# Construction Environmental Management Plan
# Rev 3.0
# Fraser Grain Terminal
# 11041 Elevator Road, Surrey, BC

Prepared for:
**FWS Western Ltd.**
275 Commerce Drive
Winnipeg, MB R3P 1B3

Prepared by:
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File: 2191-001.01
April 2019

Hemmera
An Ausenco Company

# APPENDIX A
# PROJECT PERMIT – 15-041

# VANCOUVER FRASER PORT AUTHORITY
# PROJECT AND ENVIRONMENTAL REVIEW
# PROJECT PERMIT

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| **PER No.:** | **15-041** |
| **Tenant:** | **Parrish & Heimbecker Ltd.** |
| **Project:** | **Fraser Grain Terminal - Grain Export Facility** |
| **Project Location:** | **11041 Elevator Rd, Surrey, BC** |
| **VFPA SID No.:** | **SUR360** |
| **Land Use Designation:** | **Port Terminal** |
| **Permit Holder(s):** | **Parrish & Heimbecker Ltd.** |
| **Category of Review:** | **D** |
| **Date of Approval:** | **NOVEMBER 9, 2018** |
| **Date of Expiry:** | **NOVEMBER 30, 2022** |

## PROJECT DESCRIPTION

For the purposes of this project permit, (the Permit), the project is understood to include the following works on Vancouver Fraser Port Authority (VFPA) property:

- Removal of existing Bekaert building slab, foundations, utilities and existing rail spur;
- Demolition of existing 25kV substation;
- Installation of utilities (water supply, sanitary sewer, stormwater, and electrical);
- Ground densification works (grout filled Rammed Aggregate Piers);
- Construction of semi-loop rail track, receiving track and rail crossing;
- Extensions to 3 Port Authority Rail Yard (PARY) rail tracks (Off-site works);
- Realignment of portion of existing JV Rail track;
- Construction of Rail Unloading Station;
- Construction of 20 x 3,500 tonne above-ground corrugated and galvanized silos, 35.6m x 14.6m;
- Construction of 4 x 400 tonne above-ground storage bins, 16.5m x 7.3m;
- Construction of 1 x 710 tonne above-ground storage bins, 16.5m x 10m;
- Installation of transfer steel tower containing 2 bulk weighers, 2 grain samplers and 3 bucket elevators;
- Construction of conveying equipment (comprising enclosed belt conveyors, supported by steel trusses);
- Installation of 3 stationary shiploaders with choke fed or cascading type telescoping loading spouts;
- Installation of Dust suppression systems on material handling equipment;
- Construction of integrated truck and railcar loading facility and container loading facility with associated container storage yard; and
- Construction of ancillary buildings – administration building, maintenance shop and electrical rooms.

## PROJECT AND ENVIRONMENTAL CONDITIONS

The Vancouver Fraser Port Authority (VFPA) has undertaken and completed a review of the Project in accordance with the *Canada Marine Act* and Section 5 of the Port Authorities Operations Regulations and, as applicable, Section 67 of the *Canadian Environmental Assessment Act*, 2012.



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If at any time the Permit Holder fails to comply with any of the project and environmental conditions set out in the Permit below, or if VFPA determines that the Permit Holder has provided any incomplete, incorrect or misleading information in relation to the Project, VFPA may, in its sole and absolute discretion, cancel its authorization for the Project or change the project and environmental conditions to which such authorization is subject.

Pursuant to Section 29 of the Port Authorities Operations Regulations, VFPA may also cancel its authorization for the Project, or change the project and environmental conditions to which such authorization is subject, if new information is made available to VFPA at any time in relation to the potential adverse environmental and other effects of the Project.

**The following are the project and environmental conditions that must be followed by the Permit Holder to mitigate potential or foreseeable adverse environmental and other effects.**

All VFPA Guidelines and Record Drawing Standards referenced in this document can be located at: https://www.portvancouver.com/development-and-permits/project-and-environmental-reviews/technical-guidelines/.

| No. | GENERAL CONDITIONS |
|---|---|
| 1. | The Permit Holder must have a valid lease, licence, or access agreement for the Project site prior to accessing the Project site or commencing construction or any other physical activities on the Project site. This Permit shall in no way limit any of the Permit Holder's obligations, or VFPA's rights, under such lease, licence, or access agreement. |
| 2. | The Permit Holder shall at all times and in all respects, comply with and abide by all applicable statutes, laws, regulations and orders from time to time in force and effect, including all applicable environmental, labour and safety laws and regulations. |
| 3. | This Permit in no way endorses or warrants the design, engineering, or construction of the Project and no person may rely upon this Permit for any purpose other than the fact that VFPA has permitted the construction of the Project, in accordance with the terms and conditions of this Permit. |
| 4. | The Permit Holder shall indemnify and save harmless VFPA in respect of all claims, losses, costs, fines, penalties or other liabilities, including legal fees, arising out of: (a) any bodily injury or death, property damage or any loss or damage arising out of or in any way connected with the Project; and (b) any breach by the Permit Holder of its obligations under this Permit. |
| 5. | The Permit Holder is responsible for locating all existing site services and utilities including any located underground. The Permit Holder is responsible for repair or replacement of any damage to existing site services and utilities, to the satisfaction of VFPA, that result from construction and operation of the Project. |
| 6. | The Permit Holder shall immediately notify Metro Vancouver of any actual or potential damage to Metro Vancouver infrastructure at: 604-985-1478. |
| 7. | The Permit Holder shall undertake and deliver the Project to total completion in a professional, timely and diligent manner in accordance with applicable standards and specifications set out in the sections above entitled Project Description and Information Sources, including the attached plans and drawings numbered **PER No. 15-041-A to V**. The |

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| | Permit Holder shall not carry out any other physical activities unless expressly authorized by VFPA. |
| 8. | The Permit Holder shall cooperate fully with VFPA in respect of any review by VFPA of the Permit Holder's compliance with this Permit, including providing information and documentation in a timely manner, as required by VFPA. The Permit Holder is solely responsible for demonstrating the Permit Holder's compliance with this Permit. |
| 9. | The Permit Holder shall review the Permit with all employees, agents, contractors, licensees and invitees working on the Project site, prior to such parties participating in any construction or other physical activities on the Project site. The Permit Holder shall be solely responsible for ensuring that all such employees, agents, contractors, licensees and invitees comply with this Permit. |
| 10. | The Permit Holder shall make available upon request by any regulatory authority (such as a Fishery Officer) a copy of this Permit. |
| 11. | Unless otherwise specified, the Permit Holder shall provide all plans, documents, and notices required under this Permit to the following email address: **per@portvancouver.com** and referencing **PER No.15-041**. |
| 12. | Unless otherwise specified, all plans, schedules, and other Project-related documentation that the Permit Holder is required to provide under this Permit must be to VFPA's satisfaction. |
| 13. | The Permit Holder shall prepare and submit a self-report form to VFPA demonstrating compliance with conditions at each of the following project phases:<br>a) Prior to construction Conditions (self-report shall be submitted a minimum of 15 business days prior to the commencement of construction, or any physical activities, to a maximum of 90 business days prior to construction, or any physical activities)<br>b) Construction Conditions (self-report shall be submitted bi-annually during construction)<br>c) Conditions Upon Project Completion (self-report shall be submitted within 60 business days of completion of construction)<br>d) Conditions Prior to Operations (self-report shall be submitted 15 business days prior to operation) |
| 14. | VFPA shall have unfettered access to environmental compliance documentation and the Project site at all times during construction without notice. |
| 15. | The Permit Holder must maintain and retain any records associated with, or produced by, actions or activities undertaken to achieve compliance or that indicate non-compliance with project permit conditions. These records must be made available at the request of VFPA. |
| 16. | The Permit Holder shall provide VFPA with updated mitigation plans for review and acceptance, such as the construction environmental management plan, if these plans are modified or new procedures are created to address site conditions not previously addressed in the plans submitted as part of the application. |
| 17. | All non-road diesel equipment in use within VFPA jurisdiction shall be reported as required under the Non-Road Diesel Equipment Program (http://www.portvancouver.com/environment/air-energy-climate-action/cargo-handlingequipment/nrde/). |
| 18. | All conditions in this Permit which expressly or by their nature survive expiration or termination of this Permit will remain in effect after the expiration or termination of this Permit. |



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| | CONDITIONS - PRIOR TO COMMENCING CONSTRUCTION OR ANY PHYSICAL ACTIVITIES | SUBMISSION TIMING (business days) |
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| 19. | The Permit Holder shall submit signed and sealed drawings for proposed works approved for construction by a professional engineer licensed to practice in the Province of British Columbia. | 5 days prior to commencing construction or any physical activities on each work component |
| 20. | The Permit Holder shall provide a draft construction notice to VFPA's satisfaction in accordance with VFPA's Public Consultation Guidelines. | 20 days prior to commencing construction or any physical activities |
| 21. | The Permit Holder shall submit a construction communications plan and construction notice to VFPA's satisfaction in accordance with VFPA's Public Consultation Guidelines. The plan shall outline how the Permit Holder will engage and communicate with the public and stakeholders from the date of permit issuance to the completion of construction. The plan shall be updated as necessary and upon request by VFPA to ensure public and stakeholders are provided with relevant information as it becomes available. The Permit Holder shall carry out the Project in accordance with the approved construction communications plan, and any subsequent amendments approved by VFPA. | 20 days prior to commencing construction or any physical activities |
| 22. | The Permit Holder shall distribute an approved construction notice to residents and businesses to an area to VFPA's satisfaction. The Permit Holder shall notify VFPA when such distribution has been completed. | 10 days prior to commencing construction or any physical activities |
| 23. | The Permit Holder shall submit a construction parking and traffic management plan to VFPA's satisfaction. The Permit Holder shall carry out the Project in accordance with the construction parking and traffic management plan, and any subsequent amendments approved by VFPA. | 20 days prior to commencing construction or any physical activities |
| 24. | The Permit Holder shall submit to VFPA for review and approval evidence and documentation to demonstrate that the final design and construction of the three ship loader configuration meets the performance level defined in the submitted Environmental Air Assessment for fugitive dust management. | Prior to completion of the procurement process for shiploader infrastructure |
| 25. | The Permit Holder shall submit an Archaeological Chance Find Procedure for the Project site, to VFPA's satisfaction. The Procedure shall be drafted in consultation with interested Aboriginal groups, and must include the following:<br>- photographic examples of archaeological resources;<br>- descriptions of archaeological resources and sites;<br>- visual aids to support training and tailgate meetings for crew. | 30 days prior to commencing ground disturbing activities |



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| | The Permit Holder shall carry out the Project in accordance with this Procedure, and any subsequent amendments approved by VFPA. | |
| 26. | For structures and proposed interior changes to structures that are reviewable under the National Building Code and National Fire Code, the Permit Holder shall apply for a VFPA Building Permit. | 40 days prior to commencing construction or any physical activities on any structures reviewable under the Code |
| 27. | Prior to the commencement of any vessel-related activities, the Permit Holder must contact the appropriate Canadian Coast Guard (CCG) Marine Communications and Traffic Services (MCTS) centre regarding the issuance of a Notice to Shipping (NOTSHIP) to advise the marine community of potential hazards associated with the Project. | As per Coast Guard requirements |
| 28. | The Permit Holder shall provide a Project schedule to VFPA showing the anticipated start dates for all major phases of the Project as identified by VFPA. The Permit Holder shall notify VFPA of any material changes to the Project schedule and, upon request, shall provide an updated Project schedule. | 20 days prior to commencing construction or any physical activities |
| 29. | Prior to the commencement of any physical activities or works related to the proposed rail crossings of Robson Road, the Permit Holder shall submit to VFPA detailed design drawings to the satisfaction of VFPA of the proposed rail crossings, reflecting the specification requirements of Transport Canada's Grade Crossings Regulations and Grade Crossings Standards. | 30 days prior to commencing construction of new rail crossings |
| 30. | Prior to the commencement of construction of the Phase 2 rail works, as detailed in the submitted permit application, the Permit Holder shall submit a detailed design, including drawings, for the proposed works to the satisfaction of VFPA. | 30 days prior to commencing construction or any physical activities related to Phase 2 |
| 31. | Prior to the commencement of any physical activities or works to, or within 30 metres of, any existing Metro Vancouver infrastructure, the Permit Holder shall provide an updated geotechnical report, detailed design drawings of the proposed works and an infrastructure protection and monitoring plan to Metro Vancouver. | 10 days prior to commencing construction or any physical activities within 30m of Metro Vancouver infrastructure |
| 32. | The Permit Holder shall submit a marine construction and staging plan to the satisfaction of VFPA, which includes:<br>(a) staging and construction areas;<br>(b) dates and hours of operations;<br>(c) description of activities taking place;<br>(d) participating equipment and vessels (dimensions must be included);<br>(e) method of preferred communication; and<br>(f) special requests and/or additional information. | 30 days prior to commencing any construction activities on marine works |

