Environment

Public Works and Government Services Canada

Phase III Environmental Site Assessment Regina Research Farm (DFRP 13663) – Regina, Saskatchewan

Prepared by:

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Project Number:

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Date:

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March 24, 2010

Ms. Marie McGregor
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Dear Ms. McGregor:

Project No: 60119855

Regarding: **Phase III Environmental Site Assessment**
Regina Research Farm (DFRP 13663) – Regina, Saskatchewan

Please find enclosed three (3) hard copies and three (3) electronic versions of the above mentioned report. If you have any questions or concerns, please feel free to contact Scott Chapman, P.Eng. directly.

Sincerely,
AECOM Canada Ltd.

R. V. Typliski

Ron Typliski, P.Eng.
Vice-President, Manitoba District
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SC:dh
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Executive Summary

Public Works & Government Services Canada (PWGSC) retained AECOM Canada Ltd. on behalf of Agriculture & Agri-Food Canada (AAFC) to complete a Phase III Environmental Site Assessment (ESA) at the Regina Research Farm (DFRP 13663) in Regina, Saskatchewan. The project included the installation of six (6) test holes including the installation of three (3) monitoring wells inclusive of soil and groundwater sampling in the vicinity of the two fuel underground storage tanks (USTs) south of the Maintenance Shop and Garage (UST Area) to determine the potential presence of hydrocarbon impacts due to on-site fuel storage. Soil and groundwater samples collected from the UST Area were analyzed for BTEX and PHC Fractions F1 to F4. In addition, the project included the collection of groundwater samples from three (3) monitoring wells at the Abandoned Sewage Lagoon for analysis of metals, herbicides and glycols, and one (1) monitoring well at the Designated Area for Spray Rinse Water for analysis of herbicides.

Based on the results of the Phase III ESA activities, the following can be concluded:

UST Area South of Maintenance Shop and Garage

1. None of the soil samples collected from boreholes advanced in August 2009 (TH09-08, TH09-09, TH09-10, TH09-11, TH09-12, and TH09-13) contained concentrations of BTEX or PHC Fractions F1 to F4 that exceeded the applicable SQGs protective of drinking water.
2. Based on historical results, petroleum hydrocarbon impacts to soil (ethylbenzene and PHC Fraction F1) are limited to soil in the vicinity of borehole TH09-06 installed east and proximate to the concrete pad over the USTs.
3. Based on the results of the current and previously conducted investigations, the area over which hydrocarbon impacts to soil have been identified is conservatively estimated as 65 m^2. With an estimated depth of impacted soil ranging from grade to 6 m below grade, the estimated volume of hydrocarbon-impacted soil at the UST Area is 390 m^3.
4. None of the groundwater samples collected from the monitoring wells installed in August 2009 or the monitoring well installed in January 2009 contained concentrations of BTEX or PHC Fractions F1 to F4 that were above laboratory detection limits (with the exception of benzene in a groundwater sample collected from TH09-11) or exceeded the applicable Water Quality Guidelines for the protection of community water and the protection of freshwater aquatic life.
5. Based on results to date, shallow groundwater at the UST Area has not been impacted.
6. Based on the work completed as part of 2009 AECOM investigation, a NCS score of 24.6 can be assigned to the UST Area which corresponds to a classification of “Class N, Not a Priority for Action”.

Abandoned Sewage Lagoon

1. As groundwater was not present in the monitoring wells previously installed in the Sewage Lagoon Area, no comments can be made on groundwater quality in this area with respect to metals, herbicides or solvents.

Designated Area for Spray Rinse Water

1. As groundwater was not present in the monitoring wells previously installed in the Designated Area for Spray Rinse Water, no comments can be made on groundwater quality in this area with respect to herbicides.

Recommendations for additional delineation work and associated costs are presented under separate cover along with a Remedial Action Plan (RAP).

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1. Introduction

Public Works & Government Services Canada (PWGSC) retained AECOM Canada Ltd. (AECOM) on behalf of Agriculture & Agri-Food Canada (AAFC) to complete a Phase III Environmental Site Assessment (ESA) at the Regina Research Farm (DFRP 13663) in Regina, Saskatchewan. The property is located just outside the City of Regina's south-eastern property limits and has been operated by Agriculture and Agri-Food Canada (AAFC) since 1960. Current site activities focus on semiarid agricultural crop research. The Research Farm, as shown in Figures 1 and 2, occupies approximately 240 ha of land, 55 ha of which are used to conduct research and the remainder is leased to a local farmer. The Main Complex is situated in the north portion of the property and consists of several buildings and a refuelling facility. The main complex is shown in Figure 3.

