
Benzo (k) fluoranthene
Chrysene
Dibenz (a,h) pyrene
Dibenz (a,i) pyrene
Dibenz (a,l) pyrene
Dibenzo (a,h) anthracene
Fluoranthene
Fluorene
Indeno (1,2,3 - cd) pyrene
Naphthalene
Perylene
Phenanthrene
Pyrene
Quinoline

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (205)
BBY8SOP-00030; CCME - REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 METHOD

GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

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Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (206)
BBY8SOP-00012; CCME - REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 METHOD
GC/FID - HEADSPACE
F1: C6-C10

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (264)
BBY8SOP-00003; CCME REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 METHOD
GRAVIMETRIC - SOXHLET
F4: Gravimetric

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (100% SOLID SAMPLES ONLY) (259)
BBY8SOP-000015, BBY8SOP-00009; EPA SW-846 1311 (LEACH) AND EPA SW-846 8260C (ANALYSIS)
TCLP ZERO GC/MS - HEADSPACE
1,1-Dichloroethylene
1,1,1-trichloroethane
1,1,1,2-tetrachloroethane
1,1,2-trichloroethane
1,1,2,2-tetrachloroethane
1,2-Ddichloropropane
1,2-dibromoethane
1,2-Dichlorobenzene
1,2-Dichloroethane
1,3-dichlorobenzene
1,4-Dichlorobenzene
Benzene
Bromodichloromethane
Bromoform
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,2-dichloroethene
cis-1,3-dichloropropene
Dichloromethane
Ethylbenzene
m & p -Xylene
Methyl-tert-butylether (MTBE)
o-Xylene
Styrene
Tetrachloroethylene
Toluene
trans-1,2-dichloroethene
trans-1,3-dichloropropene
Trichloroethylene
Trichlorofluorometahne
Vinyl chloride
Xylenes (Total)

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Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (Unit# 25) (258)
BBY8SOP-00030; CCME REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 METHOD
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (Unit# 378) (274)
BBY8SOP-00030; CCME REFERENCE METHOD FOR THE CANADA-WIDE PHCS IN SOIL - TIER 1 METHOD.
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Solids (Organic)
Phenols - Soil (207)
BBY8SOP-00025; modified from EPA SW-846 3510C (PREPARATION) and modified from EPA SW-846 8270D (ANALYSIS)
GC/MS - EXTRACTION
2-Chlorophenol
2-Methyl-4,6-Dinitrophenol
2-Methylphenol
2-Nitrophenol
2,3,4,6 Tetrachlorophenol
2,3,5,6-Tetrachlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,6-Dichlorophenol
3+4 Methylphenol
4-Nitrophenol
Pentachlorophenol
Phenol

Solids (Organic)
Polycyclic Aromatic Hydrocarbons (PAH) - Soil (208)
BBY8SOP-00022, BBY8SOP-00038; modified from EPA SW-846 8270D and EPA SW-846 3570
GC/MS - SHAKE EXTRACTION
1-Methylnaphthalene
1-Methylphenanthrene
1,4-Dimethylnaphthalene
2-Methylnaphthalene
2,3,5-Trimethylnaphthalene
2,6-Dimethylnaphthalene
3-Methylcholanthrene
7,12-Dimethylbenz (a) anthracene
9-Methylanthracene
9,10-Dimethylanthracene
Acenaphthene
Acenaphthylene
Anthracene
Benz(c)phenanthrene

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Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b) fluoranthene
Benzo (e) fluoranthene
Benzo (e) pyrene
Benzo (g,h,i) perylene
Benzo (k) fluoranthene
Chrysene
Dibenz (a,h) pyrene
Dibenz (a,i) pyrene
Dibenz (a,l) pyrene
Dibenzo (a,h) anthracene
Fluoranthene
Fluorene
Indeno (1,2,3 - cd) pyrene
Naphthalene
Perylene
Phenanthrene
Pyrene

