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July 9, 2015
File: 1505-018.07

Ministry of Technology Innovation Citizens' Services
Suite 209, 4000 Seymour Place
Victoria, BC V8V 1X4

Attn: Michael Masson, Environmental Lead

Dear Mr. Masson,

Re: Performance Verification Plan for Certificate of Compliance at 3200 East Broadway, Vancouver, BC

Hemmera Envirochem Inc. (Hemmera) has prepared this Performance Verification Plan (PVP) in support of an application for a Certificate of Compliance (CofC) for the property located at 3200 East Broadway, Vancouver, BC (the "Site"). The PVP presents the principle risk management measures that apply at the Site so that risk-based standards are and continue to be met, and the actions that must be taken so that these risk controls are implemented and maintained. This PVP was prepared in accordance with BC Ministry of Environment (MOE) *Procedure 12: Procedures for Preparing and Issuing Contaminated Site Legal Instruments,* effective February 1, 2014 (BC MOE 2014a) and BC MOE Administrative Guidance on Contaminated Sites #14: *Performance Verification Plans, Contingency Plans, and Operations and Maintenance Plans, Version 1.0,* dated February 2014 (BC MOE 2014b).

A detailed human health and ecological risk assessment (DHHERA) was conducted for the Site in March 2015. The DHHERA (Hemmera 2015b) relied on the Stage 1 and 2 Preliminary Site Investigation ("PSI"; Hemmera 2013); Detailed Site Investigation ("DSI"; Hemmera 2014); and Stage 1 PSI Update and Supplemental DSI (Hemmera 2015a).

1.0 RISK CONTROL TYPE

Based on the risk management measures for the Site (i.e., the use of institutional controls to mitigate/eliminate risks at the Site and lack of imminent risks in the event that controls were either not implemented or were implemented but were rendered ineffective), the Type applicable at the Site is considered to be **Type 2**.

Under a **Type 2** scenario, the BC MOE (2014a; 2014b) indicates that a PVP is required, while an operations and maintenance plan may be required.

2.0 PERFORMANCE VERIFICATION PLAN

A PVP is required to maintain the principle risk management measures upon which the DHHERA is based. This includes the maintenance of up-to-date records of performance verification actions and results for the Site being maintained by the responsible person (or their agents). If requested by the Director, the responsible person (or their agents) must provide these records to the BC MOE. As well, if requested by the Director, responsible person(s) must provide a signed statement on whether conditions set out in Schedule B of the CofC are being met.

2.1 REQUIRED RISK CONTROLS

a) Groundwater at the Site must not be used for domestic purposes (i.e. drinking water).

b) If future buildings are constructed at the Site, measures must be in place so that groundwater is not in contact with the building foundation and groundwater sumps, if required, must be sealed.

c) Subsurface capped soils (i.e., ≥ 0.8 m bgs) with nickel and/or vanadium contamination in the vicinity of AEC 9 must not be exposed or redistributed as surface soil under future Site development scenarios. If such soils are retained on Site, these soils must remain at ≥ 0.8 m depth below an impervious surface or covered with a building. A soil management plan prepared by a qualified professional must be in place for AEC 9. See **Figure 1** for AEC 9 location, which is described by the following metes and bounds description:

COMMENCING at the assumed south west corner of Lot 6, PLAN
9568 from the said UTM coordinates,
THENCE along the bearing N78°31'4"W a distance of 57.581m THE POINT OF BEGINNING;
THENCE along the bearing N11°28'55"W a distance of 4.074m;
THENCE along the bearing N78°31'5"E a distance of 7.860m;
THENCE along the bearing S11°28'55"E a distance of 4.074m;
THENCE along the bearing S78°31'5"W a distance of 7.860m THE POINT OF BEGINNING.

d) Future vegetation must not be allowed to establish at the Site in the vicinity of remaining areas of groundwater contamination (AEC 7 and AEC 14) or soil contamination (AEC 9). Vegetation may be placed in aboveground planter boxes with clean soils. See **Figure 1** for AEC 7, 9, and 14 locations, which are described by the following metes and bounds descriptions:

AEC 7

COMMENCING at the assumed south west corner of Lot 6, PLAN
9568 from the said UTM coordinates,
THENCE along the bearing N78°31'4"E a distance of 15.255m;
THENCE along the bearing N0°0'0"E a distance of 10.510m to THE POINT OF BEGINNING;
THENCE along the bearing N0°0'0"E a distance of 21.536m;
THENCE along the bearing N90°0'0"E a distance of 36.663m;
THENCE along the bearing S0°0'0"E a distance of 21.536m;
THENCE along the bearing N90°0'0"W a distance of 36.663m to THE POINT OF BEGINNING.