1.1 Background

At the Regina Research Farm (RRF), a 4,500 L gasoline UST, a 4,500 L diesel UST, and a concrete fuelling pad with pump islands were installed in 1990. The installed USTs, located south of the Machine Shop and Garage, replaced existing tanks which were installed in 1963.

In January 2009, an intrusive investigation completed by AECOM identified concentrations of PHC parameters ethylbenzene and PHC fraction F1 exceeding applicable assessment criteria in the soil collected from one of the boreholes advanced in the area. However, hydrocarbon impacted soil was not delineated during the 2009 investigation. Also in January 2009, assessments of the Abandoned Sewage Lagoon and the Designated Area for Spray Rinse Water were completed. Soil results did not identify any exceedences of applicable criteria. Groundwater sampling at groundwater monitoring wells installed during the investigation at the Abandoned Sewage Lagoon and the Designated Area for Spray Rinse Water did not take place during the investigation due to an insufficient quantity of groundwater in the wells.

The results of the January 2009 Phase II ESA are summarized in the report: "Phase I/II Environmental Site Assessment, Regina Research Farm (DFRP 13663) – Regina, Saskatchewan" dated March 31, 2009.

1.2 Objectives

The objectives of this Phase III ESA include:

- Complete a detailed intrusive investigation to delineate the horizontal and vertical extent of hydrocarbon impacted soil and groundwater in the area of the two USTs located south of the Maintenance Shop and Garage (UST Area)
- Monitor and collect groundwater samples from previously installed monitoring wells (three (3) monitoring wells at the Abandoned Sewage Lagoon and one (1) monitoring well at the Designated Area for Spray Rinse Water) to ensure the groundwater has not been impacted by site activities
- Monitor and collect groundwater samples from the previously installed monitoring wells and the newly installed groundwater wells in the area of the two USTs located south of the Maintenance Shop and Garage to ensure the groundwater has not been impacted by site activities
- Further characterize the Site by development of a thorough knowledge of subsurface geology, hydrology and hydrogeology in the areas including soil permeability and groundwater flow gradient

- Develop a Remedial Action Plan for the Site, under separate cover, for the remediation of hydrocarbon impacted soil (and groundwater, if required) including associated costs consistent with relevant Provincial and Federal regulations, guidelines, and codes of practice

- Meet the requirements of the Treasury Board Secretariat (TBS) reporting by developing an indicative estimate of liability or contingent liability for the Site

- Assignment of a site score as per the 2008 National Contaminated Sites Classification System (NCSCS)

2. Methodology

Prior to the field investigation, AECOM personnel obtained utility clearances from representatives of applicable utility companies and also used a private utility locator to locate all utilities in the area of the two USTs located south of the Maintenance Shop and Garage (UST Area).

2.1 Sampling Program

AECOM conducted an intrusive subsurface investigation in the UST Area on August 28, 2009. Earth Drilling Co. Ltd. provided a truck-mounted drill rig with continuous flight augers and support equipment with an operator to advance the boreholes on the Site. Six (6) boreholes were drilled to a maximum depth of 6.1 m (20 ft) below the ground surface. During the borehole advancement, soil samples were collected for field hydrocarbon headspace measurement. Based on the results, selected soil samples were submitted for laboratory analysis to Maxxam Analytics of Mississauga, Ontario. Maxxam is accredited by the Canadian Association of Laboratory Accreditation Inc. (CALA) and by the Standards Council of Canada (SCC).

2.1.1 Details of Boreholes

Three (3) of the six (6) boreholes advanced in the UST Area were completed as monitoring wells and are referred to as TH09-08, TH09-09, and TH09-11. Figure 4 provides a graphical representation of the borehole and monitoring well placement in relation to the on-site structures and features. Graphical representations of each borehole, the encountered strata, and the field hydrocarbon headspace measurements are provided as borehole logs in Appendix A.

Following the completion of each borehole, any soil remaining on the auger flights was removed by hand. The drill cuttings were placed in a soil bag for disposal at a licensed soil disposal facility at a later date.

