Dewatering and Stormwater Plan for Excavation at Columbia Containers Ltd. Phase 2 Site Modernization at 2775 Commissioner Street, Vancouver, BC

Prepared for:
Columbia Containers Ltd.
2775 Commissioner Street
Vancouver, BC V5K 1A1

Prepared by:
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File: 1165-002.02
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August 25, 2014
File: 1165-002.02

Columbia Containers Ltd.
2775 Commissioner Street
Vancouver, BC V5K 1A1

Attn: Adrian Samuel, General Manager, Columbia Containers

Dear Adrian,

Re: Dewatering and Stormwater Plan for Columbia Containers Ltd. Phase 2 Site Modernization at 2775 Commissioner Street, Vancouver, BC

Hemmera is pleased to provide you with this electronic copy of the Dewatering and Stormwater Plan for Phase 2 Site Modernization.

The enclosed Dewatering and Stormwater Plan is Final, and is intended to support permit application to Port Metro Vancouver. As such, the report is signed.

We have appreciated the opportunity to work with you on this project and trust that this report meets your requirements. Please feel free to contact the undersigned by phone or email regarding any questions or further information that you may require.

Regards,
Hemmera

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1.0 INTRODUCTION

Columbia Containers has been successfully operating a grain transloading facility at 2775 Commissioner Street in Port Metro Vancouver's (PMV) South Shore Trade Area for more than 40 years. To remain competitive in the global market Columbia Containers are modernizing and rebuilding their facility.

The project, which comprises four separate permit applications will:

- Decommission and remove our secondary system, stores facility and workshop and excavate new loading pits ("System II Demolition and Pit Excavation" Permit Application).
- Build a modern, efficient and compact transloading facility to replace the aging grain elevator at a new location slightly north (toward the water) and west of the current grain elevator; reinstall eight grain storage silos; and add five new silos ("New Grain Transloading Facility" Permit Application).
- Move the retaining wall on the foreshore at the 'bight' approximately 20 feet to the north, accommodating PMV's realignment of Commissioner Street, part of the South Shore Corridor Project ("Retaining Wall Realignment" Permit Application).
- Construct a new two-storey office building at the west end of our property, to replace our current office trailers ("Modular Office Building" Permit Application).

The proposed project takes place in areas classified as green and yellow in the East Vancouver Port Lands Area Plan and complies with all related requirements with respect to environment and site design. The replacement grain storage silos will be situated far enough north and east, such that the perceived view effect to the community will not be impacted as compared with our current practice of using converted containers.

In 2011, PMV selected Columbia Containers through a request for expressions of interest for Terminal Dock Redevelopment, in part due to Columbia Container's plans for the site. Potential future terminal dock redevelopment would require an environmental assessment and community consultation would be required to support this potential subsequent development.

This report is a Dewatering and Stormwater Plan for management of soil, groundwater and surface water during excavation and dewatering of the pit for the "System II Demolition and Pit Excavation" Permit Application.

2.0 OBJECTIVES

To conduct the above modernization, a Dewatering and Stormwater Plan has been requested by PMV to satisfy the System II Demolition and Pit Excavation permit, and environmental management expectations to prevent impacts to Burrard Inlet and the surrounding neighbourhood. Information requested by PMV includes management methods for groundwater, surface/storm water and soil related to the construction works for the pit excavation and management during phase 2 of the Columbia Containers modernization project.

The Dewatering and Stormwater Plan provides methodologies for managing soil, groundwater and surface water. To date, please note that soil quality and groundwater quality have not been determined. Hemmera understands that Columbia Containers intends to characterize soil and groundwater quality concurrently during excavation, and that soil and groundwater will be stored on-site prior to receipt of analytical results and validation of media quality. This will involve temporarily storing soil and groundwater in lined stockpiles, ponds and/or tanks until analytical results are received so that soil and water quality is characterized, and an appropriate disposal method can be determined. Given the absence of knowledge about soil and groundwater quality this plan is adaptive, and provides methods to address reasonably foreseeable situations during pit excavation and dewatering. Depending on the results of characterization not all management techniques mentioned here may be necessary.

