Risk Management Plan: 5th Avenue (Rogers to Jeckell Street)

Whitehorse, Yukon

April 2, 2019

Prepared for:

Government of Yukon
Department of Environment
Site Assessment and Remediation Unit

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1.0 INTRODUCTION

The Government of Yukon (YG), Department of Environment, Site Assessment and Remediation Unit (SARU) retained Stantec Consulting Ltd. (Stantec) to complete a risk management plan (RMP) to address potential health risks identified in a recent quantitative human health and ecological health risk assessment (QHHERA) for a parcel of land along 5th Avenue, in Whitehorse, Yukon Territory (YT), between Rogers and Jeckell Streets (the Site). The QHHERA was part of Stage 2 of the overall Project for the Site, with Stage 1 consisting of a Phase II Environmental Site Assessment (ESA) (Stantec, 2018). The data relied upon in the QHHERA include those collected during the Phase II ESA completed by Associated Engineering (AE, 2016), CH2M Hill (CH2M Hill, 2018), and Stantec (Stantec, 2018).

For the purpose of this RMP, please refer to the 2018 Phase II ESA (Stantec, 2018) and the QHHERA (Stantec, 2019) for details of the previous investigations and assessments.

If a developer chooses to use risk management measures (RMM) other than those recommended herein, then they should consult a qualified environmental professional to ensure the RMM selected for the Site provide a comparable level of protection for on-site receptors. Additionally, a developer can contact the Government of Yukon, Department of Community Services, Land Development Branch for more information.

2.0 RISK MANAGEMENT PLAN

The results of the human health risk assessment (HHRA) for the Site indicated that in the absence of RMM, occupants of future buildings (i.e., residences and, by default commercial operations) with basements could be exposed to volatile contaminants of concern (COC) (petroleum hydrocarbons) in indoor air that may result in potential health risks that exceed the applicable benchmark. With the exception of the Slab-on-grade RMM Zone, on the western Site boundary (**Figure 1**, **Appendix A**), potential health risks are not expected for occupants of a future slab-on-grade residential, or a commercial building that incorporates an underground parkade that covers the entire building footprint and is built to current building standards. Potential health risks are possible for occupants of residential/commercial slab-on-grade buildings or buildings with basements within the Slab-on-grade RMM Zone.

Other exposure pathways at the Site are considered incomplete, or risks are expected to be negligible, including:

- Direct contact with soil is not expected because impacts are located 2.0 m below ground surface (BGS) or deeper. Even if a subsurface worker was exposed to soil impacts, potential health risks are considered negligible. In the event a subsurface worker could come into contact with contaminated soil, a Site-Specific Health and Safety Plan (HASP) RMM is recommended and should be prepared by a qualified environmental professional.
- Groundwater ingestion is not expected.
- Direct contact with groundwater is not expected given a minimum observed depth of 3.3 m BGS. In the event a subsurface worker could come into contact with groundwater, a HASP RMM is recommended and should be prepared by a qualified environmental professional.
- Risks associated with inhalation of outdoor air are considered negligible.

A human health conceptual site model (CSM), **Figure 2-1**, identifies the human health exposure pathways that are affected by the applicable RMM.

The ecological risk assessment (ERA) for the Site did not identify any complete exposure pathways based on current Site conditions (e.g., depth to soil impacts and groundwater are beyond the ecological accessible depth of 1.5 m BGS). Therefore, potential health risks for ecological receptors (e.g., plants, soil invertebrates, mammals and birds) are considered negligible.