The installed monitoring wells were made of 50 mm (2 inch) diameter solid and No. 10 slotted schedule 40 polyvinyl chloride (PVC) pipe sections fitted with a solid slipcover on the bottom and a threaded cap on the top. The PVC pipe sections were threaded or mechanically coupled together, with no adhesive of any kind. The screened portion of the well was positioned at the required depth in the silica sand backfill, which filled the annulus surrounding the PVC screen. The annulus surrounding the solid PVC pipe was filled with bentonite, which served as a seal for the well. Each well was protected with a steel bolt-down flush-mount cover, that was set into the ground for protection from traffic and to provide access to each well.

A horizontal survey of the newly installed monitoring wells and boreholes and the previously installed monitoring wells was completed using a handheld GPS unit accurate to +/- 1 m. The GPS coordinates for the surveyed monitoring wells, boreholes and site utilities are included in Appendix B. A vertical survey of the newly installed monitoring wells and boreholes was also completed to tie them into elevations already established for the previously

installed monitoring wells. The vertical survey included the top of the PVC casing (TOC) elevations and ground surface elevations in relation to a temporary control point installed on-site.

2.1.2 Soil Sampling Program

Soil testing in the field included hydrocarbon headspace measurement using a hexane-calibrated RKI Eagle hydrocarbon vapour surveyor. New nitrile gloves were used for each borehole to prevent cross-contamination. The soil samples were collected using the following method at approximately 0.8 m (2.5 ft) vertical intervals:

Field Soil Sampling and Testing

The soil samples were collected from the flights of the auger, trimmed to prevent cross-contamination, and sealed in individual plastic Ziploc bags with an equal amount of air. The samples were allowed to reach equilibrium with outdoor temperatures prior to field analysis. The probe of the hydrocarbon vapour surveyor was then inserted through the side of the bag to sample the headspace over the soil and provide a relative indication of the volatile hydrocarbons in the soil sample. The instrument was configured to exclude methane from its analysis.

In addition to the soil samples collected for field analysis, another soil sample was collected from the auger flights, trimmed to prevent cross-contamination, and sealed in a plastic Ziploc bag with a minimal volume of air. To reduce contaminant volatilization, the bagged sample was then placed in a cooler for potential submission for laboratory analysis. Based on the hydrocarbon headspace measurement results, selected soil samples were packed into laboratory supplied sampling jars, tightly sealed with a Teflon-lined lid and placed in a cooler with an ice pack to reduce temperature fluctuations prior to delivery to Maxxam Analytics. The selected soil samples were analyzed for Canada Wide Standards for petroleum hydrocarbon fractions F1 to F4, and BTEX.

2.1.3 Groundwater Sampling Program

Groundwater sampling in the UST Area was to occur at the one (1) previously installed monitoring well and the three (3) newly installed monitoring wells using the procedures outlined below. During groundwater monitoring, monitoring wells TH09-01, TH09-02, and TH09-03 previously installed at the Abandoned Sewage Lagoon (shown in Figure 5) were determined to be dry and could not be sampled for metals, herbicides, and solvents. In addition, the one (1) monitoring well previously installed at the Designated Area for Spray Rinse Water (shown in Figure 6) was also determined to be dry and could not be sampled for herbicides.

- The groundwater elevations were measured in the newly installed and previously installed monitoring wells at the UST Area on September 3, 2009 approximately five (5) days following installation.

- The monitoring wells were then developed using a new, dedicated, 4 cm diameter bailer to remove three (3) times the well volume of groundwater or by practically emptying the well.

- After allowing approximately 12 hours for groundwater recharge in each monitoring well, samples were collected using the dedicated bailers. The bailers were handled using new nitrile gloves to eliminate the potential for cross-contamination between monitoring wells.

- Each water sample was dispensed from the bailer into clean laboratory-supplied containers for hydrocarbon analysis and preserved as necessary.

- The containers were tightly sealed and placed in a cooler for delivery to Maxxam Analytics. Groundwater samples collected from the one (1) previously installed monitoring well and the three (3) newly installed monitoring wells at the UST Area were submitted for analysis of BTEX and PHC Fractions F1 to F4.

- All the purge water from the wells was containerized and disposed of at a licensed disposal facility in Regina, Saskatchewan.

2.2 Laboratory Analytical Program

The chains of custody and certificates of analysis supplied by Maxxam Analytics can be found in Appendix C.

2.3 Quality Assurance/Quality Control Program

As outlined in Sections 2.1.2 and 2.1.3, AECOM field personnel followed pre-defined field procedures for quality control. These procedures ensured that representative samples were collected and that the risk of cross-contamination was minimized.