2.1 QUALIFIED PERSONNEL

Qualified personnel will be available on-site to assist in soil and water quality management, monitoring, and sampling during excavation and dewatering activities.

2.2 LIMITATIONS ON REMOVAL OF CONTAMINATED SOIL AND WATER

The intent of this program is to outline management plans for soil and water. This program is not intended to complete investigation or remediation of any contaminated soil or water at the site. Should significant contamination be encountered, Columbia Containers will discuss the findings with PMV so that mutually acceptable approaches to (in-situ) contamination are reached.

3.0 LITERATURE REVIEW

Available environmental and geotechnical reports for the Site, and reports for immediately adjacent properties, were reviewed to gain insight into soil and groundwater quality, and expected soil stratigraphy underlying the site. Reports reviewed included:

- *Stage 1 Preliminary Site Investigation, 2775 Commissioner Street, Vancouver BC*. Prepared for Columbia Containers Ltd. by Kermode Consulting Ltd. Jane 27, 2003
- *Phase I Environmental Site Assessment of 2695 Commissioner Street, Vancouver, BC*. Prepared for Terminal Systems Inc. by Golder Associates Ltd. March 10, 2004.
- *Environmental Risk Evaluation Container Stuffing Facility, Vancouver, BC*. Prepared for Viterra by Hemmera Envirochem Inc. November 2008.
- *Geotechnical Assessment of Proposed Site Development at the Columbia Containers Terminal, Vancouver, BC*. Prepared for Ausenco Sandwell by MEG Consulting Ltd.. October 20, 2010.
- *Terminal Dock Expansion Project – Review of Land Use History for Columbia Containers Ltd. West Yard Property and Terminal Dock Lands and Proposed Workplan for Fill Quality Investigation*. Prepared for Columbia Containers Ltd. by Hemmera Envirochem Inc. October 20, 2011.
- *Environmental Assessment Document – Columbia Containers Terminal Dock Expansion Project*. Prepared for Columbia Containers by Hemmera Envirochem Inc. November 2011.
- *Stage 1 Preliminary Site Investigation Update, Coastal Containers Ltd., 2525 Commissioner Street, Vancouver, BC*. Prepared for Canadian Malting Company Ltd. by URS Corporation. November 7, 2011.
- *Borehole Investigation Findings, 2775 Commissioner Street, Vancouver, BC*. Prepared for Nu Westech Engineering Ltd by GES Geotech Inc.. July 8, 2014.

The following is a summary of pertinent findings from the literature review.

3.1 SITE FORESHORE AND FILL HISTORY

None of the natural/original shoreline of Burrard Inlet appears to exist within the project area. The majority of the existing shoreline is reclaimed land, filled between the 1950's and the early 1980's with imported fill of unknown quality (Hemmera, 2008). Review of historic information established that the site has been used as a grain elevator facility since prior to 1957, and has been occupied by Columbia Containers since prior to 1970. The site borders Burrard Inlet, and groundwater levels are expected to be influenced by tidal flux (Kermode, 2003).

At an adjacent property (Terminal Dock), it was noted that Vancouver Port Authority (VPA) were unable to provide any records as to nature of the material used as fill, and were unaware of any recent ground investigations (Golder, 2004).

3.2 AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

The Stage 1 PSI completed by Kermode Consulting Ltd. (Kermode) identified three Areas of Potential Environmental Concern (APECs) at the Columbia Containers Site. The APECs and associated Potential Contaminants of Concern (PCOCs) are summarized on **Table A** below:

Table A APECs and PCOCs

APEC #	Description	PCOCs
1	Fill of Unknown Origin	Metals, PHC, and PAHs
2	Stained Soil	Metals, PHC, and PAHs
3	Maintenance Shed Area	Metals, PHC, PAHs, and VOCs

Note: PHCs = petroleum hydrocarbons; PAHs = polycyclic aromatic hydrocarbons; VOCs = volatile organic compounds

Kermode conducted a soil sampling and analysis program at APEC 2 in June 2003. The program involved collecting surficial soil samples in the vicinity of soil staining at the northwest corner of the site. The staining is interpreted to have resulted from decommissioned equipment storage in an unpaved area. Analytical results indicated concentrations of PHC greater than applicable standards over an area between 100 and 250 m^2. To date, APEC 1 and 3 have not been investigated and have potential to have impacted soil and groundwater quality at the Site, which will need to be managed during excavation and soil/water stockpiling.