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| | The Permit Holder shall carry out the Project in accordance with the marine construction and staging plan, including any subsequent amendments approved by VFPA. | |
| 33. | Prior to the commencement of any physical activities or works related to the pavement marking and signage, the Permit Holder shall submit to the satisfaction of VFPA detailed design drawings of the internal road layout, parking plan, and pavement marking and signage plan. | 30 days prior to commencing construction of components affecting site layout |
| 34. | Prior to the commencement of any physical activities or works on grain handling equipment, the Permit Holder shall submit an updated Fire Risk and Dust Hazard Analysis to the satisfaction of VFPA. | 20 days prior to submission of a complete package of drawings to VFPA for the purposes of a building permit application for the rail unloading station superstructure |
| | **CONDITIONS - DURING CONSTRUCTION OR ANY PHYSICAL ACTIVITIES**<br>**All references to days in submission timing refer to business days.** | |
| 35. | The Permit Holder shall notify VFPA upon commencement of construction, or any physical activities (e.g., mobilization to the Project site). | |
| 36. | All general construction and physical activities related to the Project shall be conducted from **Monday to Saturday** between the hours of **7:00 am and 8:00 pm**. No construction and physical activities shall take place on Sundays or holidays. These hours shall not be modified without prior approval of VFPA. To request permission to conduct activities outside these hours, the Permit Holder must submit a written request no less than 20 days prior to the desired start date. | |
| 37. | The Permit Holder shall notify VFPA of any complaints received from the community and stakeholders during construction and indicate how the Permit Holder has responded to such complaints. | |
| 38. | The Permit Holder shall either remove from the project site all abandoned utilities or cap all abandoned utilities that conflict with the proposed Project, both underground and aboveground. At locations of connection to municipal work (i.e., at property lines), the abandoned utilities shall be capped. | |
| 39. | The Permit Holder shall provide opportunities for interested Aboriginal groups to participate in the archaeological monitoring described in the construction environmental management plan. | |
| 40. | If the Permit Holder encounters, expects to encounter, or should expect to encounter an actual or potential archaeological resource, the Permit Holder shall:<br>a) Immediately stop any activities that may disturb the archaeological resource or the site in which it is contained (Site);<br>b) Not move or otherwise disturb the archaeological resource or other remains present at the Site; | |

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| | c) Stake or flag the Site to prevent additional disturbances;<br>d) Immediately notify VFPA by email and phone, and<br>e) Implement the approved Chance Find Procedure. |
| 41. | The Permit Holder may place temporary construction trailers on the Project site while this Permit remains in effect, provided that the Permit Holder does not connect such trailers to any underground utilities without the prior written consent of VFPA which may require, at VFPA's discretion, a VFPA Building Permit. |
| 42. | The Permit Holder, or their contractor, shall engage a qualified environmental professional to monitor the Project in order to ensure that the works are carried out in compliance with this Permit. Monitoring events shall take place as required by the environmental monitor, the construction environmental management plan, or VFPA, provided that monitoring will be full time when works are underway that have the potential to adversely affect fish or fish habitat. |
| 43. | The Permit Holder shall provide weekly environmental monitoring reports to VFPA, or more frequently if VFPA requires. In addition, a summary report for the whole monitoring period shall be forwarded to VFPA within 30 days of the conclusion of the monitoring period. |
| 44. | The Permit Holder shall carry out the Project in accordance with the construction environmental management plan provided by the Permit Holder, and any subsequent amendments accepted by VFPA. |
| 45. | The Permit Holder shall retain a qualified environmental professional to act as an Independent Monitor responsible for reviewing the construction environmental records and on-site construction activities for compliance with the construction environmental management plan and this Permit. The Independent Monitor shall possess the following qualifications:<br>a) Suitable education and knowledge demonstrating that they may be reasonably relied on to provide advice within their area of expertise;<br>b) A minimum of five years of experience monitoring related types of construction activities in similar environments.<br>The Independent Monitor shall not be an employee of the Permit Holder's organization or of a contractor/consultant retained by the Permit Holder to work on the Project in other capacities. |
| 46. | The Permit Holder shall submit a Monitoring Work Plan. At a minimum, the Monitoring Work Plan shall describe the following:<br>a) The role and responsibilities of the Independent Monitor, including the following provisions:<br>i. The Independent Monitor shall have unfettered access to environmental compliance documentation and the Project site at all times during construction without notice.<br>ii. The Independent Monitor shall have the authority to direct the Permit Holder to stop a construction activity that is causing an adverse effect.<br>iii. The Independent Monitor shall report directly to VFPA and obtain direction from VFPA on matters that arise during construction that are not described in the project permit and cannot be resolved by discussion with the Permit Holder. |



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| | iv. The Independent Monitor shall concurrently submit compliance reports directly to the Permit Holder and VFPA within one week of site visits.<br>b) The frequency of site visits by the Independent Monitor, with a higher frequency of site visits to occur during in-water works as compared to those scheduled for land-based construction activities.<br>c) The manner in which notice will be given to the Permit Holder and VFPA for an activity not in compliance with permit conditions or having unforeseen adverse effects.<br>d) The name and qualifications of the Independent Monitor.<br>e) The name(s), role(s) and qualifications of other individuals providing specialized expertise or designated to act as the Independent Monitor during specific construction activities or times.<br>The Permit Holder shall carry out the Project in accordance with the approved Monitoring Work Plan, and any subsequent amendments, to the satisfaction of VFPA. |
| 47. | The Permit Holder shall avoid impacting existing groundwater monitoring wells, where reasonable. The following monitoring wells shall not be removed without approval from VFPA at least ten days prior to decommissioning:<br>a) Within the FGT lease area:<br>o MW19<br>o MW21<br>o MW13-5<br>o MW13-39<br>b) Within the FSD lease area:<br>o MW18-1<br>o MW13-46<br>o MW14-2<br>o MW14-3<br>o MW14-4<br>o MW33FSD<br>o MW34FSD<br>o MW35FSD<br>o MW36FSD<br>Should any of the above listed monitoring wells need to be decommissioned for construction purposes or be damaged during construction, a plan for the installation of replacement monitoring well(s) shall be provided, to the satisfaction of VFPA. Without limiting the generality of permit condition No. 2, the Permit Holder shall decommission any groundwater monitoring wells approved for removal in compliance with the requirements set out in Appendix C of VFPA's Construction Environmental Management Plan Guideline. |
| 48. | Without limiting the generality of permit condition No. 2, the Permit Holder shall conduct all activities within streambank lupine critical habitat in compliance with the *Species at Risk Act* (SARA) permit issued by Environment and Climate Change Canada. No activities within critical habitat shall commence prior to the Permit Holder receiving the SARA permit. The Permit Holder shall provide a copy of the SARA permit to VFPA at least 10 days prior to commencing activities within streambank lupine critical habitat. |

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| 49. | The Permit Holder shall not discharge water from excavations to stormwater systems or the environment unless a dewatering and discharge plan, including water quality results, has been reviewed and accepted by VFPA. The plan must be submitted at least 10 days prior to the start of any such discharge. |
| 50. | For each area where recycled concrete aggregate (RCA) has been re-used as road base, the Permit Holder shall conduct post-construction follow-up groundwater monitoring to confirm that the re-use of RCA has not adversely affected soils or groundwater, to the satisfaction of VFPA. The Permit Holder shall submit a groundwater monitoring plan to VFPA for review and acceptance at least 60 days prior to completion of the ground works in the subject area. The Permit Holder shall provide reports to VFPA as specified in the plan, and VFPA may require mitigation(s) based on the results. Groundwater monitoring shall continue until VFPA confirms in writing that the results are acceptable. |
| 51. | The Permit Holder shall conduct post-construction follow-up groundwater monitoring to confirm that the installation of rammed aggregate piles through portions of the dissolved metal groundwater plume has not adversely affected groundwater quality or the movement of the plume. The Permit Holder shall submit a groundwater monitoring plan to VFPA for review and acceptance at least 60 days prior to completion of rammed aggregate pile installation. The Permit Holder shall provide reports to VFPA as specified in the plan, and VFPA may require mitigation(s) based on the results. Groundwater monitoring shall continue until VFPA confirms in writing that the results are acceptable. |
| 52. | During pile driving construction activities onshore and in-water, the Permit Holder shall monitor the following terrestrial noise levels:<br>a) Sound pressure measurements at a distance of 15m from equipment;<br>b) 1-hour LAeq, and 1-min LAFmax levels and occurrence frequency from a representative location within the community.<br>The Permit Holder shall submit a summary report detailing the noise levels recorded for each separate pile type driven in order to confirm that generated noise levels are within accepted industry standards. A summary report shall be submitted to VFPA within 5 days of initial pile driving for each representative pile type and to the satisfaction of VFPA. |
| | **CONDITIONS – PRIOR TO OPERATION** |
| 53. | The Permit Holder shall submit to VFPA written confirmation, co-signed by Musqueam Indian Band, that a marine traffic protocol agreement addressing grain vessels calling at Fraser Grain Terminal has been established between Musqueam Indian Band and the Permit Holder. The written confirmation shall be submitted to VFPA within 12 months of permit issuance. |
| 54. | Prior to the commencement of operations of the new shiploaders, the Permit holder shall provide written confirmation to VFPA that the existing shiploader operated at Berths #3 and #4 has been fully decommissioned. |
| 55. | The Permit Holder shall submit an updated Stormwater Pollution Prevention Plan to the satisfaction of VFPA 90 business days prior to the commencement of operations. The Permit Holder shall carry out the Project in accordance with the updated stormwater pollution prevention plan, including any subsequent amendments approved by VFPA. |
| 56. | The Permit Holder shall submit an updated Rail Operations Plan to the satisfaction of VFPA 90 business days prior of the commencement of operations, reflecting the opening day operating condition. |



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| 57. | Prior to the commencement of operations, the Permit Holder shall submit documentation to VFPA demonstrating opening day compliance of the rail crossing design with Transport Canada's Grade Crossings Regulations and Grade Crossings Standards. | |
| | **CONDITIONS - UPON COMPLETION** | **SUBMISSION TIMING (Business Days)** |
| 58. | The Permit Holder shall notify VFPA upon completion of the Project. | Upon substantial completion |
| 59. | The Permit Holder shall develop and implement an Air Emission Management Plan in accordance with VFPA guidelines and to the satisfaction of VFPA. The Permit Holder shall ensure that the Project and terminal operations are carried out in accordance with the plan, including any subsequent amendments approved by VFPA. | Draft submission: within 180 days after permit issuance.<br>The plan must be finalized and approved upon completion of construction. |
| 60. | The Permit Holder shall conduct dust filtration performance testing for representative filters of each class/type, during facility commissioning, to verify the assumptions of the Environmental Air Assessment. A summary report with supporting test data shall be provided to the satisfaction of VFPA, and VFPA may require additional mitigation measures based on results. | Within 40 days of completion |
| 61. | The Permit Holder shall conduct noise monitoring to confirm the predictions of the Environmental Noise Assessment and validate the effects on the surrounding community. The monitoring shall capture two weeks of valid noise data and be conducted in accordance with VFPA Environmental Noise Assessment Guidelines. Measurements shall be taken at VFPA approved locations.<br>The Permit Holder shall provide the final report to VFPA, and VFPA may require mitigation(s) based on the results. | Within 240 days of completion or at the direction of VFPA. |
| 62. | The Permit Holder shall provide an inventory of all alarms utilized at the facility in order to demonstrate that best industry practices have been considered. The inventory should include, but not limited to, all alarms associated with processes, stationary equipment, mobile sources, and loading operations. The inventory shall detail location, type of alarm, sound level, and sound characteristics. | Within 40 days of completion |
| 63. | The Permit Holder shall provide record drawings in accordance with VFPA's Record Drawing Standards, in both AutoCAD and Adobe (PDF) format to VFPA, including a Project site plan that clearly identifies the location of works. | Within 40 days of completion |
| 64. | The Permit Holder shall submit a Waste Management Report that documents the percentage of material diverted from landfills. | Within 20 days of completion |



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**VFPA reserves the right to rescind or revise these conditions at any time that new information warranting this action is made available to VFPA.**

**LENGTH OF PERMIT VALIDITY**

The Project must commence by November 30, 2019 (the Commencement Date) and be completed no later than November 30, 2022 (the Expiry Date).

**AMENDMENTS**

- Details of any material proposed changes to the Project, including days and hours when construction and any physical activities will be conducted, must be submitted to VFPA for consideration of an amendment to this Permit.
- For an extension to the Commencement Date, the Permit Holder must apply to VFPA in writing no later than 30 days prior to that date.
- For an extension to the Expiry Date, the Permit Holder must apply in writing to VFPA no later than 30 days prior to that date.