AEC 9

COMMENCING at the assumed south west corner of Lot 6, PLAN
9568 from the said UTM coordinates,
THENCE along the bearing N78°31'4"W a distance of 57.581m THE POINT OF BEGINNING;
THENCE along the bearing N11°28'55"W a distance of 4.074m;
THENCE along the bearing N78°31'5"E a distance of 7.860m;
THENCE along the bearing S11°28'55"E a distance of 4.074m;
THENCE along the bearing S78°31'5"W a distance of 7.860m THE POINT OF BEGINNING.

AEC 14

COMMENCING at the assumed south west corner of Lot 6, PLAN
9568 from the said UTM coordinates,
THENCE along the bearing N0°42'21"W a distance of 89.410m;
THENCE along the bearing N90°0'0"E a distance of 8.230m to THE POINT OF BEGINNING;
THENCE along the bearing N0°0'0"E a distance of 32.750m;
THENCE along the bearing N90°0'0"E a distance of 30.691m;
THENCE along the bearing S0°0'0"E a distance of 32.750m;
THENCE along the bearing N90°0'0"W a distance of 30.691m to THE POINT OF BEGINNING.

2.2 SUMMARY OF RATIONALE FOR SELECTING REQUIRED PVP ELEMENTS

- Groundwater at the Site must not be used for domestic purposes (i.e. drinking water).

Antimony and arsenic remain in groundwater at concentrations greater than the *BC Contaminated Sites Regulation* (CSR) Schedule 6 drinking water (DW) standards. The DHHERA concluded that drinking water wells are unlikely to be installed at the Site in the future given that the current on-site buildings are connected to the municipal water system. Communication by the Site owner to future users and operators that groundwater water should not be used as a potable water supply is considered to be a suitable risk measure. Decommissioning of the existing monitoring wells would further mitigate this as a possibility.

- If future buildings are constructed at the Site, measures must be in place so that groundwater is not in contact with the building foundation and groundwater sumps, if required, must be sealed.

The DHHERA applied a sub-slab attenuation factor of 0.02 to measured soil vapour concentrations to evaluate indoor air exposures to human receptors. The DHHERA assumed that future buildings (buildings with underground parkades, with basements, or slab-on-grade) would have measures in place that would limit the potential for sustained groundwater contact with the building foundation. Based on a preliminary geotechnical report (DGI 2013), these measures could include a perimeter drainage system, free draining backfill, and/or groundwater sumps. Future buildings with foundations in contact with contaminated groundwater may result in higher volatile concentrations in indoor air then those indoor air concentrations assessed in the DHHERA. As such, measures must be in place such that contaminated groundwater is not in contact with the future building foundations.

Groundwater sumps that are unsealed may act as a preferential pathway to vapour intrusion into a building. Potential risks to future residents and commercial receptors from exposures to chloroform, hexane, carbon

tetrachloride, and dichloromethane may exist. Non-attenuated, soil vapour concentrations for chloroform (at locations SV14-301, SV14-302), hexane (at location SV14-302), carbon tetrachloride (at location SV14-302), and dichloromethane (at location SV14-304) remain greater than BC CSR Schedule 11 soil vapour standards for residential and commercial land use. Sealing of groundwater sumps would mitigate potential health risks to future receptors from indoor air exposures to chloroform, hexane, carbon tetrachloride, and dichloromethane.

- Subsurface capped soils (i.e., ≥ 0.8 m bgs) with nickel and/or vanadium contamination in the vicinity of AEC 9 must not be exposed or redistributed as surface soil under future Site development scenarios. If such soils are retained on Site, these soils must remain at ≥ 0.8 m depth below an impervious surface or covered with a building. A soil management plan prepared by a qualified professional must be in place for AEC 9.

Nickel and vanadium contamination in surface soils remains at 0.8 m below ground surface at concentrations greater than the CSR Schedule 4, generic standards for residential land use. The DHHERA assumed that the existing capping layer of asphalt (with a limited number of boreholes filled in with crushed, compacted gravel) would remain over top of this soil contamination in the future to limit inadvertent exposures to people, wildlife, soil invertebrates, and plants. Removal of the capping layer or redistribution of contaminated soils as surface soils may result in inadvertent exposures to nickel and vanadium to human and ecological receptors.

In the event that contaminated soils are unearthed, a soil management plan prepared by a qualified professional would minimize potential human and ecological exposures to Site contaminants.

- Future vegetation must not be allowed to establish at the Site in the vicinity of known areas of groundwater contamination (AEC 7 and AEC 14) or soil contamination (AEC 9). Vegetation may be placed in aboveground planter boxes with clean soils.