3.3 SOIL STRATIGRAPHY AND POTENTIAL HYDRAULIC CONDUCTIVITY

GES Geotech Inc. (GES) conducted a borehole investigation at the Site in June 2014. Four boreholes were advanced and logged for stratigraphy and geotechnical properties. Three of the boreholes were completed with piezometers. Boreholes were advanced in the vicinity of the proposed excavation and give a general indication of expected stratigraphy below the proposed excavation. GES prepared a stratigraphic cross section of findings.

The GES results indicated groundwater is present approximately 4.5 metres below ground surface (mbgs). Of specific relevance to Columbia Containers, GES identified a 1.5m thick saturated loose sand and gravel layer from approximately 6.1 to 7.6 mbgs. This unit is expected to exhibit high hydraulic conductivity. In other words, groundwater is expected to flow fast through this unit and would require additional pumping to dewater. It remains unclear if this unit is hydraulically connected to Burrard Inlet. If so, the groundwater table will be significantly influenced by tides.

A Phase 1 report prepared by Golder Associates for the Terminal Dock property located to the west of the Site also indicated the water table is likely to be influenced by tidal fluctuations. Therefore, it is prudent to assume that groundwater at the Site is significantly influenced by the tides and that groundwater intrusion into proposed excavations will require careful prevention and dewatering management.

4.0 SOIL MANAGEMENT

4.1 EXCAVATION AND STOCKPILING

Prior to excavation works beginning, dedicated areas for soil management will be identified, and lined stockpiles and ponds/tanks will be assembled/built at the Site. For example, soil stockpiles will be placed on a high density polyethylene (HDPE) or geomembrane liner (or equivalent). This will ensure that soil materials are properly stockpiled on an impermeable surface until disposal, and water is properly stored in dedicated vessels to mitigate contaminant migration.

Soils will 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 water (run-off). If stockpiled materials are not sufficiently dewatered, runoff will be contained onsite within a catchment area or pumped into a containment tank. Use of filter fabric and lined swales to keep sediment-laden water in appropriate areas will be implemented if required.

Should excessive dust or rainfall detrimentally affect soil management, plastic covers will be applied over stockpiles and secured. Specifically, the cover will help prevent rainwater infiltration and will help mitigate dust.

During excavation, qualified personnel will monitor excavation soils, assist in identifying potential contamination (odours, staining, mineral precipitates), manage segregation of soils into stockpiles, and collect samples. To ensure sample integrity and quality, a Chain of Custody (CoC) procedure for sample submission will be followed.

For excavation soil management, excavated soil from various areas and depths on-site will be segregated in separate stockpiles to avoid cross-contamination, avoid generation of larger soil stockpiles requiring higher soil handling, and avoid larger off-site disposal costs (due to mixing of high contaminant level soils with low contaminant level soils).

4.2 SOIL DISPOSAL

All soils will be disposed off-site immediately after characterization. Characterized soil will be disposed off-site consistent with industry standards and based on the following federal and provincial regulations:

- Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines, Canadian Soil Quality Guidelines (SQG), and
- British Columbia Ministry of Environment (BCMOE), Environmental Management Act (EMA) Contaminated Sites Regulation (CSR), Industrial Land (IL) standards[1].

[1] Usually in federal jurisdictions, efforts are made to also consider other existing legislation. As indicated in the surrender of lease agreement, the British Columbia Environmental Management Act (EMA) Contaminated Sites Regulation (CSR) was also applied to analytical results for comparison purposes.