Further, blind field duplicate samples were also submitted for laboratory analysis for quality assurance. For the blind field duplicate soil samples, soil was placed in a Ziploc bag. The soil was then evenly partitioned into two separate sets of sampling jars. For groundwater, one blind field duplicate sample was submitted for analysis by evenly partitioning into the sampling bottles from the dedicated bailer each time the bailer was filled. The field duplicates ensure that the data is reproducible within certain limits and provide a means to evaluate precision of the field quality control program. Reproducibility is quantified by calculating the relative percent difference (RPD) defined by the following equation:

$$\text{Field Duplicate RPD}(\%) = \frac{(C1 - C2)}{(C1 + C2)/2} \text{x} 100$$

Where: RPD = relative percent difference
C1 = larger of the two observed values from the field duplicate analysis
C2 = smaller of the two observed values from the field duplicate analysis

In order for a valid Field Duplicate RPD to be calculated, both results must be > 5x the Method Detection Limit (MDL). If one or both of the analytical results for the matrix duplicate samples are < 5x MDL for an analyte, then it is not possible to calculate a valid Field Duplicate RPD.

Chain of Custody forms were also completed for tracking purposes. These forms were completed prior to delivering the samples to the laboratory and included the following information: project address, sample identification, type of analysis required, sampling date and time, sampler's name and project contact information.

2.4 Selection of Applicable Environmental Quality Guidelines

Environmental Quality Guidelines (EQG) used for comparison purposes are included in the documents entitled:

- Canadian Environmental Quality Guidelines (CEQG), Canadian Council of Ministers of the Environment (CCME), updated 2007.
- Canada-Wide Standards (CWS) for Petroleum Hydrocarbons in Soil, CCME, revised January 2008.
- Risk-Based Corrective Actions (RBCA) for Petroleum Hydrocarbon Impacted Sites, Saskatchewan Environment (SE), March 2009.

- Interim Guidelines for the Decommissioning of a Warehouse used for the Storage of Crop Protection Chemicals, Saskatchewan Environment (SE), 1992.

2.4.1 Soil

CCME Tier II Soil Quality Guidelines (SQGs) and the CWS Tier I SQGs are used as comparison guidelines for soil in this report. The Guidelines used in this report assume the following:

- CCME Agricultural Land Use guidelines apply to the Abandoned Sewage Lagoon and the Designated Area for Spray Rinse Water, since the current and future planned land use for these areas is agricultural. Soil samples collected during previous investigations at the Abandoned Sewage Lagoon and the Designated Area for Spray Rinse Water were submitted for grain size analysis, which indicated a fine-grained soil. As such, fine-grained SQGs were used as comparison guidelines for these sites in past assessment reports.

- CCME Commercial Land Use guidelines apply to the area, the including two USTs Located South of the Maintenance Shop and Garage, due to the nature of activities that are completed in the yard (i.e. office, vehicle and equipment maintenance and vehicle refuelling). Current and future land use is expected to remain consistent. Soil samples collected during previous investigations at the UST Area were submitted for grain size analysis, which indicated a coarse-grained soil (sand). As such, coarse-grained SQGs were used as comparison guidelines.

- The 2007 CCME Soil Quality Guideline for the Protection of Human Health (SQG_{HH}) for benzene contains guidelines for both 10^{-6} and 10^{-5} incremental risk. As the Site is federally owned, the results obtained in this soil investigation will be compared to the 10^{-6} incremental risk guideline.

The CCME and CWS guidelines utilize a risk-based approach allowing limited modification of the generic soil quality guidelines in light of prescribed site-specific factors affecting contaminant mobility and receptor characterization. In other words, in cases where soil concentrations exceed the generic Tier I guidelines, an analysis of risk factors specific to the site in question is acceptable in order to allow for a realistic assessment of the actual risks at the site. Using this approach, soil quality guidelines are selected based on a step-through procedure eliminating the exposure pathways that do not apply to receptors in the vicinity of the site and finally selecting the appropriate and most conservative guideline remaining after the elimination procedure. The guidelines are protective of both human and environmental receptors.

This approach was undertaken for the Site in order to provide a more realistic assessment of environmental risks at the Site. The applicable site-specific factors at the Site and the rationale for the use of Tier I/II soil quality objectives for BTEX and petroleum hydrocarbon fractions F1 to F4 are summarized in Tables 2 and 3, respectively.