Groundwater contamination in AEC 7 and AEC 14 and soil contamination in AEC 9 is largely covered by asphalt. Although grasses have colonized the cracked asphalt in the vicinity of known contamination, the root systems of these plants are shallow and are not likely in contact with known soil or groundwater contamination. No deep rooting vegetation is presently located in the vicinity of known soil or groundwater contamination.

Given the possibility of future gardening on the Site, the DHHERA considered potential risks to human health from ingestion of edible plants growing in the vicinity of Site contamination. Certain plants may accumulate contaminants which when harvested and consumed by people may result in adverse health effects. In the event that plants would be placed on-site within the vicinity of known soil contamination (AEC-9) and groundwater contamination (AEC-7 and AEC14), the DHHERA assumed that all plants (edible and non-edible) would be put into planter boxes with clean soils in those areas.

Instituting a prohibition on the establishment of future vegetation in the vicinity of known groundwater and soil contamination at the Site and use of planter boxes that limit the potential for accumulation of contaminants by root uptake were considered to be appropriate risk management actions.

2.3 RECOMMENDATIONS FOR FURTHER CONSIDERATION AND EVALUATION

Nickel in soil may exist in different forms (nickel soluble salts, nickel sulfate, nickel oxide etc.) which have different toxicities to humans. The DHHERA evaluated risks to construction workers from chronic and sub-chronic exposures to nickel contaminated soils during excavation and trench activities. The DHHERA identified marginal health risks to workers from site-wide chronic exposures to nickel via soil particulate inhalation. The DHHERA concluded that health risks to construction workers from chronic exposures to nickel contaminated soils are low overall given that (1) the site-wide nickel concentration of 223.5 mg/kg is less than the BC CSR Schedule 4 Generic Numerical soil standard for nickel of 500 mg/kg for industrial land use and (2) the chronic risk quotient of 1.4 is based on conservative chronic toxicity reference value with an uncertainty factor of 1000. The DHHERA concluded that sub-chronic worker exposures to nickel in soil pose low risk to worker health.

As a precaution, it is advised that a qualified health and safety professional assess the need for additional protective equipment for excavation/trench construction workers exposed to nickel soil particulate for two weeks or more.

3.0 CLOSURE

We have appreciated the opportunity of working with you on this project and trust that this report is satisfactory to your requirements. Please feel free to contact the undersigned regarding any questions or further information that you may require.

Report prepared by:
Hemmera Envirochem Inc.

ORIGINAL SIGNED AND SEALED

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Report peer reviewed by:
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This document represents an electronic version of the original hard copy document, sealed, signed and dated by Adam J. Radlowski, M.Sc., R.P.Bio.and Karey Dow, P.Ag., PMP and retained on file. The content of the electronically transmitted document can be confirmed by referring to the original hard copy and file. This document is provided in electronic format for convenience only. Hemmera Envirochem Inc. shall not be liable in any way for errors or omissions in any electronic version of its report document.

4.0 STATEMENT OF LIMITATIONS

This report was prepared by Hemmera Envirochem Inc. (“Hemmera”), based on previous investigations reports, for the sole benefit and exclusive use of the Ministry of Technology, Innovation and Citizens' Services (Client). For the purpose of the work product herein, Hemmera extends reliance on the report to the BC Ministry of the Environment (MOE), provided that the MOE is bound to the same terms and conditions as the Client. 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, mis-statement or inaccuracy in this report resulting from the information provided by those individuals.

The liability of Hemmera to Ministry of Technology, Innovation and Citizens' Services 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.

5.0 REFERENCES

BC MOE 2014a. BC Ministry of Environment (BC MOE) Procedure 12: Procedures for Preparing and Issuing Contaminated Site Legal Instruments dated January 14, 2014. Effective February 1, 2014.

BC MOE 2014b. BC MOE Administrative Guidance on Contaminated Sites: Performance Verification Plans, Contingency Plans, and Operations and Maintenance Plans, Version 1.0 dated February 2014.

BC MOE (2010). BC Ministry of Environment. CSR Technical Guidance 4 Vapour Investigation and Remediation, Version 1, September 2010.

DGI (2013) Davies Geotechnical Inc. Preliminary Geotechnical Report 3200 East Broadway Vancouver, BC. Dated September 3, 2013.