**Failure to apply for an extension as required may, at the sole discretion of VFPA, result in termination of this Permit.**

# PROJECT AND ENVIRONMENTAL REVIEW DECISION

Project Permit PER No. 15-041 is approved by:

"ORIGINAL COPY SIGNED"
**PETER XOTTA**
**VICE PRESIDENT, PLANNING & OPERATIONS**
**CHAIR OF PROJECT AND ENVIRONMENTAL REVIEW COMMITTEE**

November 9, 2018
**DATE OF APPROVAL**

## CONTACT INFORMATION

Vancouver Fraser Port Authority (VFPA)
100 The Pointe, 999 Canada Place,
Vancouver BC V6C 3T4 Canada

Project & Environmental Review
Tel.: 604-665-9047
Fax: 1-866-284-4271
Email: PER@portvancouver.com
Website: www.portvancouver.com

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# APPENDIX B

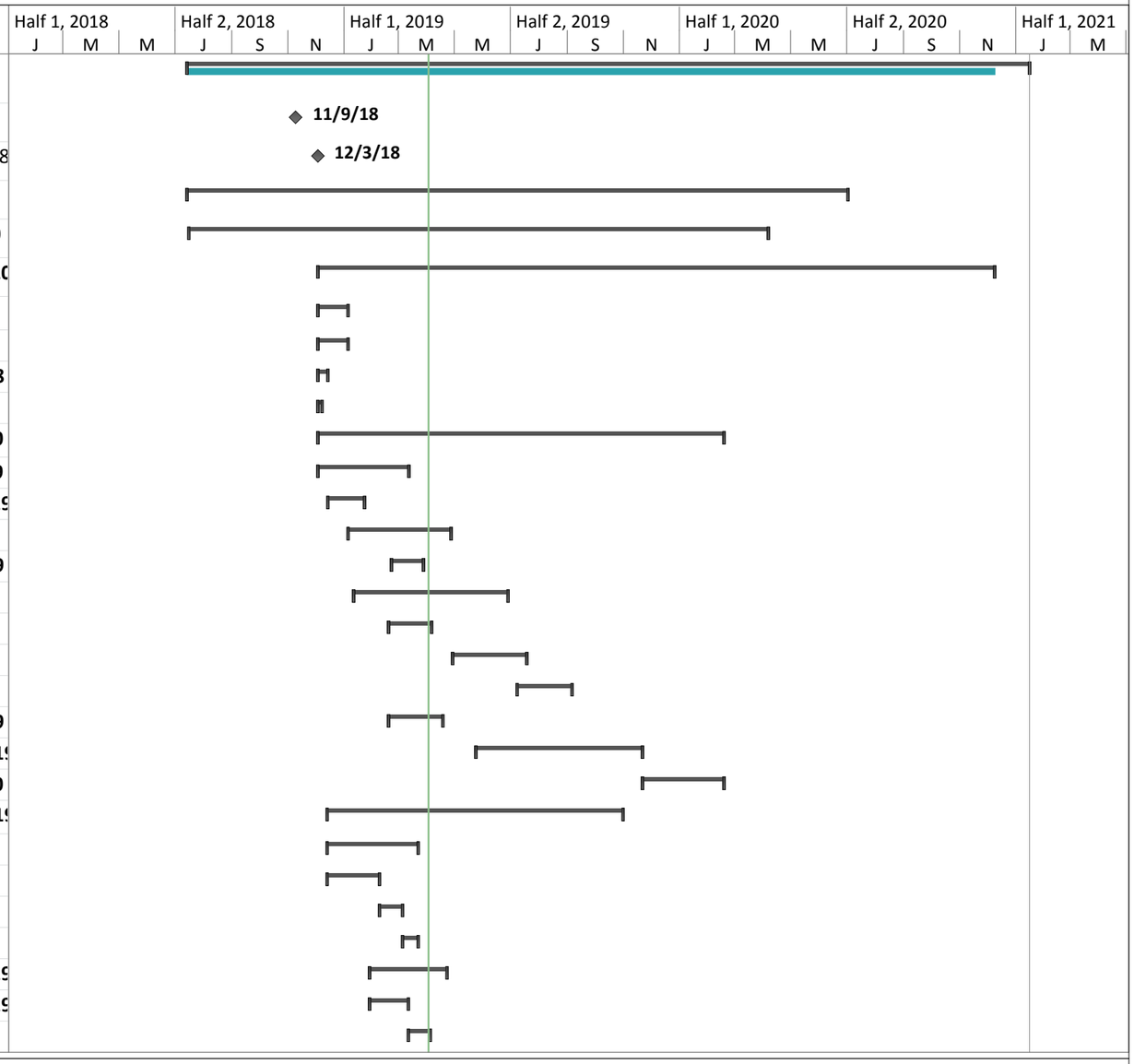
## Project Schedule

# FGT FRASER GRAIN TERMINAL PROJECT

Fraser River, Surrey BC

FWS GROUP

| ID | Task Mode | Task Name | Duration | Start | Finish |
|---|---|---|---|---|---|
| 1 | | **FGT PROJECT** | **726.62 days** | **Fri 7/13/18** | **Fri 1/15/21** |
| 2 | | **DEVELOPMENT PERMIT** | 0 days | Fri 11/9/18 | Fri 11/9/18 |
| 3 | | **MOBILIZATION DATE** | 0 days | Mon 12/3/18 | Mon 12/3/18 |
| 4 | | **ENGINEERING & BUILDING PERMITS** | **571.47 days** | **Fri 7/13/18** | **Thu 7/2/20** |
| 144 | | **PROCUREMENT** | **350 days** | **Mon 7/16/18** | **Mon 4/6/20** |
| 174 | | **CONSTRUCTION & COMMISSIONING** | **586.97 days** | **Mon 12/3/18** | **Wed 12/9/20** |
| 175 | | **MOBILIZATION** | **15 days** | **Mon 12/3/18** | **Sat 1/5/19** |
| 176 | | **Mobilize Crew and set up site** | **15 days** | **Mon 12/3/18** | **Sat 1/5/19** |
| 178 | | **Establish Temporary Power** | **10 days** | **Mon 12/3/18** | **Fri 12/14/18** |
| 180 | | **Site layout (Set up Control Points and Elevations)** | **5 days** | **Mon 12/3/18** | **Sat 12/8/18** |
| 182 | | **SITE WORKS** | **341 days** | **Mon 12/3/18** | **Tue 2/18/20** |
| 183 | | **Demo and Storage slab prep** | **70 days** | **Mon 12/3/18** | **Tue 3/12/19** |
| 190 | | **Removal of existing utilities** | **20 days** | **Fri 12/14/18** | **Wed 1/23/19** |
| 192 | | **Densification (RAP)** | **94 days** | **Sat 1/5/19** | **Sat 4/27/19** |
| 197 | | **Retaining Wall at Receiving Pit** | **30 days** | **Thu 2/21/19** | **Thu 3/28/19** |
| 201 | | **Underground Utilites** | **141 days** | **Fri 1/11/19** | **Fri 6/28/19** |
| 215 | | **Container Storage Area** | **40 days** | **Mon 2/18/19** | **Sat 4/6/19** |
| 218 | | **New Access Road** | **68 days** | **Mon 4/29/19** | **Fri 7/19/19** |
| 227 | | **Metro Van Crossings** | **50 days** | **Mon 7/8/19** | **Fri 9/6/19** |
| 235 | | **General Site Grading** | **50 days** | **Mon 2/18/19** | **Thu 4/18/19** |
| 237 | | **Detailed Grading around buildings** | **150 days** | **Fri 5/24/19** | **Thu 11/21/19** |
| 239 | | **Detailed Asphalt** | **60 days** | **Thu 11/21/19** | **Tue 2/18/20** |
| 241 | | **RECEIVING** | **254.72 days** | **Thu 12/13/18** | **Thu 10/31/19** |
| 242 | | **RAIL RECEIVING PIT** | **70 days** | **Thu 12/13/18** | **Fri 3/22/19** |
| 243 | | **Receiving  Pit Cofferdam and Excavation** | **35 days** | **Thu 12/13/18** | **Fri 2/8/19** |
| 245 | | **Concrete Installation** | **20 days** | **Fri 2/8/19** | **Tue 3/5/19** |
| 247 | | **Backfill and Cofferdam Removal** | **15 days** | **Tue 3/5/19** | **Fri 3/22/19** |
| 249 | | **RAIL RECEIVING TUNNEL** | **70 days** | **Mon 1/28/19** | **Mon 4/22/19** |
| 250 | | **Tunnel Cofferdam and Excavation** | **35 days** | **Mon 1/28/19** | **Mon 3/11/19** |
| 252 | | **Concrete Installation** | **20 days** | **Mon 3/11/19** | **Thu 4/4/19** |

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|---|---|---|---|
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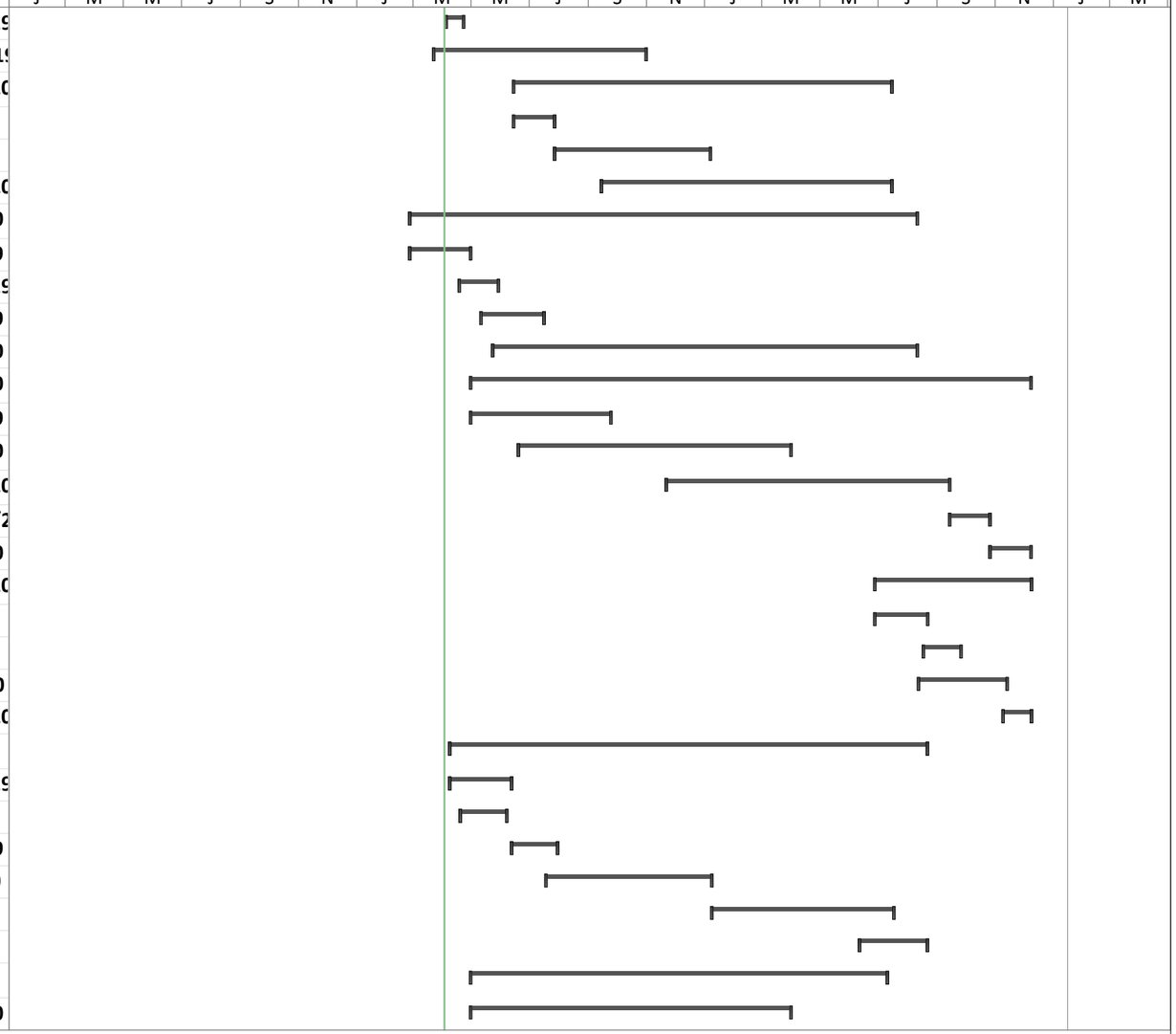
| Split | Inactive Task | Manual Summary | Progress |
| Milestone | Inactive Milestone | Start-only | Manual Progress |
| Summary | Inactive Summary | Finish-only | |
| Project Summary | Manual Task | Deadline | |
| External Tasks | Duration-only | Critical | |