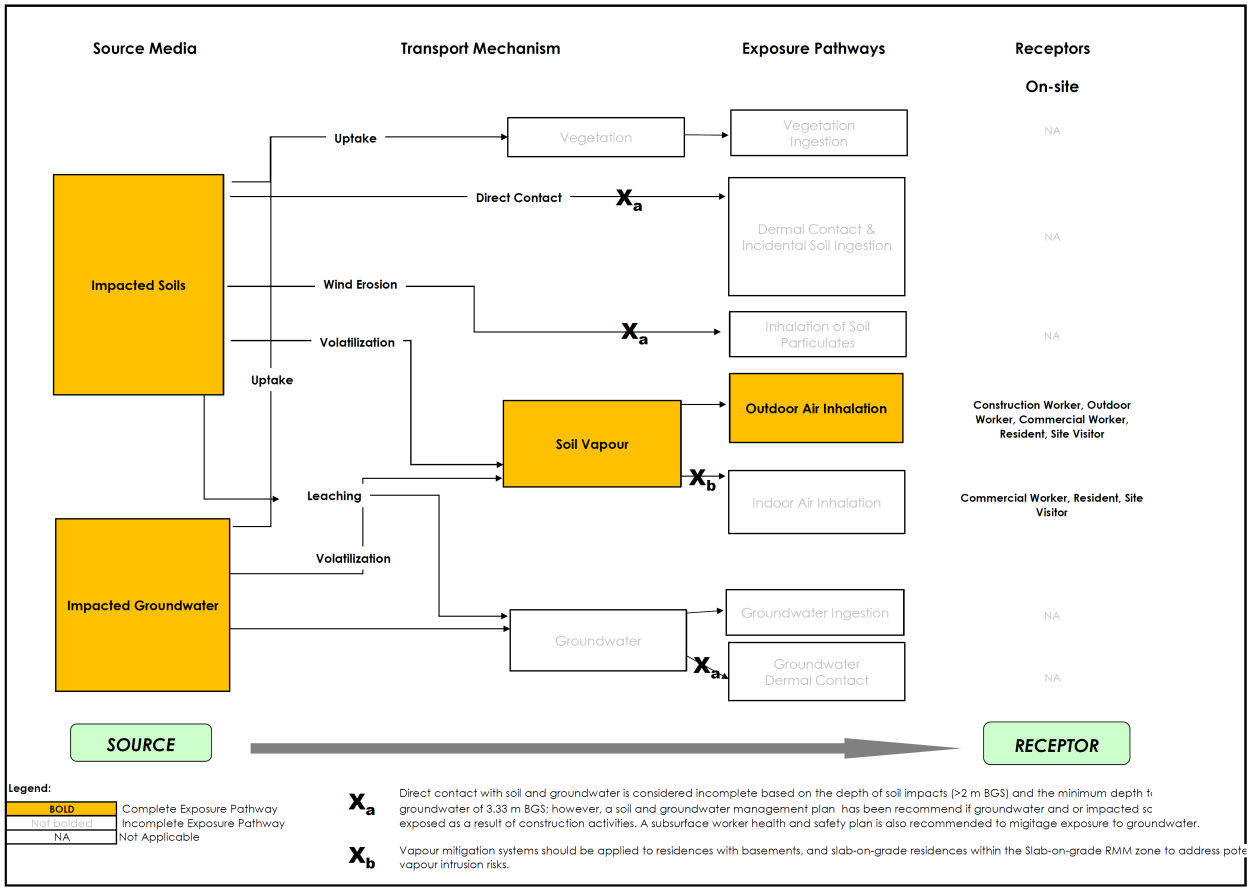

Figure 2-1 Human Health Conceptual Site Model- With Risk Management Measures

The recommended RMM for the Site include:

- For the construction of residential/commercial buildings **outside of the RMM Zone**:
  - Slab-on-grade buildings are acceptable (i.e., no engineering controls are necessary).
  - Buildings with a basement will require a vapour mitigation system.
  - Buildings with a parkade that covers the entire footprint of the building and meet with the National Building Code do not require a vapour mitigation system.
- For the construction of residential/commercial buildings **within the RMM Zone**:
  - Slab-on-grade buildings and buildings with a basement will require a vapour mitigation system.

- Buildings with a parkade that covers the entire footprint of the building and meet with the National Building Code do not require a vapour mitigations system.

- A soil and groundwater management plan (SGMP) to address potential human and ecological risks on the property related to site works. This will also include consideration for the management of soil that may exceed the Yukon Contaminated Sites Regulation (CSR) standards encountered during excavations at the Site and excess groundwater (that may exceed the Yukon CSR standards) generated as a result of potential dewatering activities.

- Preparation of a HASP by a qualified environmental professional and implementation of the HASP for construction workers working in the subsurface that includes recommendations for appropriate personal protective equipment (PPE) to prevent direct contact with groundwater.

- Maintain a minimum separation of 2.0 m from ground surface to contaminated soil and/or groundwater. This RMM blocks exposure of ecological receptors to impacted soil and/or groundwater as well as maintaining sufficient separation for vapour attenuation. Soil impacts at the Site are currently deeper than 2.0 m BGS and the minimum depth to groundwater is 3.3 m BGS.

The requirements for these RMM have been included in this RMP.