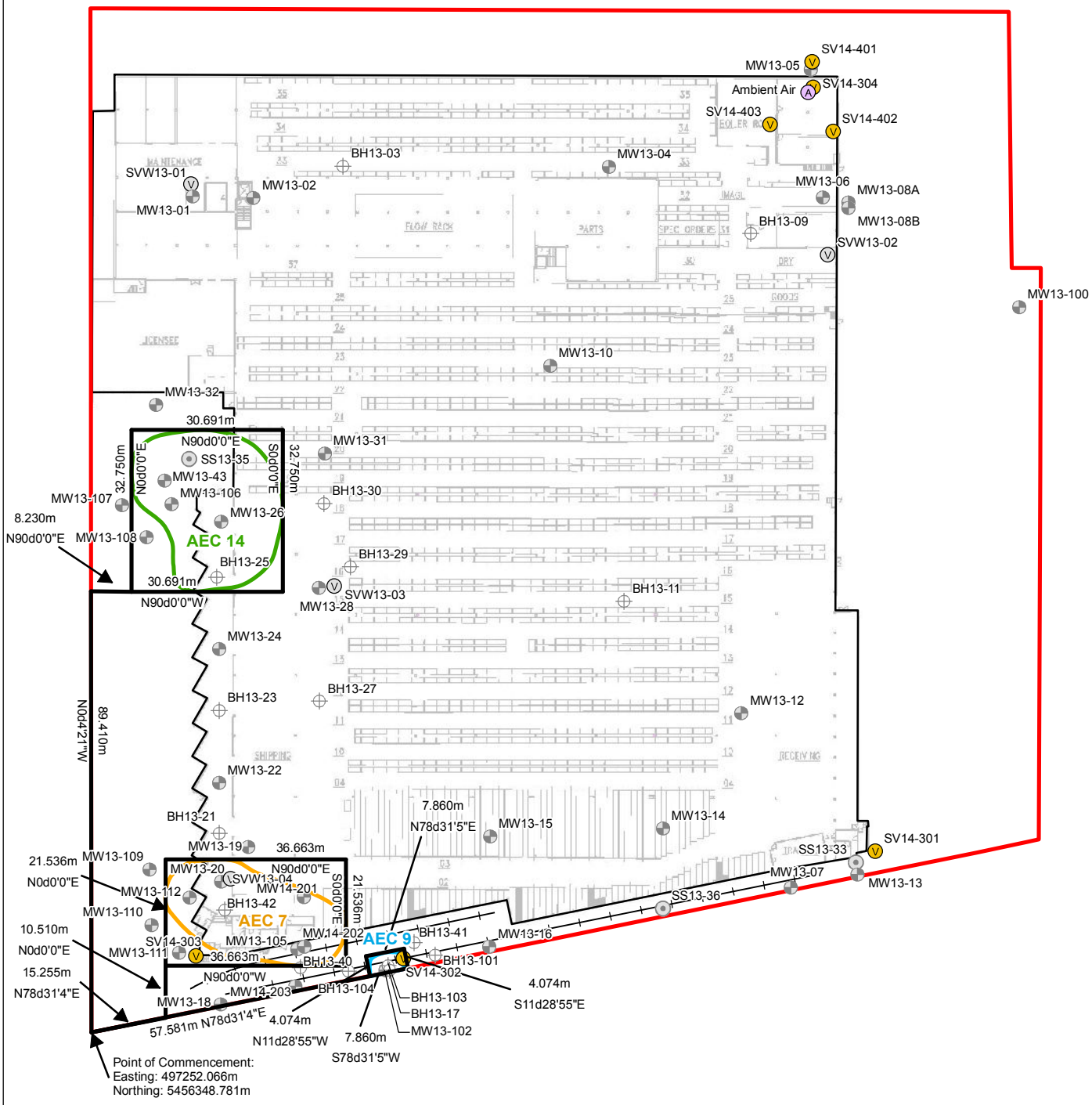
Hemmera (2013). Stage 1 and 2 Preliminary Site Investigation 3200 East Broadway, Vancouver BC, dated December 2013.

Hemmera (2014). Detailed Site Investigation 3200 East Broadway, Vancouver, BC, dated March 2014.

Hemmera (2015a). Supplemental Detailed Site Investigation and Supplemental Detailed Site Investigation. 3200 East Broadway, Vancouver, BC, dated February 2015.

Hemmera (2015b). Detailed Human Health and Ecological Risk Assessment (DHHERA) 3200 East Broadway, Vancouver, BC. March 2015.

FIGURE



Legend

- Ambient Indoor Air Sample
- Soil Vapour Well
- Borehole
- Monitoring Well
- Soil Vapour Well
- Storm Sewer Daylight Grab Samp
- Approximate Location Of Former Rail Spurs
- Warehouse Outline
- Site Boundary
- Arsenic and antimony >DW in groundwater, Solid
- LEPH and PAHs <AW in groundwater, Solid
- Nickel (>CL) and vanadium (>RL) in soil - Onsite, Solid

Notes

- Sample locations within the warehouse should be considered approximate.

Sources

N/A

N

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0 10 20 30

Metres

NAD 1983 UTM Zone 10N

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3200 E Broadway, Vancouver, BC

Areas Subject to Risk Management

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HEMMERA

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