Solids (Organic)
Tributylin - Soil (276)
BBY8SOP-00050; modified from RESTEK CORP APPLICATION NOTE# 59550
GC/MS
Tributylin Tin (TBT)

Solids (Organic)
Volatile Hydrocarbon (Unit# 378) - Soil, Sediment (296)
BBY8SOP-00046; BC LAB MANUAL SECTION D
GC/FID - HEADSPACE
F1: C6-C10

Solids (Organic)
Volatile Hydrocarbons (VH) - Soil, Sediment (Unit# 25) (133)
BBY8SOP-00032; modified from BC MOE LAB MANUAL SECTION D
GC/FID
F1: C6-C10

Solids (Organic)
Volatile Organic Compounds (VOC) - Soil (213)
BBY8SOP-00009, BBY8WI-00011; modified from EPA SW-846 8260C and modified from EPA SW-846 5021
GC/MS - HEADSPACE
1,1-Dichloroethane
1,1-dichloroethylene
1,1,1 - Trichloroethane
1,1,1,2- Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-dichlorobenzene
1,2-dichloroethane
1,2-Dichloropropane
1,3-Dichlorobenzene
1,4-dichlorobenzene
Benzene
Bromodichloromethane
Bromoform
Bromomethane

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Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dichloromethane
Ethylbenzene
Ethylene Dibromide
m/p-xylene
Methyl t-butyl ether
o-xylene
Styrene
Tetrachloroethylene
Toluene
trans,1,3-dichloropropene
trans-1,2-Dichloroethylene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

Solids (Organic)
Volatile Petroleum Hydrocarbons (VPH) - Soil (214)
BBY8SOP-00011; modified from BC MOE LAB MANUAL D
GC/FID - HEADSPACE
F1: C6-C10

Solids (Toxicology)
Chironomids - Sediment (150)
BBY2SOP-00010; EPS 1/RM/32
SURVIVAL AND GROWTH
Chironomids (10 days)

Solids (Toxicology)
Echinoid Larval Development - Sediment (298)
BBY2SOP-00062; EPS 1/RM/58
GROWTH AND SURVIVAL
Echinoid Larval Development (48hr)

Solids (Toxicology)
Hyalella azteca - Sediment (149)
BBY2SOP-00011; EPS 1/RM/33
SURVIVAL AND GROWTH
Hyalella azteca (14d)

Solids (Toxicology)
Marine Amphipods - Sediment (151)
BBY2SOP-00012; EPS 1/RM/26 and EPS 1/RM/35
ACUTE LETHALITY (SURVIVAL)
Marine Amphipods (10 day)

Solids (Toxicology)
Microtox - Solid Phase - Soil, Sediment (152)
BBY2SOP-00014; EPS 1/RM/42
BIOLUMINESCENCE
Microtox IC50

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Tissue (Inorganic)
Mercury - Tissue (255)
BBY7SOP-00012, BBY7SOP-00013; modified from EPA 200.3 and modified from EPA 245.7
COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION
Mercury

Tissue (Inorganic)
Total Metals - Tissue (215)
BBY7SOP-00002, BBY7SOP-00021; modified from EPA SW-846 6020B and BC MOE LAB MANUAL SECTION C
ICP/MS
Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Phosphorus
Potassium
Selenium
Silicon
Silver
Sodium
Strontium
Sulfur
Tellurium
Thallium
Tin
Titanium
Uranium
Vanadium
Zinc
Zirconium

Water (Inorganic)
Acidity - Water (137)
BBY6SOP-00037; modified from SM 2310 B
TITRATION
Acidity (pH 8.3)

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Water (Inorganic)
Alkalinity - Water (216)
BBY6SOP-00026; modified from SM 2320 B
TITRIMETRIC - AUTOMATED
Alkalinity (pH 4.5)

Water (Inorganic)
Ammonia (N) - Water (217)
BBY6SOP-00009; modified from EPA 350.1 and SM 4500 NH3-G
AUTO COLOR - PHENATE
Ammonia