# FGT FRASER GRAIN TERMINAL PROJECT

Fraser River, Surrey BC

FWS GROUP

| ID | Task Mode | Task Name | Duration | Start | Finish |
|---|---|---|---|---|---|
| 254 | | Backfill and Cofferdam Removal | 15 days | Thu 4/4/19 | Mon 4/22/19 |
| 256 | | RAIL RECEIVING SYSTEM MECHANICAL | 184.72 days | Fri 3/22/19 | Thu 10/31/19 |
| 265 | | TRANSFER | 315.67 days | Fri 6/14/19 | Wed 7/15/20 |
| 266 | | MAIN TOWER FOUNDATION | 36 days | Fri 6/14/19 | Sat 7/27/19 |
| 272 | | STRUCTURAL STEEL | 120 days | Sat 7/27/19 | Tue 1/7/20 |
| 275 | | MECHANICAL | 239.67 days | Sat 9/14/19 | Wed 7/15/20 |
| 295 | | RECLAIM | 430 days | Mon 2/25/19 | Tue 8/11/20 |
| 296 | | Reclaim Tunnel | 54 days | Mon 2/25/19 | Tue 4/30/19 |
| 303 | | Roof Slabs and Openings | 34 days | Thu 4/18/19 | Wed 5/29/19 |
| 307 | | Reclaim Tunnel Tie-In to Receiving Pit | 54 days | Sat 5/11/19 | Tue 7/16/19 |
| 314 | | Equipment | 357 days | Thu 5/23/19 | Tue 8/11/20 |
| 324 | | STORAGE | 475 days | Tue 4/30/19 | Tue 12/8/20 |
| 325 | | Bin Foundation | 122 days | Tue 4/30/19 | Tue 9/24/19 |
| 356 | | Storage Bin Mechanical 3500 Ton Silos | 224 days | Wed 6/19/19 | Tue 3/31/20 |
| 422 | | Storage Bin Mechanical 500 Ton Silos | 234 days | Thu 11/21/19 | Mon 9/14/20 |
| 530 | | STORAGE & RECLAIM COMMISSIONING | 35 days | Mon 9/14/20 | Mon 10/26/2 |
| 534 | | FILL & SETTLE ELEVATOR | 36 days | Mon 10/26/2 | Tue 12/8/20 |
| 542 | | CONTAINER LOADING | 135.84 days | Sat 6/27/20 | Wed 12/9/20 |
| 543 | | FOUNDATIONS | 46 days | Sat 6/27/20 | Sat 8/22/20 |
| 550 | | STRUCTURAL STEEL | 34 days | Mon 8/17/20 | Sat 9/26/20 |
| 554 | | MECHANICAL | 77 days | Wed 8/12/20 | Fri 11/13/20 |
| 573 | | CONTAINER LOADING COMISSIONING | 25 days | Mon 11/9/20 | Wed 12/9/20 |
| 577 | | RAIL LOOP SYSTEM | 405 days | Mon 4/8/19 | Fri 8/21/20 |
| 578 | | Survey and General Excavation | 55 days | Mon 4/8/19 | Wed 6/12/19 |
| 582 | | Utility Crossings | 41 days | Fri 4/19/19 | Fri 6/7/19 |
| 589 | | Retaining Wall | 40 days | Wed 6/12/19 | Tue 7/30/19 |
| 592 | | Excavation and Subballast | 130 days | Thu 7/18/19 | Wed 1/8/20 |
| 597 | | Track & Crossings Construction | 160 days | Wed 1/8/20 | Fri 7/17/20 |
| 602 | | Fencing Installation | 60 days | Thu 6/11/20 | Fri 8/21/20 |
| 607 | | ELECTRICAL | 350.12 days | Tue 4/30/19 | Fri 7/10/20 |
| 608 | | General Trenching and Transformer Install | 266.05 days | Tue 4/30/19 | Tue 3/31/20 |




Project: **Construction Schedule Option 3**
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| Split | Inactive Task | Manual Summary | Progress |
| Milestone | Inactive Milestone | Start-only | Manual Progress |
| Summary | Inactive Summary | Finish-only | |
| Project Summary | Manual Task | Deadline | |
| External Tasks | Duration-only | Critical | |

# FGT FRASER GRAIN TERMINAL PROJECT

Fraser River, Surrey BC

FWS GROUP

| ID | Task Mode | Task Name | Duration | Start | Finish |
|---|---|---|---|---|---|
| 612 | | New Switch Substation - Install and Connect | 80 days | Mon 4/6/20 | Fri 7/10/20 |
| 617 | | MAINTENANCE SHOP BUILDING | 147 days | Tue 7/30/19 | Sat 2/8/20 |
| 618 | | Excavation & Foundation | 37 days | Tue 7/30/19 | Fri 9/13/19 |
| 622 | | Erect Building | 50 days | Fri 9/13/19 | Wed 11/13/1 |
| 624 | | Building Finishes | 60 days | Wed 11/13/1 | Sat 2/8/20 |
| 628 | | ADMINISTRATION BUILDING | 171 days | Tue 7/30/19 | Mon 3/9/20 |
| 629 | | Excavation & Foundation | 65 days | Tue 7/30/19 | Thu 10/17/19 |
| 633 | | Erect Building | 50 days | Thu 10/17/19 | Thu 1/2/20 |
| 637 | | Building Finishes | 56 days | Thu 1/2/20 | Mon 3/9/20 |
| 641 | | CONTROL BUILDING | 73 days | Sat 7/27/19 | Thu 10/24/19 |
| 642 | | Excavation & Foundation | 18 days | Sat 7/27/19 | Mon 8/19/19 |
| 646 | | Install Building & Building Finishes | 50 days | Sat 8/24/19 | Thu 10/24/19 |
| 651 | | MCC BUILDINGS | 155 days | Tue 8/27/19 | Wed 3/18/20 |
| 652 | | Excavation & Foundation | 48 days | Tue 8/27/19 | Thu 10/24/19 |
| 656 | | Install and Internal Wiring | 102 days | Wed 10/30/1 | Wed 3/18/20 |
| 662 | | SHIPPING | 313.72 days | Thu 6/20/19 | Sat 7/18/20 |
| 663 | | FOUNDATIONS | 50 days | Thu 6/20/19 | Tue 8/20/19 |
| 668 | | TOWER | 80 days | Fri 8/9/19 | Thu 11/14/19 |
| 679 | | GALLERIES | 142.72 days | Thu 11/14/19 | Wed 5/20/20 |
| 689 | | Wiring and Air Lines | 50 days | Wed 5/20/20 | Sat 7/18/20 |
| 693 | | MARINE STRUCTURE | 201 days | Sat 6/15/19 | Sat 2/29/20 |
| 694 | | Fish Window for Dredging/Backfilling | 201 days | Sat 6/15/19 | Sat 2/29/20 |
| 696 | | Off-Shore Marine Piling | 116 days | Sat 6/15/19 | Sat 11/2/19 |
| 704 | | On-Shore Piling | 83 days | Thu 8/29/19 | Sat 12/7/19 |
| 710 | | SHIP LOADER | 398.69 days | Wed 2/6/19 | Thu 9/3/20 |
| 711 | | Pre-Assembly at PHB Site | 275 days | Wed 2/6/19 | Mon 1/20/20 |
| 716 | | Shipping | 72 days | Mon 1/20/20 | Wed 4/15/20 |
| 720 | | Installation and Adjustments | 40 days | Wed 4/15/20 | Tue 6/2/20 |
| 726 | | Interconnections | 58 days | Sat 5/23/20 | Fri 7/31/20 |
| 729 | | Ship Loader Commissioning | 28.72 days | Fri 7/31/20 | Thu 9/3/20 |

Project: **Construction Schedule Option 3**
Date: Wed 4/3/19 4:40 PM
File: 190403_FGT_CnstSched_Port Submission

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|---|---|---|---|---|---|
| Task | External Milestone | Manual Summary Rollup | Critical Split |
| Split | Inactive Task | Manual Summary | Progress |
| Milestone | Inactive Milestone | Start-only | Manual Progress |
| Summary | Inactive Summary | Finish-only | |
| Project Summary | Manual Task | Deadline | |
| External Tasks | Duration-only | Critical | |

# APPENDIX C

## Soil and Groundwater Management Plan

# Soil and Groundwater Management Plan
## Fraser Grain Terminal
## 11041 Elevator Road, Surrey, BC

Prepared for:
**Fraser Grain Terminal Ltd**.
355 Burrard St, Suite 640
Vancouver, BC  V6C 2G8

Prepared by:
**Hemmera Envirochem Inc.**
4730 Kingsway, 18th Floor
Burnaby, BC  V5H 0C6

File: 2191-001.01
June 2018

HEMMERA

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Appendix A1 Regulatory Framework

# 1.0 INTRODUCTION

Hemmera was retained by FWS Group of Companies on behalf of Fraser Grain Terminal Ltd.[1] (FGT) to prepare a Soil and Groundwater Management Plan (the "Plan") for the proposed Fraser Terminal to be located on 11041 Elevator Road in Surrey, BC (the "Site"). The proposed Fraser Grain Terminal Export Facility (the "Project") will be a new agri-products handling facility located on land adjacent to the Fraser Surrey Docks (FSD) facility. Parrish & Heimbecker currently operate an agri-products handling facility on FSD-leased property adjacent to the Site.

The Site is leased from Vancouver Fraser Port Authority (VFPA) by the Proponent and was formerly leased by Bekaert Canada Ltd. (Bekaert). Hemmera understands that the Project will serve as a trans-shipment storage location for bulk grain products, and will include loading and unloading infrastructure, storage silos, a transfer tower and gallery, and ancillary works.

The Plan is required as part of a permit application with VFPA to support the Project's Application for Category D Application Submission Requirements for PER No. 15-041. The Plan will address the known or suspected soil contamination within the Project area, while outlining the testing, appropriate handling, limiting migration/run-off, disposal of contaminated soils, and health and safety concerns associated with soil management.

Based on previous investigations, soil and groundwater contamination was identified on the Site. The purpose of this document is to provide guidance to workers that will be conducting intrusive work on the Site about existing Site contamination, soil management best practices, and health and safety measures. This Plan is based upon future, ongoing Industrial activities at the Site, and considers the current federal and provincial standards and practices for soil management. Should the intended use of the Site be modified this Plan should be adjusted accordingly. The Plan should be revaluated regularly to ensure the regulatory framework remains up-to-date.

While the Plan identifies known existing contamination at the Site, areas of unforeseen contamination may exist. Hence, any intrusive activities at the Site should consider soil management with the context of encountering potential contamination.

This Plan supplements any site- and/or tenant-specific health and safety plan. It does not supersede local, provincial, or federal regulations with respect to worker health and safety.

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[1] Fraser Grain Terminal Ltd. is a Canadian family-owned and operated grain company with more than 100 years of experience in agribusiness and locations across Canada. Serving more than 10,000 Canadian farmers and producers, we market grain to over 40 countries.

## 2.0 BACKGROUND

Prior to and following the closure of the Bekaert facility, several environmental investigations were conducted at the Site by Hemmera. These previous investigations identified areas of soil and groundwater contamination. The results of these investigations were summarised in the following reports, which were previously provided to P&H, and VFPA:

- Phase I Environmental Site Assessment (ESA), April 2013
- Phase II ESA, August 2013
- Detailed Site Investigation (DSI), March 2014
- Detailed Human Health and Ecological Risk Assessment (DHHERA), April 2014
- Remediation of Contaminated Soils and Backfilling of the former Cooling Water Discharge Pit, August 2014

# 3.0 CONTAMINANTS OF CONCERN (COCS)

The primary Contaminants of Concern (COCs) in soil and groundwater are metals and hydrocarbons. A summary of the findings for these COCs is provided below, and the approximate extents are illustrated on **Figures 1** and **2**, respectively.

## 3.1 SOIL

### 3.1.1 Metals

Zinc in soil was the primary Site COC and extends northwest from the former Cleaning Line Containment (CLC) area onto the adjacent property (Fraser Surrey Docks) as illustrated in **Figure 1**. The CLC area is a process line used to clean and prepare steel rod. The CLC contains a series of wire dip baths including sulphuric acid, zinc phosphate, borax, and hot and cold water rinses. Two areas of zinc contamination in soil have been identified as shown on the figure. While the extent of the zinc soil impacts between the two plumes were undetermined (i.e., around MW14-2, MW13-5 and MW13-46), both plumes are likely connected across the property line, given the mechanism of historical release[2]. Zinc in soil ranges from depths of approximately 3.0 metres below ground surface (m bgs) to 5.0 m bgs and concentrations ranged from less than the background concentration (100 µg/g[3]) to a maximum known concentration of 1,790 µg/g.

Additionally, shallow soil impacts, up to 1.5 m bgs, were noted near the former remediated lagoons (**Figure 1**). Localized arsenic impacts in this area (maximum of 88 µg/g – BH13-19, SS13-7, BH13-27) are likely attributed to chromated copper arsenate (CCA) spills and surface remediation earthwork located near the rail line. The shallow arsenic concentrations have not been horizontally delineated in any direction at SS13-7 and to the northwest at BH13-19/BH13-27, near the former remediated lagoons and rail line. Hence, as a conservative measure, the shallow surface soils in this area should be treated as contaminated with arsenic.

Soil impacted with shallow zinc (553 µg/g – SS13-8) up to 0.8 m bgs was also located near the former remediated lagoons. This impact was delineated laterally and vertically by subsequent samples. These localized impacts are likely attributed to the rail line, and the shallow surface soils in this area should be treated as contaminated with zinc.

### 3.1.2 Hydrocarbons

Two plumes (**Figure 1**) were identified beneath and down-gradient of the southwest portion of the plant building (former maintenance operations). The plumes were associated with petroleum hydrocarbons (polycyclic aromatic hydrocarbons (PAH), light and heavy extractable hydrocarbons (LEPH/HEPH), and

---

2 Historical operation of the CLC was identified as a source of metal contamination to the subsurface and movement of groundwater metals contamination down-gradient (west/northwest) of the Site.