The Saskatchewan Government has adopted the CCME criteria; they have not developed a set of criteria to be used for assessing the environmental quality of soils impacted with hydrocarbons. Saskatchewan has developed a set of guidelines to be used for the remediation of sites that have been impacted with herbicides. This set has been listed below for information purposes and would be applied in the event that CCME did not have criteria for herbicides.

- Saskatchewan Environment Interim Guidelines for the Decommissioning of a Warehouse used for the Storage of Crop Protection Chemicals. These guidelines were developed to assist the owner of an agricultural chemical warehouse to anticipate and understand the requirements for property assessment and decommissioning, demolition and restoration of the facility. This assessment uses the soil remediation criteria listed for Agricultural Land Use. These guidelines are used for comparison purposes only, or in the absence of CCME criteria (1992).

2.4.2 Groundwater

As indicated in the March 2009 report completed by AECOM for the Phase I/II ESA completed at the Site in January 2009, government records indicate that groundwater drinking wells are located onsite as well as on adjacent properties (within 800 m). As such, groundwater results from this report are compared to the Health Canada Guidelines for Canadian Drinking Water Quality. A water body also exists approximately 290 m north of the UST Area. As such, the CCME water quality guidelines for the protection of freshwater Aquatic Life are also applicable.

3. Results

The measurements and observations made in the field are summarized in the following subsections.

3.1 UST Area

3.1.1 Soil Investigation

The soil encountered during the drilling program generally consisted of sand and gravel fill underlain by silty clay or clay to the maximum depth explored of 6.1 metres (20 ft).

A detailed description of the soil stratigraphy encountered during the borehole drilling is included in the borehole logs in Appendix A.

3.1.1.1 Soil Vapour Concentrations

For the intrusive investigation, soil grab samples were retrieved from the auger flights in 0.8 metre (2.5 ft) increments. Once collected, hydrocarbon headspace tests were conducted as indicated in Section 2.1.2. Results of the field hydrocarbon headspace analyses conducted on the collected soil samples indicated headspace vapours below the instrument detection limit (0 ppm) for all soil samples collected. The results of the field hydrocarbon headspace analyses are summarized on the borehole logs in Appendix A.

3.1.2 Groundwater Conditions

Groundwater was encountered during the drilling of all six (6) boreholes and monitoring wells were installed in three (3) of them. The monitoring wells were installed to allow for groundwater sampling and to determine the direction of local groundwater flow.

Groundwater elevations were determined by measuring the distance from the surveyed top of casing (TOC) to the static water level with an electronic interface probe that also detects depth to liquid petroleum hydrocarbons. No free-phase liquid petroleum hydrocarbons were detected at any of the measured on-site monitoring wells. Groundwater in the UST Area was encountered in the monitoring wells at approximately 0.7 m to 2.7 m below grade. The groundwater elevation measurements are presented in Table 4. The shallow groundwater at the Site appears to flow primarily in a northwest direction as indicated in Figure 4.

One rising head test was conducted at the Site on Monitoring Well TH09-08 indicating a hydraulic conductivity of approximately 1.0×10^{-7} m/sec. The result of the rising head test is included in Appendix D.

The average horizontal hydraulic gradient at the Site was calculated to be 0.21 m/m. Given the types of soil encountered during drilling activities, an effective porosity of 0.10 was assumed. Given a hydraulic conductivity of 1.0×10^{-7} m/sec, the estimated horizontal groundwater seepage velocity beneath the Former UST Area in the

shallow clay aquifer is estimated to be 2.15 x 10^{-7} m/s (6.8 m/year) to the northwest. The groundwater seepage velocity beneath the Site was calculated using the following form of Darcy's law:

$$v = \frac{Ki}{n}$$

where: v = average groundwater velocity (m/s)
K = aquifer hydraulic conductivity (m/s)
i = average hydraulic gradient (m/m)
n = aquifer porosity, estimated as 0.1 based on literature values

Hydrocarbon headspace measurements in the monitoring wells ranged from below detection limits (TH09-08, and TH09-11) to 20 ppm and 75 ppm for Monitoring Wells TH09-09 and TH09-05, respectively.

3.1.3 Laboratory Analytical Results

The results of the laboratory analyses for the soil, sediment, and groundwater samples are summarized in the paragraphs below and the accompanying tables. Copies of the analytical results for the submitted samples are included in Appendix C.