Water (Inorganic)
Biochemical Oxygen Demand (BOD) - Water (218)
BBY6SOP-00045; modified from SM 5210 B
D.O. METER
BOD (5 day)
CBOD (5 day)

Water (Inorganic)
Carbon - Water (233)
BBY6SOP-00003; modified from SM 5310 C
COLORIMETRIC
Organic Carbon

Water (Inorganic)
Carbon - Water (277)
BBY6SOP-00018; modified from SM 5310 C
COLORIMETRIC
Carbon (Total Inorganic)

Water (Inorganic)
Chemical Oxygen Demand (COD) - Water (220)
BBY6SOP-00024; modified from SM 5220 D
TITRIMETRIC - DIGESTION
COD

Water (Inorganic)
Chloride - Water (221)
BBY6SOP-00011; modified from SM 4500-Cl- E
AUTO COLOR - KONELAB
Chloride

Water (Inorganic)
Chlorophyll A and Phaeophytins - Water (122)
BBY6SOP-00002; modified from SM 10200 H
UV/VIS/SPECTROPHOTOMETER
Chlorophyll A
Phaeophytins

Water (Inorganic)
Colour - Water (023)
BBY6SOP-00021; modified from SM 2120 B
VISUAL COMPARISON
Apparent Colour

Water (Inorganic)
Colour - Water (295)
BBY6SOP-00057; modified from SM 2120 C
SPECTROPHOTOMETRIC
True Colour

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Water (Inorganic)
Conductivity - Water (222)
BBY6SOP-00026; modified from SM 2510 B
CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic)
Conductivity - Water, Wastewater (156)
BBY0SOP-00006; modified from SM 2510 B
CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic)
Cyanide - Water (223)
BBY6SOP-00004, BBY6W1-00016; modified from SM 4500 CN- O and modified from EPA SW-846 9013
COLOR - DISTILLATION
Cyanide (SAD)
Cyanide (Weak Acid Digestion)

Water (Inorganic)
Dissolved and Extractable Metals - Water (004)
BBY7SOP-00018, BBY7WI-00004; modified from EPA SW-846 6010C
ICP
Aluminum (High)
Antimony
Arsenic
Barium (High)
Beryllium (High)
Bismuth (High)
Boron (High)
Cadmium (High)
Calcium
Chromium (High)
Cobalt (High)
Copper (High)
Iron (High)
Lead (High)
Lithium (High)
Magnesium
Manganese (High)
Molybdenum (High)
Nickel (High)
Phosphorus
Potassium
Selenium
Silicon
Silver (High)
Sodium
Strontium (High)
Sulphur
Tin (High)
Titanium (High)
Vanadium (High)
Zinc (High)
Zirconium (High)

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Water (Inorganic)
Dissolved Metals - Water (225)
BBY7WI-00004, BY7SOP-00002; modified from EPA SW-846 6020B
ICP/MS
Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Cesium
Chromium
Cobalt
Copper
Gold
Iron
Lanthanum
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Palladium
Phosphorus
Platinum
Potassium
Rubidium
Selenium
Silicon
Silver
Sodium
Strontium
Sulphur
Tellurium
Thallium
Thorium
Tin
Titanium
Tungsten
Uranium
Vanadium
Zinc
Zirconium

Water (Inorganic)
Fluoride - Water (226)
BBY6SOP-00048; modified from SM 4500-F- C
SELECTIVE ION ELECTRODE
Fluoride

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Water (Inorganic)
Hexavalent Chromium - Water (227)
BBY6SOP-00015; modified from SM 3500 CR B
COLORIMETRIC
Hexavalent Chromium

Water (Inorganic)
Mercury - Water (095)
BBY7SOP-00015; modified from BC MOE LAB MANUAL SECTION C
COLD VAPOUR ATOMIC FLUORESCENCE - DIGESTION
Mercury