- The BC Hazardous Waste Regulations (HWR) defines practices and methodologies for handling, transporting, and storing/disposing of materials designated as hazardous waste. Therefore, for the purpose of the remediation program, soil samples were also compared to the HWR Leachate Quality Standards[2].

If backfill soils are required, stockpile or imported soils will be expected to meet both of the above regulatory expectations. It may be possible to dispose of clean soil on unused PMV property pending analytical results and approval from PMV. This can be discussed with PMV in advance of project initiation and excavation works.

Impacted soils are currently assumed to be non-leachable, and that no hazardous waste is present. If high concentrations are encountered, additional characterization testing may be conducted including further leachate testing.

4.3 GRAIN SILOS - SOIL

The following methodology is recommended for handling excavated soil from below the footprint of the proposed grain silos.

Based on conversation with Nu Westech staff, soil will be excavated to a depth of 1m below the footprint of three large and ten small grain silos. Based on the work complete with GES, this soil is expected to be above the water table. Therefore, grain silo excavations are not expected to contain groundwater and will not require dewatering. The large silos have a diameter of 22.86 m; the small silos have a diameter of 9.145 m. Therefore, approximately 410 m^3 of soil will be excavated for each large silo, and approximately 66 m^3 of soil will be excavated for each small silo.

However, please note that the proposed silo locations encompass the historic maintenance shed area (APEC 3) and some soil contamination may be encountered. To minimize the risk of cross contamination, it is recommended that soil excavated from each silo footprint be stockpiled and characterized separately.

Consistent with PCOC identified for APEC 3 in the Kermode Phase 1 report, soil stockpiles will be sampled for:

- Metals;
- Volatile Petroleum Hydrocarbons (VPH) including benzene, toluene, ethylbenzene and xylenes (BTEX);
- Extractable Petroleum Hydrocarbons (EPH);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Volatile Organic Compounds (VOCs); and
- Toxicity Characteristics Leachate Procedure (TCLP)[3]

[2] As per footnote 1, provincial standards have been applied considering transport and off-site soil disposal at provincially regulated landfills.

[3] Required for acceptance at landfill for disposal

The number of soil samples required soil quality characterization will be based on *Technical Guidance 1 – Site Characterization and Confirmation Testing* of the British Columbia Contaminated Sites Regulation (BC CSR). Analytical results will be used to determine disposal options/requirements for this material, consistent with regulatory expectations.

4.4 NEW RAILCAR DUMPER – SOIL

Based on conversation with Nu Westech staff, a 12m (39ft) deep excavation will be dug to accommodate the foundation for a new Railcar Dumper Building. The excavation is 'L' shaped and will have a footprint of 432 m^2. Specific dimensions of the excavation are shown on drawings prepared by Nu Westech. Between 3600 and 5000 m3 of soil will require excavation, stockpiling and soil quality characterization. The footprint of this excavation is located in the vicinity of four boreholes advanced by GES as part of their geotechnical investigation. A cross section prepared by GES (2014) provides a good indication of the expected soil types the excavation will encounter, and the vertical position of the water table (groundwater elevation).

Generalized stratigraphy expected below the new dumper car building, based on borehole observations from GES, is summarized in **Table B** below.

Table B Generalized Stratigraphy

Depth [mbgs]	Stratigraphic Unit
0.0 to 4.6	Loose Sand and Gravel, dry to moist (Unit 1)
4.6 to 6.1	Medium dense sand and gravel silt, moist to wet (Unit 2)
6.1 to 7.6	Very loose sand and gravel, wet (Unit 3)
7.6 to greater than 16.8	Very dense sand, clayey silt, dry to wet (Unit 4)

Note: Generalized stratigraphy is based on borehole observations and stratigraphy cross section prepared by GES for Columbia Containers Ltd.

During excavation, it is recommended that each stratigraphic unit be characterized separately. Based on available Phase 1 reports reviewed (**Section 3.0**) Units 1, 2, and 3 potentially constitute fill of unknown origin. Accordingly, each unit will be stockpiled and analysed separately.