3.1.3.1 Soil

A total of 12 soil samples plus two field duplicate soil samples were submitted for laboratory analysis of BTEX and PHC Fractions F1 – F4. Generally, one sample was selected from boreholes at a depth where hydrocarbon impacts to soil could be expected based on the depth of the USTs. One (1) additional soil sample per borehole was submitted for laboratory analysis from a greater depth below grade to confirm the vertical extent of potential soil impacts. None of the soil samples submitted for laboratory analysis from the UST Area contained detectable concentrations of BTEX or PHC F1 – F4 or concentrations that exceeded of the applicable soil quality guidelines.

The results of the laboratory analyses are summarized in Table 5 along with historical soil analytical results from the January 2009 investigation.

3.1.3.2 Groundwater

Groundwater samples were collected from each of the newly installed monitoring wells and the previously installed monitoring well. With the exception of the groundwater sample collected from TH09-11, none of the groundwater samples collected at the Site contained detectable concentrations of BTEX or PHC F1 – F4 or concentrations that exceeded of the applicable drinking water quality guidelines. Benzene was detected in the groundwater sample collected from TH09-11 (0.0006 mg/L) but was well below the applicable drinking water quality guideline of 0.005 mg/L.

The groundwater laboratory results are summarized in Table 6.

3.1.3.3 Quality Assurance/Quality Control

Two (2) blind field duplicate soil samples were submitted for laboratory analysis along with one (1) blind field duplicate groundwater sample from the UST Area. Soil samples TH09-11-17 (a blind field duplicate of sample TH09-11-7) and TH09-12-17 (a blind field duplicate of sample TH09-12-7) were submitted for analysis of hydrocarbons (BTEX and PHC F1 – F4). Groundwater sample TH08-5 (a blind field duplicate of sample TH09-05)

was also submitted for analysis of hydrocarbons (BTEX and PHC F1 – F4). The blind duplicates were prepared in the field by the sampler. The purpose of these samples was to determine if any unintentional contamination occurred from atmospheric effects, equipment or sampler effects.

The relative percent difference (RPD) calculations for the blind field duplicate samples for soil and groundwater are presented in Tables 7 and 8, respectively. RPD analysis was not possible as hydrocarbon parameter concentrations for all soil and groundwater samples submitted for analysis were less than five times the laboratory detection limits. In addition, laboratory analysis of the groundwater trip blank did not produce any detectable concentrations of hydrocarbon parameters. Laboratory quality assurance testing such as matrix spike, spiked blanks, method blanks and RPD were all within acceptable laboratory limits for both soil and groundwater analysis.

3.2 Abandoned Sewage Lagoon

3.2.1 Groundwater Conditions

Groundwater was not present at the time of the investigation in any of the three (3) monitoring wells previously installed at the Abandoned Sewage Lagoon (TH09-01, TH09-02, and TH09-03). As such, groundwater samples could not be collected from this area.

3.3 Designated Area for Spray Rinse Water

3.3.1 Groundwater Conditions

Groundwater was not present at the time of the investigation in Monitoring Well TH09-04 previously installed at the Designated Area for Spray Rinse Water. As such, groundwater samples could not be collected from this area.

4. Discussion

The following sections of the report discuss the results of the investigations in each area investigated at the Site.

4.1 UST Area

A discussion of soil and groundwater results for the UST Area is included in the following sub-sections.

4.1.1 Soil

None of the samples collected from boreholes advanced in August 2009 (TH09-08, TH09-09, TH09-10, TH09-11, TH09-12, and TH09-13) contained concentrations of BTEX or PHC Fractions F1 to F4 that exceeded the applicable SQGs protective of drinking water. Hydrocarbon impacts to soil are therefore limited to soil in the vicinity of borehole TH09-06 installed east and proximate to the concrete pad over the USTs during the January 2009 investigation. The soil sample collected from TH09-06 at a depth of 3.8 m below grade contained concentrations of ethylbenzene and PHC Fraction F1 of 0.21 mg/kg and 370 mg/kg, respectively. These concentrations exceed the applicable SQGs of 0.082 mg/kg and 240 mg/kg for ethylbenzene and PHC Fraction F1, respectively. With reference to Figure 7, hydrocarbon impacts to soil originating from the UST Area have been delineated in all horizontal directions.