3 BC CSR Protocol 4 - Background Soil Quality, October 15, 1999, Table 1 - Column III - Region 2 - Lower Mainland (includes Delta and Surrey)

volatile petroleum hydrocarbons (VPH)) as well as trichloroethylene (TCE). Soil contamination was considered to extend onto the FSD property. Petroleum hydrocarbon (PHC) fractions F1 to F3 (300 to 11,000 µg/g), VPH (290 µg/g), LEPH (11,600 µg/g), and HEPH (5,740 µg/g), and PAHs (acenaphthene (3.8 µg/g), phenanthrene (30 µg/g), and naphthalene (0.14 µg/g)) were found at MW/SV13-10 ranging from 3.35-3.51 m bgs. This impact was delineated laterally in all directions, and vertically with clean samples from MW/SV13-10 from 1.07-1.37 m bgs and deeper at MW13-30 from 3.51-3.81 m bgs. The hydrocarbon contaminated soil is estimated to be present from 1.37 to 3.51 m bgs and extend in the area immediately around MW/SV13-10.

A second plume associated with TCE (0.013 µg/g at MW/SV13-8 and MW13-31) ranged from depths of approximately 3.20 to 3.51 m bgs. The impact is not delineated to the northwest, but is delineated laterally to the south-southwest, and vertically from 3.51-3.81 m bgs. There is no vertical delineation from surface though, and to be conservative is estimated to extend from surface to 3.52 m bgs.

#### 3.1.3 On-Site Rail Line

Phenanthrene (**Figure 1**) was detected within the vicinity of the rail line at one location (BH13-17). The presence of this polycyclic aromatic hydrocarbon (PAH) is consistent with rail operations and creosote-treated rail ties. Given the immobile nature of the contaminant (preferential partitioning to soils compared to water), it is likely the contamination is limited to the immediate rock ballast and shallow soils surrounding the rails. The existing rail line will be removed and reconfigured, hence appropriate soil management procedures (see **Section 4** below) will be followed including segregation of rail ballast rock/soils into separate piles for testing and subsequent disposal. Rails and/or ties will be recycled/reused as required either on-site or disposed off-site.

### 3.2 GROUNDWATER

#### 3.2.1 Metals

As noted above, zinc is the primary COC for the Site. A plume of dissolved zinc (256,000 µg/L) was identified down-gradient (west/northwest) and northeast of the plant building (CLC area) and storage building. The plume was observed to extend from the FGT lease onto the FSD-managed property (**Figure 2**). Additionally, dissolved zinc was located near the northeast portion of the Site (near MW18). Groundwater contamination was also reported for concentrations of other metals including (maximum concentrations shown):

- Aluminum (3,610 µg/L),
- Arsenic (19.9 µg/L),
- Boron (22,400 µg/L),
- Cadmium (1.67 µg/L),

- Copper (120 µg/L),
- Iron (32,600 µg/L),
- Manganese (5,590 µg/L), and
- Nickel (2,710 µg/L).

As would be expected based on historical operations, the majority of these impacts were located down-gradient (west/northwest) and northeast of the plant building (CLC area). The groundwater plumes for the above metals are shown on **Figure 2**. All previous metal exceedances in this Plan are assumed to be relevant for worker protection.

While dissolved arsenic was also observed beneath the CLC (MW13-39), localized dissolved arsenic (MW-18, MW-12, and MW13-47) as well as widely-dispersed dissolved iron and manganese were noted beneath and between the remediated lagoons and CLC (see **Figure 3** for investigation locations). While the source for the arsenic, iron and manganese could be correlated to the remediated lagoons; groundwater quality data upgradient and cross-gradient of the Site has not been collected and compared. Hence, arsenic, iron and manganese concentration may extend beyond the upgradient property boundaries.

The depth of groundwater was approximately 3.0 m bgs and has been observed to fluctuate by approximately 0.5 to 1 m with tidal and seasonal influences.

### 3.2.2 Hydrocarbons

Similar to soil results, a groundwater hydrocarbon plume (**Figure 2**) was identified extending from the maintenance operations onto the FSD property. Impacts included $EPH_{W10-19}$ (13,000 µg/L), $LEPH_W$ (13,000 µg/L), and several PAH parameters, including acridine (8.2 µg/L), anthracene (<1.4 µg/L), fluoranthene (1.5 µg/L), phenanthrene (18 µg/L), pyrene (7.2 µg/L).

## 3.3 VAPOURS

No vapour contamination was identified on the Site with the current site configurations. Should intrusive work be conducted in areas where hydrocarbons were previously identified in soil and groundwater, the vapour concentrations should be re-evaluated and appropriate personal protective equipment (PPE) should be used.

# 4.0 SOIL CHARACTERIZATION AND MANAGEMENT

## 4.1 INITIAL EVALUATION AND INTRUSIVE PLANNING

The information in this report (and referenced in previous reports discussed in **Section 2.0**, and previously supplied to P&H, and VFPA) should be incorporated into any intrusive works at the Site given that contaminated soil and groundwater exists on-site, and may be encountered during these works. As the volume of soil moved during potential on-site work that will require characterization will depend on the scope of the Project, previous soil analytical data should initially be evaluated to determine how impacted areas overlap with the planned excavation areas for the grain handling facility.

In all areas where soil will be excavated, the following techniques will be used to manage soil (and groundwater) contamination:

- Where worker safety necessitates, sheet piling will be installed for excavations. Sheet piling will be driven around the perimeter of the planned excavation and the area inside the sheet pile walls will be excavated.
- Excavated material will be stockpiled on site. The proposed location of the stockpile is shown in the Erosion and Sediment Control Plan Drawing 1419-G-05-405.
- Although excavations will reach a depth below the water line, there will be no active dewatering as the excavation proceeds.
- Upon reaching the prescribed depth, a trémie concrete plug will be poured to plug the bottom of the excavation.
- Once the trémie plug has set, the excavation will be dewatered.
- Water will be treated before discharging into the Fraser River.

The following protocols will also be adhered to:

1) Especially where contamination is anticipated, all subsurface soil excavation work will be planned and managed. Where groundwater will be intercepted, this will also be managed.
2) If unforeseen contamination is encountered (e.g. visual indications of contamination, staining, sheen, odour):
    a. Work will stop immediately and the area will be taped off;
    b. The site superintendent or manager will be notified;
    c. The Environmental Monitor will be notified;
    d. A contaminated site specialist (“specialist”) will be consulted to determine if contamination is present;
    e. If contamination is not present, continue work;
    f. If contamination is present, survey the location, take detailed notes and photos, have a specialist take soil samples and conduct 3rd party analytical testing;

g. The specialist will notify the site team (superintendents, managers, EM, etc.) once the contamination is confirmed; and,

h. The specialist will confirm any remaining remediation tasks necessary.

Excavation and backfilling will be accomplished using standard excavation equipment such as excavators, backhoes, and dump trucks.

Where soils will be excavated or handled, care should be taken to avoid mixing of clean and contaminated soils both vertically and laterally. While the Plan (and referenced reports previously supplied) provides information regarding COC concentrations and locations of known contamination, soil quality in specific areas of the Site may not be fully understood. Hence, it is advised that pre-characterization of soil be completed in the planned excavation areas to avoid improper removal, mixing, handling/stockpiling, and disposal of the materials. This is especially important in areas of higher contamination where handling and segregation of soils will influence excavation approach and disposal options (see below).

As noted above, any intrusive excavation at the Site, even outside of known contamination areas, may encounter contamination. Excavation plans should incorporate visual characterization for obvious contamination (i.e. staining), and laboratory testing for proper soil management. An environmental professional should be involved in the planning process, and continue with on-site excavation monitoring and soil management. For example, if materials are to be excavated and/or disposed off-site, an environmental professional should:

- Review all available and pertinent environmental information for the Site;
- Assist contractors with segregation and stockpiling of contaminated soils (as needed);
- Characterize any stockpiled soil by appropriate sampling and analyses as per the BC Ministry of Environment (BC MOE) Technical Guidance on Contaminated Sites 1: *Site Characterization and Confirmation Testing* (TG 1);
- Compare analytical data against applicable regulatory guidelines and/or standards;
- Interpret the analytical results and provide recommendations for soil reuse/disposal; and,
- Document the sampling, stockpiling, and disposal procedures completed on-site.

### 4.2 REGULATORY FRAMEWORK

A detailed summary of the federal and provincial guidelines and standards that were applied at the Site during previous environmental investigations (summarised in **Section 2.0**) is provided in **Appendix A1**. As guidelines and standards are likely to change in the future, changes should be re-evaluated and assessed in future intrusive excavation or soil/groundwater management work, especially as soil characterization should be based on applicable standards at the time that the work is being conducted. Current guidelines and standards that are applicable to the Site are outlined in the following documents:

- Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health.
- Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life.
- Canadian Council of Ministers of the Environment (CCME) Canada Wide Standards (CWS) for Petroleum Hydrocarbons (PHCs), January 2008.
- Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines for the Protection of Environmental and Human Health, Polycyclic Aromatic Hydrocarbons, 2010.
- *Environmental Management Act*, Contaminated Sites Regulation (CSR). 2009 BC Reg. 375/96 (Effective April 1997 and amended July 1999, November 1999, February 2002, November 2003, and July 2004, July 2007), including amendments up to B.C. Reg. 4/2014, effective January 31, 2014.
- British Columbia Hazardous Waste Regulations, Table 1, Leachate Quality Standards, amended April 1, 2009.

### 4.3 SOIL EXCAVATION AND STOCKPILE CHARACTERIZATION

Excavations required for the Project (shown in **Figure 4**) should avoid mixing of different materials and soil classifications. As excavated soils are removed from the ground, they should be segregated and stockpiled according to anticipated soil contaminant classifications (as planned above). Soil characterization should be undertaken generally following the procedures outlined in the BC MOE TG 1 and/or the current regulations and practices.

It is recognized that soil stockpile sizes will be dependent on the volume of material being removed from the ground. Regardless of volume, soils should still be segregated appropriately into stockpiles and tested to verify quality and management options (i.e. potential for reuse on-site or disposal off-site).

Based on previous soil analytical results, soil plumes outlined on **Figure 1** are characterized as waste greater than Industrial quality. In addition, soils with higher metal concentrations are present beneath, and immediately down-gradient of the former CLC. For example, hazardous waste (lead leachate) was identified in one soil sample (BH13-43 at 4.7 – 5.0 m bgs), located down-gradient of the former CLC. It should be noted that lead concentrations in all analysed soil samples were below the applicable standards/guidelines (including BH13-43). Additionally, a sample from MW13-39-6 was above the toxicity characteristic leaching procedure (TCLP) trigger value (100 µg/g); however, it contained lead leachate concentrations that were less than the laboratory detection limit and below the BC *Hazardous Waste Regulation* (HWR). Leachable lead soils most likely exist beneath (i.e. the area surrounding BH13-43) and immediately down-gradient of the former CLC. To support off-site disposal, leachate concentrations should be further assessed and managed when subsurface utility work or soil excavation activities are planned in the vicinity of the former CLC.

Additionally, the soil quality across the entire Site has not been fully established or investigated, such that any soil excavated on-site may be contaminated and it is advised that the soil be treated as such until analytical results indicate that it is not.

### 4.3.1 Underground Storage Tanks

Based on the Phase I Environmental Site Assessment (ESA) (Hemmera, 2013) two previous USTs (approximately 37,850 L each) were reported to be on-site, located in the maintenance shop area of the plant building. The USTs were reported to have been decommissioned and filled with sand and covered by a concrete slab in the early 2000s. The USTs were no longer in use, as they were replaced by a 35,000 L diesel above ground storage tank. The approximate location of the former USTs are shown in **Figure 3**. The exact locations of the USTs were not determined during the Phase I ESA, but cuts in the concrete flooring were observed during the site visit as part of the Phase I ESA. However, without confirmation of the removal of these tanks, they may potentially still be in place and require removal.

As required for construction, excavations will be completed in the suspected areas of the USTs to confirm their presence/absence. Should USTs be encountered, the tanks will be removed via excavation and disposed off-site. The procedure will involve removal of suspect clean soil (i.e. above or beside the tanks with absence of visual and olfactory indications of contamination) to expose the UST. Excavated suspect clean soil will be stockpiled on-site on a plastic sheet and covered with plastic sheet. The UST will be dipped to confirm the presence of any residual oil/water/sludge, and the contents will be pumped out of the UST for off-site disposal. The tank will be made inert and cut open to minimize the potential for ignition of fumes. The tank will be loaded onto a truck for off-site disposal.

Once the tank has been extracted from the ground, any suspect soil contamination identified (visual or olfactory) will removed and the soil stockpiled on-site on a plastic sheet and covered with plastic sheet. Soils (both suspect clean and suspect contaminated soils) will be tested to confirm re-use on-site (i.e. soil does not contain contaminants) or off-site disposal (soil is contaminated or is otherwise unsuitable for re-use).

A letter report will be prepared for appropriate distribution with stakeholders to confirm the removal of the tank and the in-situ soil quality should remaining contamination be left in place (noting that several areas of contamination exist at the Site, a risk assessment has determined that risks to human health and the environment are minimal, and the intent is not to fully remediate soil contamination at the Site.