Once soil has been excavated, samples can be collected directly from the soil stockpiles. Consistent with recommendations from **Section 4.1**, soil will be stockpiled on HDPE Geomembrane liners (or equivalent).

The number of confirmatory soil samples will be based on *Technical Guidance 1: Site Characterization and Confirmation Testing* of the British Columbia Contaminated Sites Regulation (BC CSR). Consistent with PCOC identified in the Kermode Phase 1 report, soil stockpiles should be sampled for:

- Metals;
- Volatile Petroleum Hydrocarbons (VPH) including benzene, toluene, ethylbenzene and xylenes (BTEX);

- Extractable Petroleum Hydrocarbons (EPH);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Volatile Organic Compounds (VOCs); and
- Toxicity Characteristics Leachate Procedure (TCLP)

Consistent with borehole observations from GES and Hemmera's experience with similar sites in the area, Unit 4 is interpreted to be comprised of glacial till that was deposited naturally. In other words, Unit 4 is not comprised of fill of unknown origin and was present prior to land reclamation from the 1950's to the 1980's.

It should be noted, that although contaminant migration into Unit 4 is not expected it is still possible and Unit 4 will require soil quality characterization sampling and analysis similar to Units 1, 2, and 3.

5.0 DEWATERING AND EXCAVATION WATER MANAGEMENT

5.1 NEW RAILCAR DUMPER – EXCAVATION WATER

Documents received from Nu Westech indicate that an excavation approximately 12m (39') deep will be required to accommodate the new Car Dumper Building foundation. A stratigraphic cross section prepared by GES indicated that the water table is located approximately 4.6m (15') below ground surface. Therefore, dewatering will be required to accommodate the excavation depth.

Literature review (**Section 3.0**) indicated that the site groundwater table is likely influence by tidal fluctuations. Based on Hemmera's experience with sites located on the foreshore of the Burrard Inlet, groundwater elevation fluctuations of up to 1.5m are common in response to tidal fluctuations. Therefore, the elevation of the groundwater table may be up to 1.5m higher than reported by GES during a high tide event. In other words, during a high tide event, the depth to groundwater may be less than 3mbgs, and the corresponding volume of soil requiring dewatering would increase.

To maintain the excavation depth, Hemmera understands that sheet piles will be installed around the excavation footprint and material excavated with a clam shell bucket. Keying sheet piles into Unit 4 is expected to reduce the volume of groundwater entering the excavation by hydraulically isolating the saturated portion of Units 1, 2 and 3 from the surrounding aquifer and Burrard Inlet[4].

Regardless, groundwater is still expected to intercept the excavation and surface water may enter the excavation (see also Storm Water management below for management approach). Hence dewatering will be required, with water pumped into temporary holding tanks for testing and possible treatment discussed below.

5.2 WATER TESTING

Based on discussions with Columbia Containers, the Prime Contractor, and the Dewatering Contractor, options for water storage and/or treatment will be established based on expected water volumes and pumping rate. Additional investigation is required to determine the pumping rate and dewatering volumes.

Once stored in storage tanks and prior to discharge, water quality will be determined prior to discharge. The following groundwater quality analyses will be conducted at an accredited laboratory. The proposed analytical suite is based on PCOCs identified during the Phase 1 investigation and water quality guideline regulated parameters:

- Dissolved metals
- Total metals

[4] Unit 4 may be fractured. If continuous fractures in Unit 4 are hydraulically connected to Burrard Inlet, sheet piles may not reduce infiltration of groundwater into the excavation to the degree expected

- BTEX
- PAHs
- VOCs
- General chemistry: anions, nutrients, nitrogen, organic carbon

Water samples can be collected directly from the dewatering pump discharge line or from the tank/pond. A minimum of two samples will be collected from each tank/pond on-site every time it is filled. Analytical results will be compared to relevant CCME Water Quality guidelines (and municipal/BC MOE standards) for surface waters.