The RMP performance objectives, details regarding the RMM and duration requirements for the recommended RMM are included in **Sections 2.1** through **Section 2.2.3**.

2.1 RISK MANAGEMENT PERFORMANCE OBJECTIVES

A RMP has been developed to address the elevated human health risks estimated for the Site. The RMP is intended to address the following media and exposure pathways:

- **On-site inhalation of vapours in buildings with basements, or in slab-on-grade buildings within the Slab-on-grade RMM Zone** - The performance objective for this pathway is to reduce inhalation risks in buildings with basements, and in slab-on-grade buildings within the Slab-on-grade RMM Zone to negligible levels through the application of a vapour intrusion mitigation system. Vapour intrusion mitigation is not required for slab-on-grade buildings outside the Slab-on-grade RMM Zone or for buildings with parkades that cover the footprint of the building and comply with applicable national building and territorial codes.

- **On-site direct contact with soil and groundwater by human and ecological receptors as part of site works** – The performance objective for this pathway is to limit or eliminate the direct contact exposures to soil and thereby reduce risks to negligible levels. This can be achieved by limiting the direct contact exposure pathway via a HASP (for the subsurface worker) and a SGMP that includes a requirement to maintain 2.0 m of separation from surface to impacted soil or groundwater.

The RMP is intended to reduce on-site risks for:

1) Humans, by reducing exposure for the occupants of buildings with basements, or for occupants of slab-on-grade buildings within the Slab-on-grade RMM Zone, to vapours in indoor air that originate from petroleum hydrocarbon contaminants that may be present in soil or groundwater.

2) Humans and ecological receptors, through the use of a SGMP that requires maintaining a minimum separation of 2.0 m between ground surface and impacted soil or groundwater.

3) Humans, by limiting their exposures to petroleum hydrocarbon contaminants in soil and groundwater during site works through a HASP (for subsurface workers).

Implementation of these RMM is expected to result in negligible risks for human and ecological receptors.

2.2 RISK MANAGEMENT MEASURES

The RMM proposed are discussed in **Section 2.2.1** to **Section 2.2.3**. Each RMM is expected to result in an exposure reduction that would result in negligible risk for human and/or ecological receptors.

2.2.1 Vapour Intrusion Control-Buildings with Basements, and Slab-on-Grade Buildings Within the Slab-on-Grade RMM Zone

Vapour intrusion mitigation systems will be required for future buildings with basements and slab-on-grade buildings located within the Slab-on-Grade RMM Zone. The vapour mitigation system at each proposed building should include two components:

- A vapour barrier, such as a flexible vapour-mitigation geomembrane, to isolate the building from underlying soils and groundwater that may be the source of contaminants; and,
- A passive vapour removal and treatment system that can be converted to an active system, if required.

2.2.1.1 Slab-on-Grade Buildings Outside the Slab-on-Grade RMM Zone

Vapour intrusion RMM are not required for slab-on-grade buildings outside the Slab-on-grade RMM Zone.

2.2.1.2 Parkade

Additional vapour intrusion RMM are not required for buildings anywhere on the Site with continuously ventilated parkades (e.g., underground parking garages). The parkade must have a ventilation system that meets or exceeds the requirements of the 2012 or later BC Building Code (BC Building Safety Standards Branch, 2018) or National Building Codes (National Research Council Canada, 2015).

2.2.2 Construction Considerations (Soil and Groundwater Management Plan)

During redevelopment activities, it is possible that the management of soil may be required for isolated areas of excavation during service installations, and/or construction. Soil management activities may include the removal of excess soil from the Site and/or the import of clean soil and/or aggregate. It is also recognized that future activities following site development may be necessary in which identified receptors could be exposed to soil impacted with COC. Possible post-development scenarios would include repair or replacement of on-site services (e.g., sewers), building upgrades, or replacement of asphalt or concrete. Should activities be required that would likely result in identified receptors being exposed to COC in soil, a qualified professional will prepare a SGMP for submission to the applicable regulatory body a minimum of 14-days before the required activities are scheduled to commence. Relevant elements of the SGMP that may be required are included in the following paragraphs.

Should site development require soil to be imported from an off-site location, the quality of imported soil shall be determined in a manner consistent with the requirements of the Yukon CSR (Department of Environment, 2002).

Excavated soil stored on-site shall be covered and barricaded to prevent direct access by the public. Runoff from excavated soil will be controlled by covering stockpiles with tarpaulins or equivalent impermeable material to block precipitation from contacting stockpiled soil. As a further precaution, where practicable, areas containing stockpiles will be surrounded by silt fence to control the migration of sediment with runoff.