Water (Inorganic)
Mercury (Ultra-Low Level) - Water (299)
BBY7SOP-00022; US EPA METHOD 1631
COLD VAPOUR ATOMIC FLUORESCENCE
Mercury

Water (Inorganic)
Metals (High Level) - Seawater (228)
BBY7SOP-00002, BBY7SOP-00007; modified from EPA 200.10
ICP/MS - CHELATION EXTRACTION
Aluminum
Cadmium
Cobalt
Copper
Iron
Lead
Manganese
Nickel
Titanium
Uranium
Vanadium
Zinc

Water (Inorganic)
Mineral Oil and Grease - Water (229)
BBY8SOP-00004; modified from BC MOE LAB MANUAL D
GRAVIMETRIC - EXTRACTION
Mineral Oil and Grease

Water (Inorganic)
Nitrite/ Nitrite+Nitrate - Water (230)
BBY6SOP-00010; modified from SM 4500 -NO3- I
AUTO COLOR
Nitrate plus Nitrite
Nitrite

Water (Inorganic)
Nitrogen - Water (231)
BBY6SOP-00016; modified from SM 4500-N C
AUTO COLOR - DIGESTION
Total Dissolved Nitrogen
Total Nitrogen

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Water (Inorganic)
Oil and Grease - Water (232)
BBY8SOP-00004; modified from BC MOE LAB MANUAL D
GRAVIMETRIC - EXTRACTION
Total Oil and Grease

Water (Inorganic)
pH - Water (155)
BBY0SOP-00003; modified from SM 4500-H+ B
pH METER
pH

Water (Inorganic)
pH - Water (234)
BBY6SOP-00026; modified from SM 4500-H+ B
pH METER - AUTOMATED
pH

Water (Inorganic)
Phosphorus - Water (236)
BBY6SOP-00013; modified from SM 4500-P- E
AUTO COLOR - KONELAB
Phosphate
Total Dissolved Phosphorus
Total Phosphorus

Water (Inorganic)
Reactive Silica - Water (237)
BBY6SOP-00014; modified from SM 4500-SiO2 E
AUTO COLOR
Reactive Silica

Water (Inorganic)
Solids - Water (238)
BBY6SOP-00033, BBY6SOP-00034; modified from SM 2540 C, D
GRAVIMETRIC
Total Dissolved Solids
Total Suspended Solids

Water (Inorganic)
Solids - Water (280)
BBY6SOP-00035; modified from SM 2540 A
GRAVIMETRIC
Total Solids
Total Solids Fixed

Water (Inorganic)
Sulphate - Water (239)
BBY6SOP-00017; modified from SM 4500-SO42- E
AUTO COLOR - KONELAB
Sulfate

Water (Inorganic)
Sulphide - Water (240)
BBY6SOP-00006; modified from SM 4500-S2- D
SPECTROPHOTOMETRIC - METHYLENE BLUE
Sulphide

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Water (Inorganic)
Total Metals - Seawater (241)
BBY7SOP-00002, BBY7SOP-00003; modified from EPA SW-846 6020B

- ICP/MS
- Aluminum
- Barium
- Beryllium
- Bismuth
- Boron
- Cadmium
- Calcium
- Chromium
- Cobalt
- Copper
- Iron
- Lead
- Magnesium
- Manganese
- Molybdenum
- Nickel
- Phosphorus
- Potassium
- Silicon
- Silver
- Sodium
- Strontium
- Sulfur
- Tellurium
- Thallium
- Titanium
- Vanadium
- Zinc
- Zirconium

Water (Inorganic)
Total Metals - Water (066)
BBY7SOP-00003, BBY7SOP-00018; modified from BC MOE LAB MANUAL SECTION C and EPA SW-846 6010C

- ICP - DIGESTION
- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Bismuth
- Boron
- Cadmium
- Calcium
- Chromium
- Cobalt
- Copper
- Iron
- Lead
- Lithium