If stored water does not meet guidelines, the contractor will arrange for either treatment on-site or transportation and disposal of wastewater collected from the Site to an approved facility. Therefore, methods for managing excavation water pumped into tanks for temporary storage may include:

- Trucking of water for off-site treatment and/or disposal
- On-site treatment and/or dispersion of water (if such water quality is confirmed to meet the applicable CCME guidelines) with a combination of:
    - Discharge over adjacent permeable surface of site for infiltration,
    - Discharge into an infiltration trench, settling ponds, settling areas and/or tanks (to clarify turbid water),
    - Discharge into the Burrard Inlet and/or storm sewer.

For example, if excessive turbidity or chemical concentrations of PCOCs are encountered, off-site disposal and/or a water treatment plant may be assembled on the site.

As noted above, estimation of water volumes and pumping rates will be completed with contractors. Pending estimated volumes to be disposed, Columbia Containers and Hemmera may approach PMV regarding disposal and treatment options prior to or during the excavation program.

In addition to the above listed parameters to be analysed at an accredited lab, key parameters for determining water disposal options are turbidity, temperature, pH, and dissolved oxygen. When dewatering is occurring to accommodate excavation, the turbidity, temperature, pH and dissolved oxygen of pumped water will be measured a minimum of three times a day. If analytical results indicate concentrations of PCOCs are in compliance with BC and Canadian Council of Ministers of the Environment (CMME) Water Quality Guidelines, turbidity, temperature, pH and dissolved oxygen still needs to be managed as they are regulated parameters in Water Quality Guidelines.

6.0 SURFACE WATER AND DISCHARGE MONITORING

In addition to the relevant CCME Water Quality guidelines (and municipal/BC MOE standards) mentioned above, all site surface waters leaving work areas will be monitored to prevent excessive turbidity and impacts to the receiving environment. The monitoring shall be in compliance with the following water quality criteria:

- Change from background of 8 nephelometric turbidity units (NTU) or 25 milligrams per litre (mg/L) non-filterable residue (NFR), for a duration of 24 hours in all waters during clear flows[5] or in clear water
- Change from background of 2 NTU or 5mg/L NFR for a duration of 30 days in all waters during clear flows or in clear water
- Change from background of 5 NTU, or 10mg/L NFR at any time when background is 8 to 50 NTU (25 to 100 mg/L NFR) during high flows or in turbid water[6]
- Change from background of 10% when background >50 NTU (>100 mg/L NFR) at anytime during high flows or in turbid water
- pH, temperature, and dissolved oxygen should not exceed BC and CCME Water Quality Guidelines

The above monitoring will commence with background monitoring just prior to construction work. Where visual monitoring indicates turbidity or potential off-site impacts from surface water run-off or water discharges, turbidity monitoring will commence.

It is proposed that a water quality Sonde be deployed in Burrard Inlet adjacent to the site to record turbidity on an hourly basis. This data can be used in conjunction with turbidity readings from water discharges to verify that CCME Water Quality Guidelines (and other relevant provincial/municipal standards) have not been exceeded. As noted above, if turbid water is encountered, efforts will be made to collect, treat and clarify turbidity on-site to satisfy turbidity water quality criteria listed above prior to discharge.

If all above criteria are met, water will be discharged per the options mentioned above (e.g. site surface, trench, site storm sewer, or discharge to Burrard Inlet).

5 less than 8 NTU
6 greater than or equal to 8 NTU

7.0 STORM WATER – SITE WIDE

Rainwater falling on the work area is expected to runoff to catch basins and to Burrard Inlet. Limited infiltration will occur into site soils given the majority of the site is paved. Hence, appreciable quantities of rainwater may drain into the excavation or travel off-site. Due to soil excavation work, runoff is expected to be sediment-laden (turbid) and will need to be managed to prevent excess turbidity reaching Burrard Inlet.