Based on the results of the current and previously conducted investigations, the area over which hydrocarbon impacts to soil have been identified is conservatively estimated as 65 m^2. Based on field hydrocarbon headspace tests completed during the January 2009 investigation, the depth of impacted soil is conservatively estimated as

ranging from grade to 6 m below grade. As such, the total estimated volume of hydrocarbon-impacted soil at the UST Area is 390 m^3. The estimated horizontal extent of hydrocarbon impacts to soil is shown in Figure 7.

4.1.2 Groundwater

None of the groundwater samples collected from the monitoring wells installed in August 2009 (TH09-08, TH09-09, and TH09-11) or the monitoring well installed in January 2009 (TH09-05) contained concentrations of BTEX or PHC Fractions F1 to F4 that exceeded the applicable Water Quality Guidelines for the protection of community water and the protection of freshwater aquatic life. Based on results to date, groundwater impacts, if present at the UST Area, are limited to a minimal area similar to the area identified for soil impacts (65 m^2).

4.2 Abandoned Sewage Lagoon

4.2.1 Groundwater

As groundwater was not present in the monitoring wells previously installed in the Sewage Lagoon Area, no comments can be made on groundwater quality in this area with respect to metals, herbicides or solvents.

4.3 Designated Area for Spray Rinse Water

4.3.1 Groundwater

As groundwater was not present in the monitoring wells previously installed in the Designated Area for Spray Rinse Water, no comments can be made on groundwater quality in this area with respect to herbicides.

4.4 National Classification System for Contaminated Sites Scoring

The National Classification System for Contaminated Sites (NCS, 2008) scoring evaluation form for the UST Area is included in Appendix E based on the information presented in this report. The NCS score is discussed below.

4.4.1 UST Area

The NCS score assigned to the UST Area following the January 2009 Phase II ESA completed by AECOM was 28.3 indicating a site classification of Class N, Not a Priority for Action. Based on the work completed as part of the recent 2009 AECOM investigation, a NCS score of 25.7 can be assigned to the UST Area which corresponds to a classification of “Class N, Not a Priority for Action” mainly due to the absence of groundwater impacts and the lack of exposure pathways with respect to soil.

5. Conclusions

Based on the work completed at the Site by AECOM the following conclusions can be made:

UST Area South of Maintenance Shop and Garage

1. None of the soil samples collected from boreholes advanced in August 2009 (TH09-08, TH09-09, TH09-10, TH09-11, TH09-12, and TH09-13) contained concentrations of BTEX or PHC Fractions F1 to F4 that exceeded the applicable SQGs protective of drinking water.

2. Based on historical results, petroleum hydrocarbon impacts to soil (ethylbenzene and PHC Fraction F1) are limited to soil in the vicinity of borehole TH09-06 installed east and proximate to the concrete pad over the USTs.
3. Based on the results of the current and previously conducted investigations, the area over which hydrocarbon impacts to soil have been identified is conservatively estimated as 65 m^2. With an estimated depth of impacted soil ranging from grade to 6 m below grade, the estimated volume of hydrocarbon-impacted soil at the UST Area is 390 m^3.
4. None of the groundwater samples collected from the monitoring wells installed in August 2009 or the monitoring well installed in January 2009 contained concentrations of BTEX or PHC Fractions F1 to F4 that were above laboratory detection limits or exceeded the applicable Water Quality Guidelines for the protection of community water and the protection of freshwater aquatic life.
5. Based on results to date, shallow groundwater at the UST Area has not been impacted.
6. Based on the work completed as part of 2009 AECOM investigation, a NCS score of 25.7 can be assigned to the UST Area which corresponds to a classification of “Class N, Not a Priority for Action”.

Abandoned Sewage Lagoon

1. As groundwater was not present in the monitoring wells previously installed in the Sewage Lagoon Area, no comments can be made on groundwater quality in this area with respect to metals, herbicides or solvents.

Designated Area for Spray Rinse Water

1. As groundwater was not present in the monitoring wells previously installed in the Designated Area for Spray Rinse Water, no comments can be made on groundwater quality in this area with respect to herbicides.

Recommendations for the Regina Research Farm are included under a separate document entitled: “Remedial Action Plan, Regina Research Farm (DFRP 13663) – Regina, Saskatchewan”.

6. Conditions

The present study was designed to meet the requirements of PWGSC (in accordance with provincial guidelines). Conditions outlined in the Consulting Agreement and Authorization to Proceed of the project proposal apply.