The transportation and disposal of soil and groundwater removed from the Site shall be undertaken consistent with the Yukon CSR and other applicable Statutes, Regulations and by-Laws.

The groundwater management plan will include consideration for the potential to encounter groundwater exceeding the Yukon CSR standards as a result of dewatering activities.

Soil and groundwater management activities shall be conducted under the supervision of a qualified professional.

The property owner shall be responsible for maintaining records of soil and groundwater management activities. Such records shall include:

- Dates and duration of work including weather and site conditions
- Locations and depth of excavation management activities
- Soil and groundwater characterization results obtained as a requirement of the SGMP
- Documentation of sampling program(s) conducted to characterize soil excavated from beneath the surface cover, and/or groundwater
- Documentation of any dust control or runoff control measures implemented at the Site
- Names of qualified professionals, contractors, waste haulers, and receiving sites for any excavated excess soils
- If soil or groundwater is disposed off-Site, documentation of the quantity, waste carrier(s) and receiving waste management site(s)
- A summary of any complaints received during the tasks included in the SGMP

Such records shall be made available to the YG Department of Community Services, Land Development Branch and/or the YG Department of Environment, Environmental Programs Branch, Standards and Approvals upon request.

2.2.2.1 Surface Cover- Separation between the Surface and Contaminated Soil and/or Groundwater

To mitigate the risk associated with exposure to the identified COC in soil and groundwater at the Site a separation of 2.0 m should be maintained between the surface and impacted media (i.e., soil and/or groundwater). This separation is currently present at the Site and is inferred to be comprised of soil that meets applicable Yukon CSR standards. If this separation is altered through construction activities and/or

soil removal from the Site, then it should be restored. This cap will block human and ecological exposure to soil and groundwater and maintain sufficient vapour attenuation for slab-on-grade buildings.

2.2.3 Subsurface Worker Health and Safety Plan

In order to protect subsurface (or remedial) workers, a HASP shall be prepared by a appropriately qualified environmental professional in accordance with applicable YG Labour health and safety regulations and shall consider the potential human health risks identified in the HHRA. The following potential exposure risks shall be addressed in the HASP:

- Protection of construction workers from dermal exposure to contaminated groundwater at the Site. As a minimum, this will entail workers wearing long sleeve coveralls, waterproof footwear and disposable nitrile gloves when working in excavations.

These requirements are in addition to any other health and safety requirements under the territorial or federal Occupational Health and Safety Act and Regulations, including, but not limited to, excavation safety.

The property owner will be responsible for advising anyone responsible for conducting or overseeing the conduct of subsurface excavation of the site conditions and the elements to be included in the HASP for the work related to the QHHERA. Records of such notifications should be kept in a log and retained by the property owner.

2.3 DURATION OF RISK MANAGEMENT MEASURES

This section describes the required duration of the RMM.

2.3.1 Vapour Intrusion Controls

Vapour intrusion controls on buildings with basements, and slab-on-grade buildings or buildings with basements within the Slab-on-grade RMM Zone will be required indefinitely; however, should future site conditions indicate that COC concentration in soil and groundwater no longer pose an unacceptable inhalation risk, then this condition may be re-evaluated in consultation with the YG Department of Community Services, Land Development Branch and/or the Department of Environment, Environmental Programs Branch, Standards and Approvals.

The ventilation system for buildings with parkades will also be required to be operated indefinitely.

2.3.2 Construction Considerations

The requirement for a SGMP will be in force for an indefinite period of time whenever impacted soil is brought to within 2.0 m of final grade. Should the Site be remediated to the applicable Yukon CSR standards approved for this purpose, this condition may be re-evaluated in consultation with the YG Department of Environment, Environmental Programs Branch, Standards and Approvals.

2.3.2.1 Surface Cover- Separation between the Surface and Contaminated Soil and/or Groundwater

A 2.0 m separation between the surface and contaminated soil and groundwater at the Site will need to be maintained indefinitely. Should soil and groundwater at the Site be remediated to the applicable Yukon CSR standards, this condition may be re-evaluated in consultation with the YG Department of Environment, Environmental Programs Branch, Standards and Approvals.