The working area and stockpile areas will require controls for silt-laden runoff and a combination of several techniques may be utilized including, but not limited to, those described below:

- Installation of upslope drainage interceptors to capture clean uncontaminated rainwater redirect around the site periphery, reducing the amount of water flowing through the work area.
- Installation of silt fence material on the downslope side between working areas and/or stockpile areas;
- Soil excavation stockpiles will either be contained within silt fences and/or covered with plastic sheeting to prevent erosion (as per **Section 4.1**).
- Based on surface water run-off direction, sediment control structures will be installed along the foreshore and banks to prevent impacts to Burrard Inlet, and surrounding storm drains will be plugged or protected. The use of silt fence and spill booms to keep sediment-laden water in appropriate areas will be implemented, as needed.
- Filter cloth will be readily available on-site should it be required; this material provide a reasonably effective, on the spot filtration device in field situations and may be placed in any configuration deemed necessary by the on-site contractor to prevent sediment-laden runoff reaching Burrard Inlet.

In the event silt fences are observed to be ineffective at preventing turbid water from reaching Burrard Inlet, additional water diversion and collection (as mentioned in **Section 6.0**) will be implemented by the on-site contractor.

8.0 WATER MANAGEMENT RISKS

It should be noted that during high rainfall events, the capacity of on-site dewatering storage infrastructure (tanks, ponds) may be exceeded. In other words, high rainfall events may result in the capacity of dewatering storage vessels to store water pumped from the excavation to be reached. This may result in temporarily ceasing dewatering operations until stored water can be characterized and disposed. This would have an impact on the construction schedule and rate of excavation. During rainfall events, the water pumped from the excavation (i.e. dewatering) should be sampled and analyzed in the same manner as recommended in **Section 4.3**.

As the construction program progresses and water quality data is compiled, and in the event that:

- Analytical results indicate concentrations are consistently less than the CCME Water Quality Guidelines (and other standards), and
- Systems can be implemented to manage water turbidity,

Direct discharge from dewatering pumps directly to storm sewer and/or Burrard Inlet may be considered with PMV. Any discharge must consider erosion along the banks of Burrard Inlet, and discharge directly to surface water or onto armour rock is recommended to discharge along an un-armoured bank.

9.0 SEDIMENT/DUST – SITE WIDE

Hemmera recommends the on-site contractor keep a watering truck on-site for the duration of the excavation work. The purpose is to supress dust during dry-spells between rainfall events. Clean water should be sprayed into and around excavated areas as needed to prevent dust from causing nuisance to the surrounding neighbours, and prevent windblown deposition of dust into Burrard Inlet which could result in excess turbidity greater than BC and CCME Water Quality Guidelines.

10.0 SITE CLEANLINESS AND FUEL HANDLING

Appropriate spill containment and cleanup supplies will be kept available on site whenever the work program is underway, and personnel working on the project will be familiar with implementing spill cleanup procedures and the deployment of spill response materials[7]. Any fuel that is on-site will be safely handled and carefully stored to prevent potential ground contamination associated with excavation and refueling activities.

Hemmera recommends the on-site contractor ensure that all machinery use on-site is kept in good working condition. Any significant maintenance should be conducted off-site.

[7] A Spill Contingency Plan will be developed by the Prime Contractor. The Prime Contractor and appropriate on-site personnel will also be suitably trained in spill response.

11.0 CONCLUSION

The above outlines a methodology to be followed during modernisation of Columbia Containers facility to prevent impacts to Burrard Inlet and the surrounding neighbours. Specifically, recommended methods for excavation and soil and water quality determinations are detailed. In summary, Hemmera recommends:

Silos

- dewatering is not expected to accommodate excavation of silo footprints
- excavated material from each silo footprint be stockpiled separately
- the number of soil quality samples will be based on *Technical Guidance 1 – Site Characterization and Confirmation Testing* and samples will be analysed for the suite of parameters listed in **Section 4.1**

Railcar Dumper Building – Soil

- dewatering is required to accommodate excavation of railcar dumper building foundation
- sheet piles should be keyed into Unit 4 to minimize ingress of groundwater from Unit 1, 2 and 3 into the excavation
- soil from each unit be stockpiled separately and held on-site until soil quality has been determined and disposal options confirmed
- the number of soil quality samples will be based on *Technical Guidance 1 – Site Characterization and Confirmation Testing* and samples will be analysed for the suite of parameters listed in **Section 4.2**
- in consideration of Columbia containers desire to minimize the footprint of soil stockpiles, the capacity of the stockpiles may be exceeded prior to receipt of analytical results to characterize soil quality. This could have an impact on construction schedule.