## 4.4 SOIL STOCKPILE MANAGEMENT

Excavation of soils for the Project should prioritize “clean and tidy” site-handling of materials, with minimal handling and vehicle tracking of soils, which could potentially be contaminated, on ground surface. Soils should be contained in a way that minimizes the possibility for contaminants to spread to other areas on-

site or to adjacent properties via the air (dust) or surface water (run-off). Soil stockpiles should be kept covered to limit the potential for movement (i.e. via airborne dust or run-off from precipitation) to mitigate contaminant migration.

An appropriate temporary soil storage area should be identified prior to excavation work commencing. Soils should be properly stockpiled on an impermeable surface in order to avoid contamination of the ground surface, and to assist in managing run-off during periods of rainfall. Depending on the depth of excavation and volume of water to be removed from below the water table, water saturated soils should be placed in bermed and lined enclosures. To avoid removal of water saturated soils, excavations below the water table should be timed with tidal low water levels. If stockpiled materials are not sufficiently dewatered, run-off can be contained on-site within a catchment area or pumped into a containment tank for off-site disposal. Use of filter fabric and lined swales to keep sediment-laden water in appropriate areas should be deployed as required.

Additionally, should any unanticipated suspect contaminated material be encountered during excavation activities, in-situ (i.e. in ground) or ex-situ (i.e. in a separate stockpile) testing can be completed to determine whether further soil management changes are required.

### 4.5 REUSE/DISPOSAL

Once the stockpiles have been characterized, the soils can be reused or removed to the appropriate disposal location. Soil exceeding CCME and/or CSR IL land use guidelines/standards for non-leachable COCs may be disposed of off-site at a local permitted facility. Soil classified with leachable COCs (based on the HWR leachate quality standards as determined by leachate analysis) may not be disposed of at local facilities and should be transported to a permitted facility capable of accepting such contaminants.

Once the disposal site is determined, it may be necessary to conduct additional testing of the material to adequately characterize it as per the requirements of the receiving site. Off-site disposal will also include obtaining relevant soil permits, waste manifests and/or Soil Relocation Agreements[4] pertaining to the Site.

Soil meeting the CSR IL standards and CCME IL guidelines for the specific contaminants of concern will be suitable for backfill on the Site. However, if the soil does not meet geotechnical requirements for backfill, or additional backfill material is not needed, the soil should be disposed of off-site at a licensed facility and not kept long-term in stockpiles at the Site.

[4] Contaminated Soil Relocation Agreement, BC MOE

### 4.6 SOIL TRACKING

Following classification of the stockpiles by the Contractor's appropriately qualified environmental professional (QEP), the appropriate soil tracking measures should be followed for stockpiles.

The Contractor's environmental personnel, under the direction of the QEP, shall provide a completed soil tracking manifest for each load of soil classified as exceeding the IL standards/guidelines for specific contaminants of concern and removed from the temporary stockpile area(s). The environmental personnel should keep one copy of the manifest and supply the truck driver with two additional copies. Upon delivery of the soil, the truck driver will provide the off-site landfill operator with the manifest copies. The landfill operator will keep one copy of the manifest for their files and will forward the other copy to the environmental personnel. The Contractor shall maintain copies of all manifests for Proponent inspection.

For disposal of excavated soil from the Site, the soil will be removed and disposed at an accredited facility that can receive the soil, where the quality of soil being disposed is less than or equal to the lowest value of the soil standards applicable to the land use of the receiving site, as in Schedule 3.1 of the CSR. The stockpile characterization samples will also be analyzed for leachate quality, with the leachate results also meeting the water quality standards that are considered applicable to the receiving site, as per Schedule 3.2 of the CSR. All soil removed from the Site will be tracked, with a manifest or soil tracking form, dependent on the quality of the soil based on the stockpile characterization samples. The Contractor (with direction from the Proponent) will be responsible for filling out the manifests.

# 5.0 ENVIRONMENTAL PROTECTION

The intrusive work required for the Project should be conducted in a manner that ensures any impacted soil, sediment-laden water, and/or any additional effluent potentially harmful to aquatic life does not leave the work area and enter the environment. Potential harmful effluent may include groundwater drainage, surface run-off, contaminated soils, oil/fuel spills, etc.

## 5.1 ENVIRONMENTAL MONITORING

Any movement of surface water from the work area to the receiving environment (i.e. down-gradient ditch) should be closely monitored for sediment. During all stages of any intrusive work, surface water should be visually monitored a minimum of three times per day.

Prior to and/or during significant surface water run-off events (see below for details), suspected impacted water samples should be collected as deemed necessary by an environmental monitor due to visual indications (i.e. turbidity or sheen). All works should be in compliance with the following water quality criteria (or equivalent based on the intrusive work required for the Project):

- When background is less than or equal to 50 nephelometric turbidity units (NTU) or 100 milligrams per litre (mg/L) non-filterable residue (NFR), induced turbidity should not exceed 5 NTU or 10 mg/L NFR above the background values.
- When background is greater than 50 NTU or 100 mg/L NFR, induced turbidity should not exceed the background values by more than 10% of the background value.

If the water quality exceeds these criteria the work should be suspended until adequate corrective measures have been implemented to the satisfaction of the environmental monitor.

## 5.2 EROSION AND SEDIMENT CONTROL

Rainwater run-off from work areas should be managed. While rainfall can be expected to infiltrate into the surrounding land (unpaved), surface water run-off from the work area should not be allowed to enter any watercourse. Should the working area and potential stockpile areas require controls for silt-laden run-off, a combination of several techniques may be utilized including, but not limited to, those described below:

- Installation of upslope drainage interception to remove clean uncontaminated water and reduce amount of water flowing through the Site.
- Installation of sediment fence material on the downslope side between working areas or stockpile areas to limit surface water movement;
- Filter cloth should be readily available on-site as required; this material can provide a reasonably effective, on the spot filtration device in field situations and may be placed in pools or ditches to filter water laden with sediments.

- Ditches can be excavated surrounding the work area to maintain adequate drainage as long as water is managed and tested.
- Soil excavation stockpiles should either be completely contained within sediment fences and/or covered with polyethylene sheeting to prevent erosion.
- Surrounding storm drains should be plugged and/or protected. The use of sediment fence and spill booms to keep sediment-laden water in appropriate areas should be implemented as needed.
- If sediment fencing is necessary, it shall be installed adjacent and downslope of the sediment generating activity. Orientation shall be in a manner to intercept any sediment laden water and reduce potential sedimentation of local run-off.

### 5.3 DEWATERING AND WATER MANAGEMENT

Excavations (see depths in **Figure 4**) below the high water mark and/or water table will fill with groundwater. Based on existing data for the Site, there are groundwater impacts related to dissolved metals, petroleum hydrocarbons, and PAHs.

As noted in the Construction Environmental Management Plan (CEMP), excavations will be conducted within sheet pile walls and once the target depth is reached, concrete will be tremied to seal the excavation from water ingress (see CEMP **Section 6.7.2** for process details). Water in the excavation will be pumped out and sent to a treatment system to satisfy the BC Ministry of the Environment and Climate Change Strategy (MoECCS) discharge requirements for discharge to a storm drain or ditch. Prior to discharge of any water from the Site, the applicable discharge permits will be obtained from the MoECCS.

Water quality will be confirmed through field in-situ testing concurrent with discharge events, and with laboratory analytical testing to confirm treatment process quality. The treated water will be discharged into a storm drain. Groundwater control during excavation pumping may include:

A) Excavation water to be pumped into a holding tank (to retain water until treatment or clarify turbid water) or directly to the treatment system.
B) Samples tested from holding water/prior to treatment (as needed) and from post-treatment streams (See Appendix A1 for reference to applicable regulatory discharge concentrations).
C) Water treatment for metals and/or hydrocarbons with a portable on-site system or disposed off-site using a vac truck.
D) Water discharged to a designated location (as per applicable permits) such as the sedimentation pond (which will continue to receive storm water run-off during construction), storm drain or ditch. Sediment control structures will be installed to prevent impacts to discharge location, if on-site ditches are used (see above).

Water discharge objectives will be dependent on the discharge location and permit issued for the Project and will include specific reporting requirements to the applicable regulatory body as well. The permit

applications should be completed prior to beginning dewatering activities with care taken to limit the quantity of water to be stored on-site and to prevent delays to the Project.

As dewatering will be short-term approval requirement, quarterly report(s) will be prepared during the dewatering phase of the Project, which will include volumes pumped, discharge location, and water quality information.

### 5.4 SITE CLEANLINESS AND FUEL HANDLING

Appropriate spill containment and cleanup supplies should be kept available on site whenever the work program is underway, and personnel working on the Project will be familiar with implementing the spill cleanup plan and the deployment of spill response materials.

A spill contingency plan included in the CEMP to address spills in close proximity to working machinery. Workers should be suitably trained in spill response in accordance with **Section 7.0** of the CEMP and ensure that all machinery use on-site is kept in good working condition in accordance with **Section 6.5** of the CEMP. Any significant maintenance should be conducted off-site.

Any fuel that is on-site should be carefully and safely handled in accordance with **Section 8.0** of the CEMP and stored away from open excavation areas so that spills will not enter the excavation.

## 6.0 HEALTH AND SAFETY

The following sections detail the exposure risks and health and safety precautions to reduce identified risks. The Plan is intended to supplement any site- and/or tenant-specific health and safety plan and to provide awareness of soil and groundwater contamination on the Site along with general soil handling practices. It does not supersede local, provincial or federal regulations with respect to worker health and safety.

The Site operators and their contractors will be responsible for developing a health and safety plan for any excavation, which adequately addresses potential health and safety concerns related to soil contact.

The level and type of contamination, if present in a proposed work area should be provided to the contractor prior to initiation of any project. The contractor shall recommend the type of Personnel Protective Equipment (PPE) for the specific contaminants of concern and concentrations in working areas.

### 6.1 RISKS AND HEALTH AND SAFETY PRECAUTIONS

Potential risks to workers at the Site are primarily exposure to soils, as well as groundwater and vapour should soils be excavated and exposed. As noted in the DHHERA, which was previously provided, chronic exposures and subchronic exposures to the soil contaminants through incidental ingestion, particulate inhalation, and dermal contact were found to pose low risk to human health.

However, most exposure to contaminated soils will occur after the excavated soils have been removed and workers undertake activities within an excavated area, coming into contact with soils, and potentially groundwater, and vapours. Therefore, this Plan identifies additional measures for the protection of construction worker exposure to in-place soils, groundwater, and vapours that could be uncovered during excavation activities (i.e. within excavation areas)

If soil contaminants are uncovered and available for direct contact within an area of excavation, measures to protect workers (e.g. personal protective equipment) need to be put in place prior to construction workers entering an excavation and coming into contact with these soils/contaminants, groundwater, and/or vapour. To address this, the location and extent of contamination (as described in **Sections 3.0** and **4.1** and illustrated on **Figures 1** and **2**) relative to proposed work area should be identified prior to initial excavation. However, the soil quality located across the entire Site has not been fully investigated or understood, such that additional contamination may exist outside of the know plume areas. Any intrusive work completed on-site should be aware of the risks posed, and prepared to deal with the worse case.

If work is being conducted in areas identified and described in Section 3.0 and illustrated on **Figures 1** and **2**, at minimum the following PPE and health and safety measures should be followed:

- Workers that will be in direct contact with excavation soils and/or groundwater must wear nitrile (or equivalent) gloves;
- Workers around and in an excavation must wear coveralls or long sleeve shirts and full pants, and work boots;
- Workers must wear protective safety glasses;
- If dusty conditions exist, the soil should be wetted and workers must wear a dust mask;
- If excavation work is being conducted in hydrocarbon contaminated area (3 m bgs), vapours should be monitored and if required, protective masks should be worn;
- No smoking in or within the vicinity of the excavation areas; and
- No smoking or eating should be permitted without hands first being washed.

Health and Safety meetings should be conducted at the beginning of each workday and potential risks (new or old) should be highlighted. It is recommended that a QEP be on-site to monitor excavation activities and that a project-specific health and safety plan with mitigation measured and required PPE be prepared.

## 7.0 CLOSURE

This Work was performed in accordance with Contract 08-17-115C Professional Services Agreement between Hemmera Envirochem Inc. ("Hemmera") and Parrish & Heimbecker c/o FWS Group of Companies ("Client"), dated December 8, 2017 ("Contract"). This Report has been prepared by Hemmera, based on fieldwork and desktop work conducted by Hemmera, for sole benefit and use by the Client and Fraser Grain Terminal Ltd. In performing this Work, Hemmera has relied in good faith on information provided by others, and has assumed that the information provided by those individuals is both complete and accurate. This Work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the Report was produced. The conclusions and recommendations contained in this Report are based upon the applicable guidelines, regulations, and legislation existing at the time the Report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

We sincerely appreciate the opportunity to have assisted you with this project and if there are any questions, please do not hesitate to contact the undersigned by phone at 604.669.0424.