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Magnesium
Manganese
Molybdenum
Nickel
Phosphorus
Potassium
Selenium
Silicon
Silver
Sodium
Strontium
Sulphur
Tin
Titanium
Vanadium
Zinc
Zirconium

Water (Inorganic)
Total Metals - Water (242)
BBY7SOP-00002, BBY7SOP-00003; modified from EPA SW-846 6020B and BC MOE LAB MANUAL SECTION C

ICP/MS - DIGESTION
Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Bromine
Cadmium
Calcium
Cesium
Chromium
Cobalt
Copper
Gold
Iron
Lanthanum
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Palladium
Phosphorus
Platinum
Potassium
Rubidium
Selenium
Silicon
Silver

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Sodium
Strontium
Sulphur
Tellurium
Tellurium
Thallium
Thorium
Tin
Titanium
Tungsten
Uranium
Vanadium
Zinc
Zirconium

Water (Inorganic)
Total Recoverable Phenols - Water (243)
BBY6SOP-00008; modified from SM 5530
AUTO COLOR - DISTILLATION
Total Phenolics

Water (Inorganic)
Turbidity - Water (244)
BBY6SOP-00027; modified from SM 2130 B
TURBIDIMETRIC
Turbidity

Water (Organic)
BTEX, MTBE, Styrene - Water (252)
BBY8SOP-00010; modified from EPA SW-846 8260C and EPA SW-846 5035 and EPA SW-846 5021A
GC/MS - HEADSPACE
Benzene
Ethylbenzene
m/p-xylene
Methyl t-butyl ether
o-xylene
Styrene
Toluene

Water (Organic)
Petroleum Hydrocarbons - Water (305)
BBY8SOP-00012 (ANALYSIS), BBY8SOP-00018 (PREP); modified from CCME CANADA-WIDE STANDARD FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 (DEC 2000)
GC/FID - HEADSPACE
F1: C6-C10

Water (Organic)
Petroleum Hydrocarbons (PHC) - Water (263)
BBY8SOP-00030; modified from CCME REF. METHOD FOR THE CANADA-WIDE STD. FOR PETROLEUM HYDROCARBONS IN SOIL-TIER 1 METHOD
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

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Water (Organic)
Phenols - Water (248)
BBY8SOP-00025; modified from EPA SW-846 3510C (PREPARATION) and modified from EPA SW-846 8270D (ANALYSIS)

GC/MS - EXTRACTION

2-Chlorophenol
2-Methyl-4,6-Dinitrophenol
2-Methylphenol
2-Nitrophenol
2,3-Dichlorophenol
2,3,4-Trichlorophenol
2,3,4,5 Tetrachlorophenol
2,3,4,6-tetrachlorophenol
2,3,5-Trichlorophenol
2,3,5,6-Tetrachlorophenol
2,3,6-Trichlorophenol
2,4 & 2,5-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4,5-Trichlorophenol
2,4,6-trichlorophenol
2,6-Dichlorophenol
3+4-Chlorophenol
3+4-Methylphenol
3,4-Dichlorophenol
3,4,5-Trichlorophenol
3,5-Dichlorophenol
4-Nitrophenol
Pentachlorophenol
Phenol

Water (Organic)
Polycyclic Aromatic Hydrocarbons (PAH) - Water (249)
BBY8SOP-00021; modified from EPA SW-846 8270D and EPA 3510C

GC/MS - EXTRACTION

1-Methylnaphthalene
1,4-Dimethylnaphthalene
2-Methylnaphthalene
3-Methylcholanthrene
7,12-Dimethylbenz (a) anthracene
9-Methylanthracene
9,10-Dimethylanthracene
Acenaphthene
Acenaphthylene
Acridine
Anthracene
Benz (c) phenanthrene
Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b&j) fluoranthene
benzo(e)fluoranthene
Benzo (e) pyrene
Benzo (g,h,i) perylene
Benzo (k) fluoranthene