2.3.3 Subsurface Worker Health and Safety Plan (HASP)

A HASP will be required indefinitely for subsurface workers that may be exposed to COC in groundwater. Should groundwater at the Site be remediated to the applicable Yukon CSR standards, this condition may be re-evaluated in consultation with the YG Department of Environment, Environmental Programs Branch, Standards and Approvals.

3.0 LIMITATIONS

This report documents work that was performed in accordance with the scope, schedule and limitations set out in the contract between Stantec and its Client. Stantec does not represent, warrant, or guarantee that this work has uncovered all potential liabilities associated with the identified property, other than those liabilities which are reasonably discoverable based on our contractual scope.

This report provides an evaluation of selected environmental conditions associated with the identified portion of the property that was assessed at the time the work was conducted and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec, acting reasonably, to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

The opinions in this report can only be relied upon as they relate to the condition of the portion of the identified property that was assessed at the time the work was conducted. Activities at the property subsequent to Stantec's assessment may have significantly altered the property's condition. Stantec cannot comment on other areas of the property that were not assessed.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report and are based solely on the scope of work described in the report, the limited data available and the results of the work. They are not a certification of the property's environmental condition. This report should not be construed as legal advice.

This report has been prepared for the use of the client identified herein pursuant to the terms of, and for the purposes reasonably contemplated within, the contract between Stantec and the client. Stantec makes no representations, warranties or guarantees that the report will be suitable for other purposes; any use which a third party makes of the report is at that party's own risk, and Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from such third party use of this report.

4.0 CLOSURE

This report, entitled Risk Management Plan: 5th Avenue (Rogers to Jeckell Street) prepared for Government of Yukon, Department of Environment, SARU, dated April 2, 2019, was produced by Stantec Consulting Ltd.

Regards,

Stantec Consulting Ltd.

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5.0 REFERENCES

Associated Engineering. 2016. Detailed Phase II Environmental Site Assessment on the Jeckell and Hoge Street Lots (Block 338). Whitehorse: Associated Engineering.

BC Building Safety Standards Branch. (2018). *BC Building Code.* Victoria: Crown Publishers BC.

CH2M Hill. 2018. Phase II Environmental Site Assessment (2017-18): 5th Avenue (Rogers to Jeckell Street). Whitehorse: CH2M Hill.

Department of the Environment, Yukon Territory. 2002. Contaminated Sites Regulation. Whitehorse: Government of Yukon. Availble online: https://www.canlii.org/en/yk/laws/regu/yoic-2002-171/latest/part-1/yoic-2002-171-part-1.pdf

Government of Yukon. 2002. Revised Statutes of the Yukon. Chapter 19 Building Standards Act. 2002. Available online: http://www.gov.yk.ca/legislation/acts/bust_c.pdf

National Research Council Canada. (2015). *National Building Code of Canada.* Ottawa.

Stantec Consulting Ltd. (Stantec). 2018. Phase II Environmental Site Assessment (2018-2019): 5th Avenue (Rogers Street to Jeckell Street). Whitehorse, Yukon.

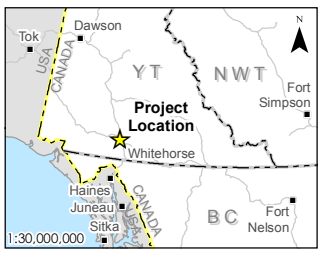
Stantec Consulting Ltd. (Stantec). 2019. Quantitative Human Health and Ecological Risk Assessment: 5th Avenue (Rogers to Jeckell Street). Whitehorse, Yukon.

Appendix A Figure
April 2, 2019

APPENDIX

Appendix A Figure
April 2, 2019

Appendix A FIGURE



Tank Location (Estimated) (Areas of Environmental Concern)
Site Boundary
APEC Site
Slab-on-Grade RMM Zone

Pre-2018 Borehole
Pre-2018 Monitoring Well
2018 Borehole and Monitoring Well, Deep (approx. 15 mbgs)
2018 Borehole and Monitoring Well, Shallow (approx. 6-9 mbgs)
Vapour Probe Installed

0 10 20 30 40 m
1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

Stantec

Yukon Government

Project Location: Whitehorse, Yukon
Project Number 123221161
Prepared by KALUCAS on 20180829
Discipline Review by MDEANE on 20181121
GIS Review by RCOATTA on 20181121

Client/Project/Report
Yukon Government
5th Avenue (Rogers Street to Jeckell Street)
Risk Management Plan

Figure No.
1

Title
Site Plan

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