Report prepared by:
**Hemmera Envirochem Inc.**

***ORIGINAL SIGNED***

Michael Choi, B.Sc., P.Chem.
Project Director

Reviewed by:

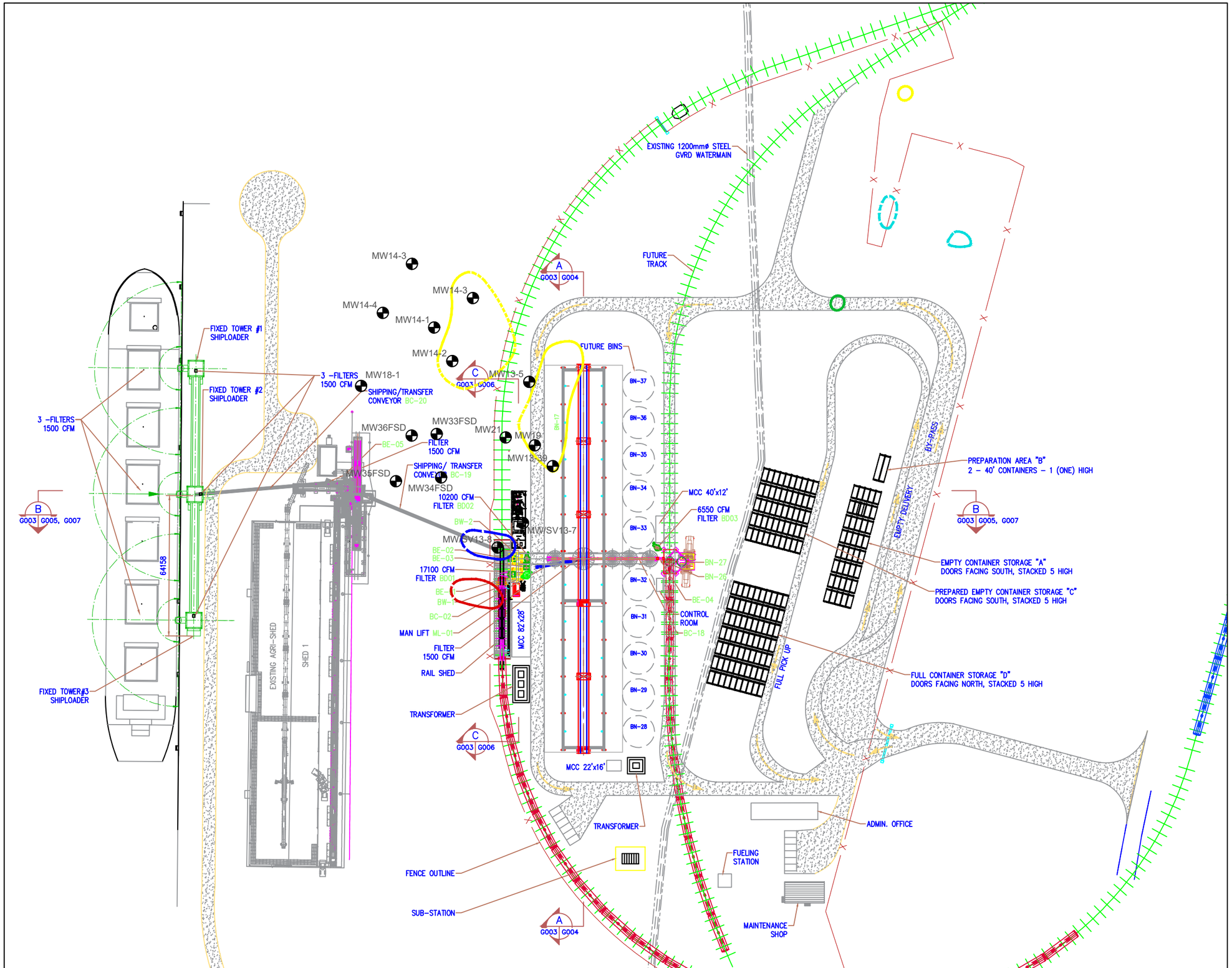
***ORIGINAL SIGNED***

Robin Taylor, MRM, EP
Project Manager

# FIGURES

Soil and Groundwater Management Plan
Fraser Grain Terminal
11041 Elevator Road, Surrey, BC

**Estimated Extent of Soil Contamination as of 2013 Investigation**




Legend

- MNA Monitoring Well

Extent of Soil Contamination

- Arsenic
- PAH, LEPH, HEPH, VPH
- Phenanthrene
- TCE
- Zinc

Dashed = Estimated

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

N

1:1700

0 25 50 75

Metres

NAD 1983 UTM Zone 10N

Page Size: 11" x 17"

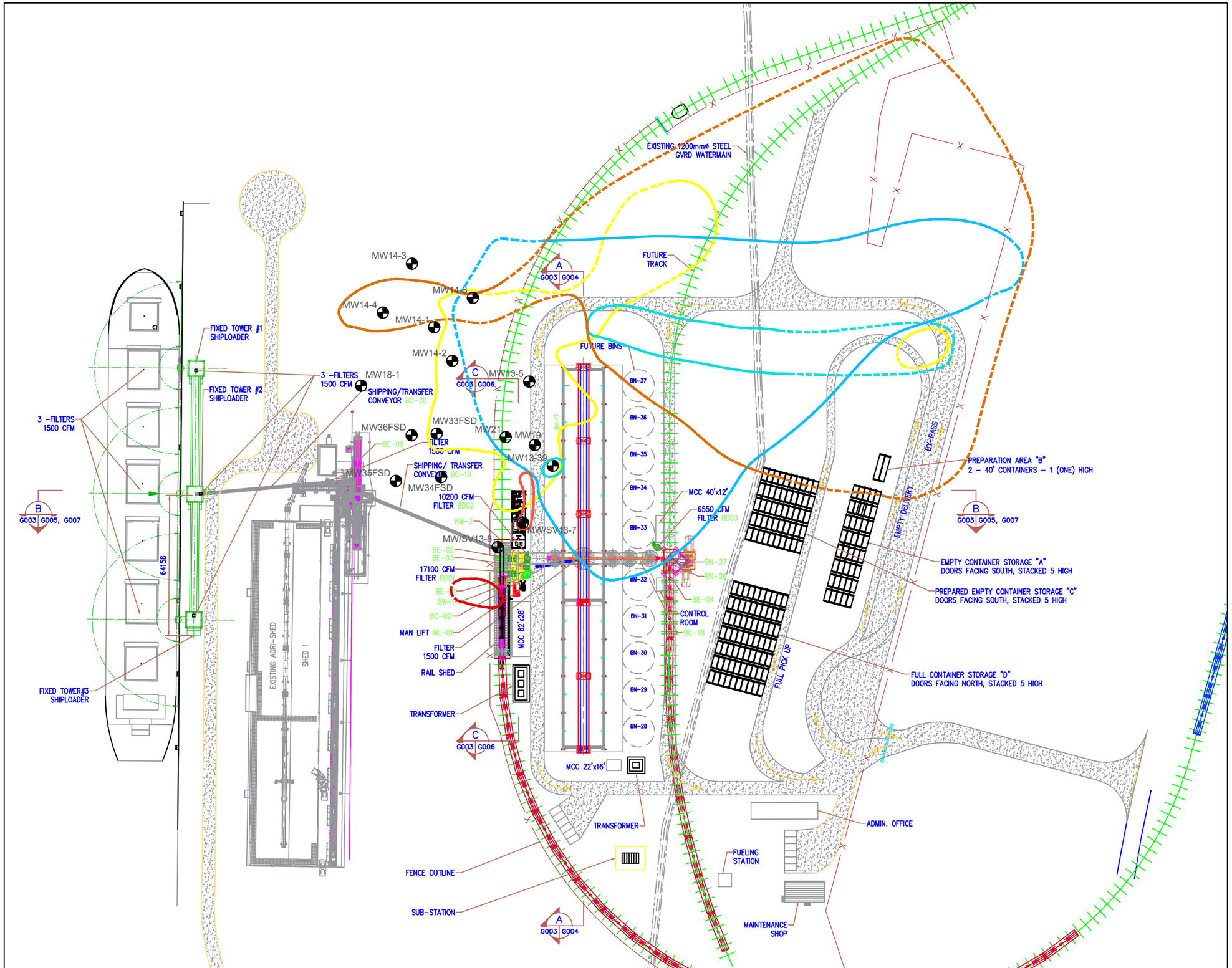
| 2191-001.01 | Production Date: May 14, 2018 | Figure 1 |
|---|---|---|

Hemmera
An Ausenco Company

FWS Group of Companies

Soil and Groundwater Management Plan
Fraser Grain Terminal
11041 Elevator Road, Surrey, BC

**Estimated Extent of Groundwater Contamination as of 2013 Investigation**




Legend

- MNA Monitoring Well

Extent of Groundwater Contamination

- Arsenic
- Boron
- Hydrocarbons
- Iron
- Manganese
- Zinc

Dashed = Estimated

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

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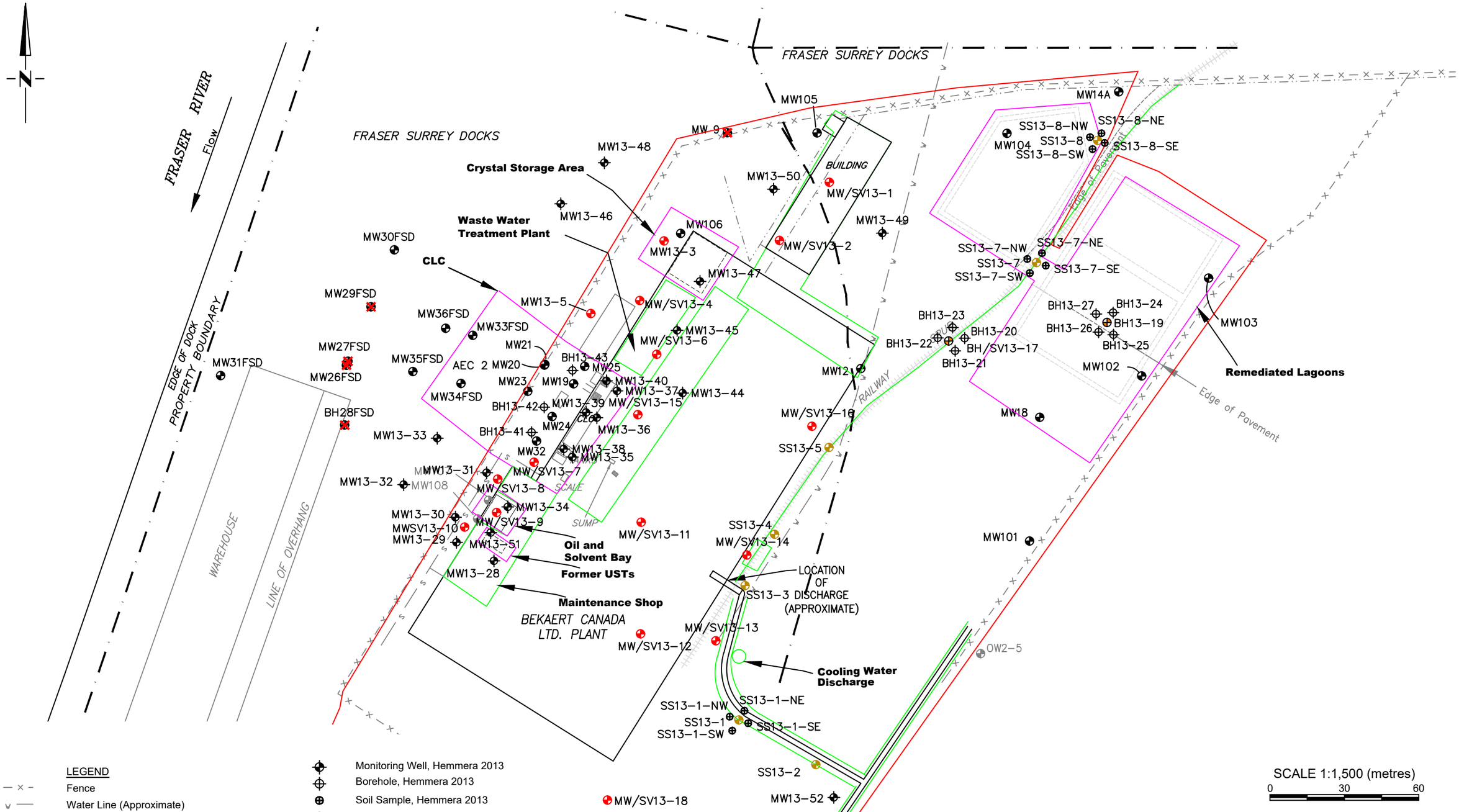
| 2191-001.01 | Production Date: May 14, 2018 | Figure 2 |
|---|---|---|

Hemmera
An Ausenco Company

FWS Group of Companies




LEGEND

- Fence
- Water Line (Approximate)
- Sewer Line (Approximate)
- Gas Line (Approximate)
- Property Boundary (Approximate)
- APEC - Area of Potential Environmental Concern
- AEC - Area of Environmental Concern

- Monitoring Well, Hemmera 2013
- Borehole, Hemmera 2013
- Soil Sample, Hemmera 2013
- Previously installed Monitoring Well
- Groundwater Monitoring Well and/or Soil Vapour Probe (2013)
- Surficial Soil Sample
- Borehole and/or Soil Vapour Probe
- Inaccessible/Destroyed
- CLC Cleaning Line Containment Line

NOTE: Figure and monitoring wells are approximate and not to scale

SCALE 1:1,500 (metres)