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Chrysene
Dibenz (a,h) pyrene
Dibenz (a,i) pyrene
Dibenz (a,l) pyrene
Dibenzo (a,h) anthracene
Fluoranthene
Fluorene
Indeno (1,2,3 - cd) pyrene
Naphthalene
Perylene
Phenanthrene
Pyrene
Quinoline

Water (Organic)
Total Extractable Hydrocarbons (TEH) - Water (250)
BBY8SOP-00029; modified from BC MOE LAB MANUAL D
GC/FID - EXTRACTION
Total Extractable Hydrocarbons (TEH)

Water (Organic)
Volatile Hydrocarbons (VH) - Water (251)
BBY8SOP-00011; modified from BC MOE LAB MANUAL SECTION D
GC/FID - HEADSPACE
Volatile Hydrocarbons (VH C6-C10)

Water (Organic)
Volatile Organic Compounds (VOC) - Water (253)
BBY8SOP-00009; modified from EPA SW-846 8260C and EPA 5021A, EPA SW-846 5035
GC/MS - HEADSPACE
1,1-Dichloroethane
1,1-dichloroethylene
1,1,1-Trichloroethane
1,1,1,2-tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-dichlorobenzene
1,2-dichloroethane
1,2-Dichloropropane
1,3-Dichlorobenzene
1,4-dichlorobenzene
Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromoethane
Dibromomethane
Dichloromethane

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Ethylbenzene
Ethylene Dibromide
m/p-xylene
Methyl t-butyl ether
o-xylene
Styrene
Tetrabromomethane
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

Water (Toxicology)
Acute Fathead Minnow - Water (287)
BBY2SOP-00015; EPA-821-R-02-012
ACUTE LETHALITY
Fathead Minnow (96h)

Water (Toxicology)
Acute Topsmelt - Water (291)
BBY2SOP-00050; EPA-821-02-012
ACUTE LETHALITY
Topsmelt (96h)

Water (Toxicology)
Ceriodaphnia dubia - Water (139)
BBY2SOP-00001; EPS 1/RM/21
SURVIVAL AND REPRODUCTION
Ceriodaphnia dubia (7d)

Water (Toxicology)
Daphnia magna - Water (141)
BBY2SOP-00007; EPS 1/RM/11 and EPS 1/RM/14
LETHALITY
Daphnia LC50 (48 h)
Single Concentration (48h)

Water (Toxicology)
Echinoid Fertilization - Water (143)
BBY2SOP-00009; EPS 1/RM/27
FERTILIZATION SUCCESS
Echinoderm Fertilization (20 min)

Water (Toxicology)
Fathead Minnow - Water (147)
BBY2SOP-00002; EPS 1/RM/22
GROWTH AND SURVIVAL
Fathead Minnow (7d)

Water (Toxicology)
Lemna Minor Growth Inhibition - Water (289)
BBY2SOP-00053; EPS 1/RM/37
GROWTH INHIBITION
Lemna Minor (7d)

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Water (Toxicology)
Microtox - Liquid Phase - Water (144)
BBY2SOP-00013; EPS 1/RM/24
BIOLUMINESCENCE
Microtox IC50 (15 min)

Water (Toxicology)
Pseudokirchneriella subcapitata - Water (146)
BBY2SOP-00006; EPS 1/RM/25
GROWTH INHIBITION
Pseudokirchneriella subcapitata (72h)

Water (Toxicology)
Rainbow Trout - pH Stabilization - Water (294)
BBY2SOP-00061; EPS 1/RM/50
ACUTE LETHALITY (SURVIVAL)
Single Concentration (96h) pH-stabilized
Trout LC50 (96h) pH Stabilized

Water (Toxicology)
Rainbow Trout - Water (140)
BBY2SOP-00004; EPS 1/RM/9 and EPS 1/RM/13
LETHALITY
Single Concentration (96h)
Trout LC50 (96 h)

Water (Toxicology)
Topsmelt - Water (142)
BBY2SOP-00008; modified from EPA 600/R-95/136
SURVIVAL AND GROWTH
Topsmelt (7d)

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