Railcar Dumper Building – Groundwater and Storm Water

- dewatering is required
- tanks and/or constructed ponds will be required to contain pumped water until receipt of analytical results
- the capacity of ponds/tanks may be exceeded during high rainfall events
- a minimum of two samples should be collected from each pond/tank per filling. Samples can be collected from the pump discharge or from the tanks/ponds directly
- turbidity is a key consideration. A Sonde should be deployed in Burrard Inlet adjacent to the Site and programed to take a reading every hour to monitor background turbidity values.
- analytical results indicating concentrations of PCOCs less than BC and CCME Water Quality Guidelines (WQG) must still meet BC WQG for turbidity prior to discharge to storm sewer and/or Burrard Inlet

- analytical results indicating concentrations of PCOCs greater than BC and CCME WQG will require treatment
    - a water treatment plant can be assembled on-site, though this would have a corresponding opportunity cost of space on the Site
    - water can be trucked for off-site treatment,

Storm Water – Site Wide

- silt fences should be installed along the entire site periphery adjacent to Burrard Inlet to capture sediment-laden (turbid) water prior to reaching Burrard Inlet
- if qualified personnel deem silt fences ineffective to manage sediment-laden water, additional measures should be taken to prevent sediment-laden water reaching Burrard Inlet

Sediment / Dust – Site Wide

- a water truck should be on-site for the duration of excavation to spray down dust as needed to prevent nuisance to the surrounding neighbourhood

Site Cleanliness / Fuel Handling

- adequate spill containment supplies and a spill contingency plan should be kept on-site for the duration of the program
- the on-site contractor should be trained in spill containment
- major maintenance work on equipment should be conducted off-site

With the above recommendations enacted the management of soil, groundwater and surface water during excavation and dewatering for the project will be mitigated to industry standards.

12.0 CLOSURE

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.

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13.0 STATEMENT OF LIMITATIONS

This report was prepared by Hemmera, based on fieldwork conducted by Hemmera, for the sole benefit and exclusive use of Columbia Containers Ltd. The material in it reflects Hemmera's best judgment in light of the information available to it at the time of preparing this Report. Any use that a third party makes of this Report, or any reliance on or decision made based on it, is the responsibility of such third parties. Hemmera accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this Report.

Hemmera has performed the work as described above and made the findings and conclusions set out in this Report in a manner consistent with the level of care and skill normally exercised by members of the environmental science profession practicing under similar conditions at the time the work was performed.

This Report represents a reasonable review of the information available to Hemmera within the established Scope, work schedule and budgetary constraints. It is possible that the levels of contamination or hazardous materials may vary across the Site, and hence currently unrecognised contamination or potentially hazardous materials may exist at the Site. No warranty, expressed or implied, is given concerning the presence or level of contamination on the Site, except as specifically noted in this Report. The conclusions and recommendations contained in this Report are based upon applicable legislation existing at the time the Report was drafted. Any changes in the legislation may alter the conclusions and/or recommendations contained in the Report. Regulatory implications discussed in this Report were based on the applicable legislation existing at the time this Report was written.

In preparing this Report, Hemmera has relied in good faith on information provided by others as noted in this Report, and has assumed that the information provided by those individuals is both factual and accurate. Hemmera accepts no responsibility for any deficiency, misstatement or inaccuracy in this Report resulting from the information provided by those individuals.

The liability of Hemmera to Columbia Containers Ltd. shall be limited to injury or loss caused by the negligent acts of Hemmera. The total aggregate liability of Hemmera related to this agreement shall not exceed the lesser of the actual damages incurred, or the total fee of Hemmera for services rendered on this project.