0 30 60

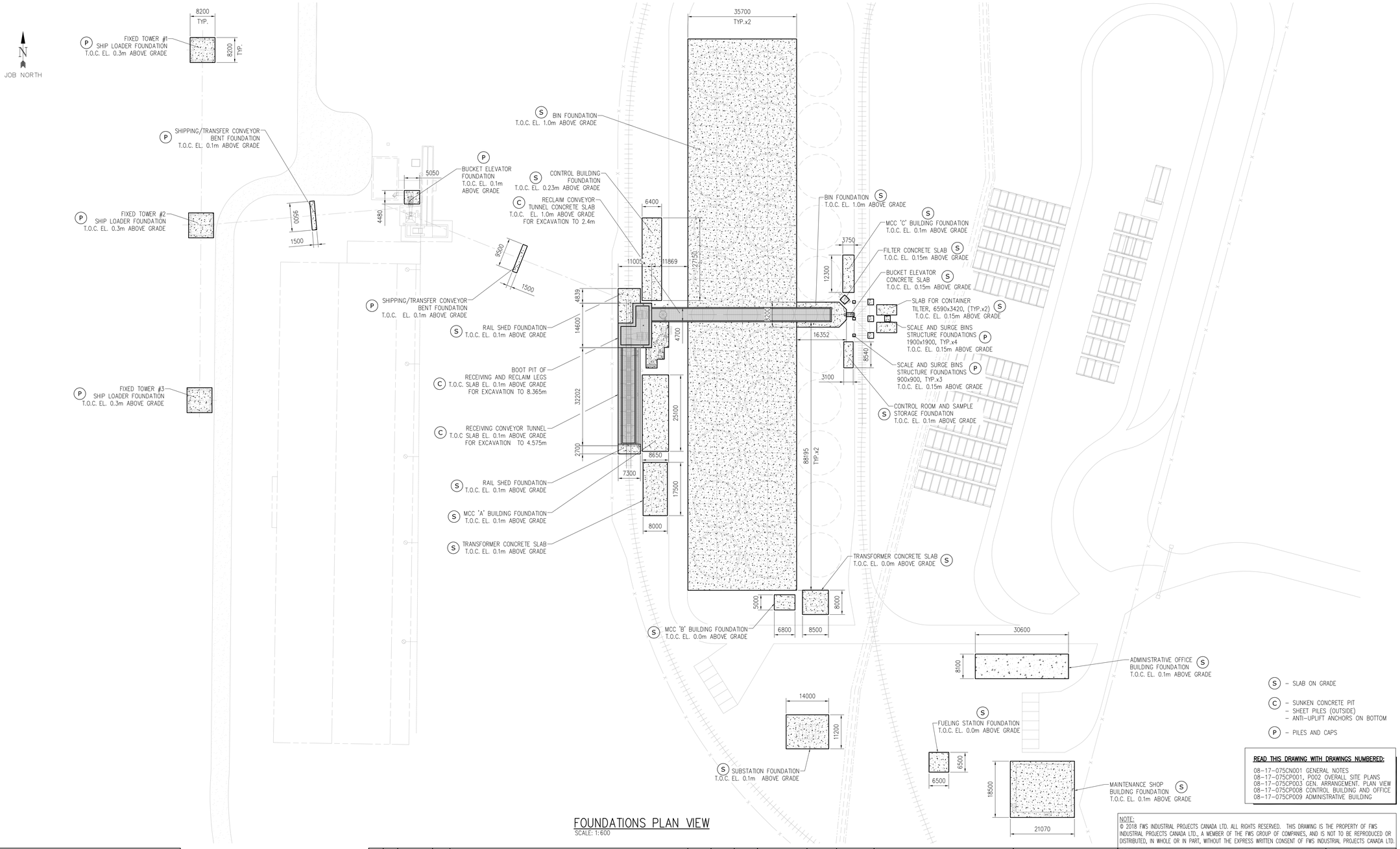
Hemmera
An Ausenco Company

CLIENT: FGT FRASER GRAIN TERMINAL

SOIL AND GROUNDWATER MANAGEMENT PLAN
FRASER GRAIN TERMINAL
11041 ELEVATOR ROAD, SURREY, BC

**INVESTIGATION LOCATIONS**

| PROJECT No. | | |
|---|---|---|
| 2191-001.01 | May 14, 2018 | FIGURE 3 |




## FOUNDATIONS PLAN VIEW

SCALE: 1:600

NOTE:
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ISSUED FOR PERMIT

| REV | BY | DATE | VR | DESCRIPTION | D/O MGR | P. ENG | P. MGR |
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| B | FP | 04/18/2018 | | REVISED ELEVATION DESCRIPTION | | | |
| A | FP | 04/13/2018 | | ISSUED FOR PERMIT | | | |

| DISTRIBUTION | COPIES | DATE |
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| CLIENT | | |
| PROJ. MGR. | | |
| FIELD | | |
| E-MAIL | | |
| PURCHASING | | |
| ENGINEERING | | |

TITLE: NEW TERMINAL
MAIN PLANT AREA
FOUNDATIONS PLAN VIEW

DRAWN BY: FP
DATE: APRIL 2018
SCALE: AS NOTED
JOB NO: 08-17-075C
DWG NO: P011
REVISION: B

CLIENT: P&H

LOCATION: SURREY, BC

FWS
The Confidence Builders
FWS INDUSTRIAL
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# APPENDIX A1

## Regulatory Framework

# 1.0 APPENDIX A1 – REGULATORY FRAMEWORK

The Site is owned by Vancouver Fraser Port Authority (VFPA), and therefore is under federal jurisdiction. The primary federal regulatory document for the evaluation of soil, sediment and water quality is the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines.

In federal jurisdictions, efforts are usually made to also consider other existing legislation. Therefore, in discussion with VFPA, the British Columbia Environmental Management Act (EMA) Contaminated Sites Regulation (CSR) were also applied to analytical results for comparison purposes. A discussion of the applicable soil, groundwater, and vapour regulations that were applied during the Phase II Environmental Site Assessment (ESA), Detailed Site Investigation (DSI), and Remediation of the Former Cooling Water Discharge Pit are provided in the following sections.

## 2.0 SOIL

### 2.1 FEDERAL

The CCME Canadian Soil Quality Guidelines (SQG) for the Protection of Environmental and Human Health and the CCME Canada Wide Standards (CWS) for petroleum hydrocarbons (PHCs) in soil are applicable at the Site.

The CCME SQG for the Protection of Environmental and Human Health (1999, last updated 2007, revised 2010) are risk-based and are typically used as a preliminary means of evaluating soil. The soil quality guidelines have been developed based on land use; different guidelines exist for “Agricultural”, “Residential/Parkland”, “Commercial” and “Industrial” sites. In addition to land use, CCME SQG for benzene, toluene, ethylbenzene and xylenes (BTEX) are also dependent on exposure pathways, soil type (fine versus coarse grained), and depth [surface (<1.5m bgs) versus subsoil (>1.5m bgs)].

Based on the current and future land use, and based on prior grain size analysis at the Site, the CCME SQG for coarse surface and subsurface soil at an industrial site was considered for soil contact exposure scenarios. The CCME SQG for fine grained soils were provided for reference.

The CCME CWS Tier 1 for PHCs in Soil (2001, updated 2008) are typically used as a preliminary means of evaluating PHCs in soil. CCME CWS have been developed for each fraction (F1, F2, F3 and F4) based on land use, soil type and soil depth. Different generic levels exist for “Agricultural”, “Residential”, “Commercial” and “Industrial” sites, and are based on coarse-grained soil versus fine-grained soil. The standards also change with depth of soil as related to exposure. Allowable concentrations for surface soil (i.e. less than 1.5m bgs) are different from those for subsurface soil (i.e. deeper than 1.5m bgs).

In addition to land use and soil characteristics, additional generic criteria have been developed according to exposure pathways. If potential exposure pathways can be identified at a site, different generic levels may exist for specific exposure pathways including soil ingestion, dermal contact, vapour inhalation, protection of groundwater for aquatic life, potable groundwater, protection of groundwater for livestock watering, nutrient cycling, eco-soil contact, eco-soil ingestion, produce, livestock ingestion and off-site migration.

Considering potential exposure pathways at the Site, Hemmera selected the most stringent applicable standards for coarse grained surface and subsurface soil at an industrial site, however all criteria were provided as reference.

### 2.2 PROVINCIAL

Hemmera understands that the Site is currently zoned Industrial and future use for the Site is likely to remain as industrial land use. Therefore, the CSR Generic Numerical Soil Standards and Matrix Numerical Soil Standards, for Industrial Land Use (IL) as presented in Schedules 4, 5, and 10 of the CSR (which includes amendments up to B.C. Reg. 97/2011, May 31, 2011) were applied to the Site.

In accordance with the CSR, and based on the current and future groundwater uses in the vicinity of the Site, the following site-specific factors were considered to determine the applicable matrix soil standards:

- Intake of contaminated soil (mandatory at all sites).
- Toxicity to soil invertebrates and plants (mandatory at all sites).
- Groundwater flow to surface water used by aquatic life (freshwater and marine).
- Groundwater used for drinking water.

Where applicable, the most stringent of the above-noted matrix standards was used for assessing the soil analytical results at the Site.

Based on the absence of agricultural areas within 500 m of the vicinity of the Site, the site-specific factors for environmental protection of “livestock ingesting soil and fodder,” “major microbial functional impairment,” “groundwater used for livestock watering,” and “groundwater used for irrigation watering” are not considered to be applicable at the Site.

Soil analytical results were also compared to the Lower Mainland (**Table 1**, Column III) regional background soil quality estimates for inorganic substances, according to Protocol 4 for Contaminated Sites – Determining Background Soil Quality (MOE, 2010).

Additionally, the BC Hazardous Waste Regulations (HWR) defines practices and methodologies for handling, transporting, and storing/disposing of materials designated as hazardous waste. For the purpose of remediation planning only, selected soil samples were compared to the HWR Leachate Quality Standards.

# **3.0** GROUNDWATER

## 3.1 FEDERAL

In May 2010, the Federal Contaminated Sites Action Plan under Environment Canada released the Federal Interim Groundwater Quality Guidelines (FIGWQG) for use at Federal Contaminated Sites. These guidelines were initially applied to the Site during the Phase II ESA investigation. However, VFPA has since clarified that as these guidelines are in draft, they have continued to use the CCME Water Quality Guidelines (WQG) with an applied 10x dilution factor. Therefore, the CCME WQG for the Protection of Aquatic Life (freshwater and marine) with a 10x dilution factor were considered applicable at the Site.

As agricultural land use was not identified within 500 m of the Site, the CCME WQG for the Protection of Agricultural Water Use was not applied to the Site.

## 3.2 PROVINCIAL

The applicable groundwater standards for the Site are based on the CSR, specifically Technical Guidance (TG) #6, and are dependent upon one or more of: existing water use, existing land use, distance to receptors (including consideration of preferential pathways), future water use, and hydrogeologic characteristics of the aquifer (including hydraulic conductivity and aquifer yield).

A search of provincial groundwater well database revealed no domestic wells within 500 metres of the Site. However, as outlined in the CSR and effective February, 2011, CSR drinking water (DW) standards are considered to apply based on “future” drinking water use.

As per TG6, the applicability of CSR Aquatic Life (AW) standards is based on the presence of aquatic receptors within 500 m of the Site with preferential pathways also considered. The nearest surface water bodies to the Site is the Fraser River, located approximately 125 m west of the Site and Gunderson Slough located approximately 50 m to the south of the Site. As such, CSR AW (freshwater and marine) standards are expected to apply at the Site.

Based on the above, the following groundwater standards were considered applicable at the Site:

- The CSR Generic Numerical Water Standards for the protection of Freshwater and Marine Aquatic Life (AW), as presented in Schedule 6 of the CSR.
- The CSR Generic Numerical Water Standards for the protection of Drinking Water (DW), as presented in Schedule 6 and 10 of the CSR.

Agricultural land use, irrigation or livestock watering practices were not identified within 500 m of the Site; as such, irrigation land use (IW) and livestock use (LW) standards do not apply to the Site.

# **4.0** SURFACE WATER

Surface water discharges after appropriate laboratory testing (and treatment if required) will follow the applicable surface water guidelines/standards based on site-specific factors:

## 4.1 FEDERAL STANDARDS / GUIDELINES

- The CCME Canadian Water Quality Guidelines (CWQG) for the protection of Aquatic Life (Freshwater and Marine) Standards (CCME FAL and MAL, updated to 2014).

## 4.2 PROVINCIAL GUIDELINES

- The British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife, and Agriculture Summary Report, 1998, updated to January 2017.
- Freshwater and Marine Aquatic Life criteria are referenced from the Approved Guidelines and/or Working Guidelines Tables 1 to 46 (BCWQG FAL and MAL respectively).

# **5.0** VAPOUR

Vapour guidelines are currently not regulated under CCME, therefore vapour results were compared to the CSR standards.

The applicable soil vapour standards for the Site are based on land use standards (i.e. CSR IL). The BC CSR Schedule 11 Generic Numerical Vapour Standards (CSR GNV) for Industrial Land (IL) Use (Column V) were used to evaluate the results of the soil vapour sampling program for both indoor and outdoor air.