Figures

Phase III Environmental Site Assessment, Regina Research Farm (DFRP 13663) – Regina, Saskatchewan

0 250 500 m SCALE 1:25000

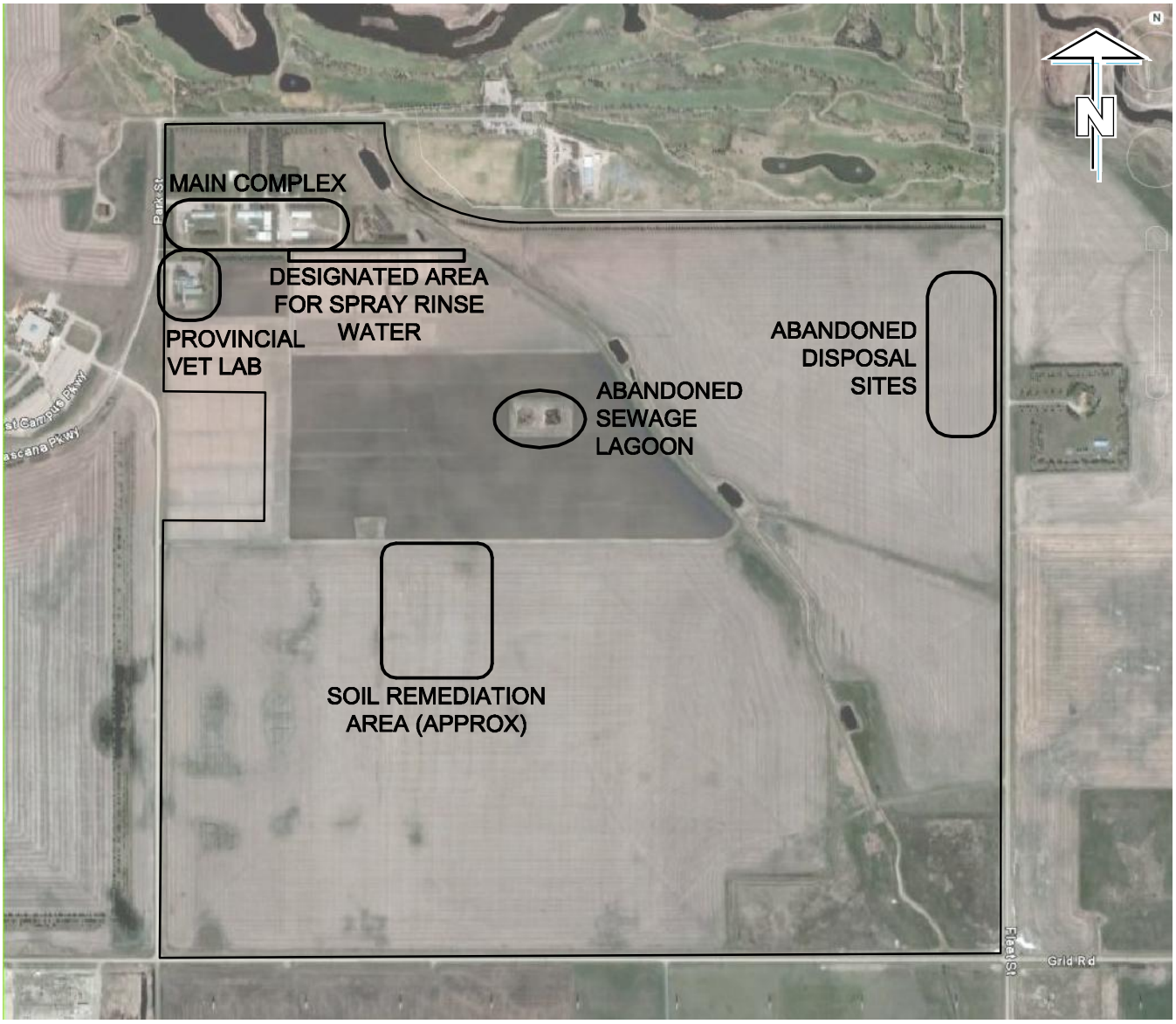
IMAGE SOURCE: GOOGLE EARTH

Public Works and Government Services Canada
Phase III Environmental Site Assessment
Regina Research Farm (DFRP 13663) - Regina, SK

Location Plan

AECOM

Figure - 1



0 125 250 m SCALE 1:12500

IMAGE SOURCE: GOOGLE EARTH

Public Works and Government Services Canada
Phase III Environmental Site Assessment
Regina Research Farm (DFRP 13663) - Regina, SK

Site Plan

Figure - 2

AECOM

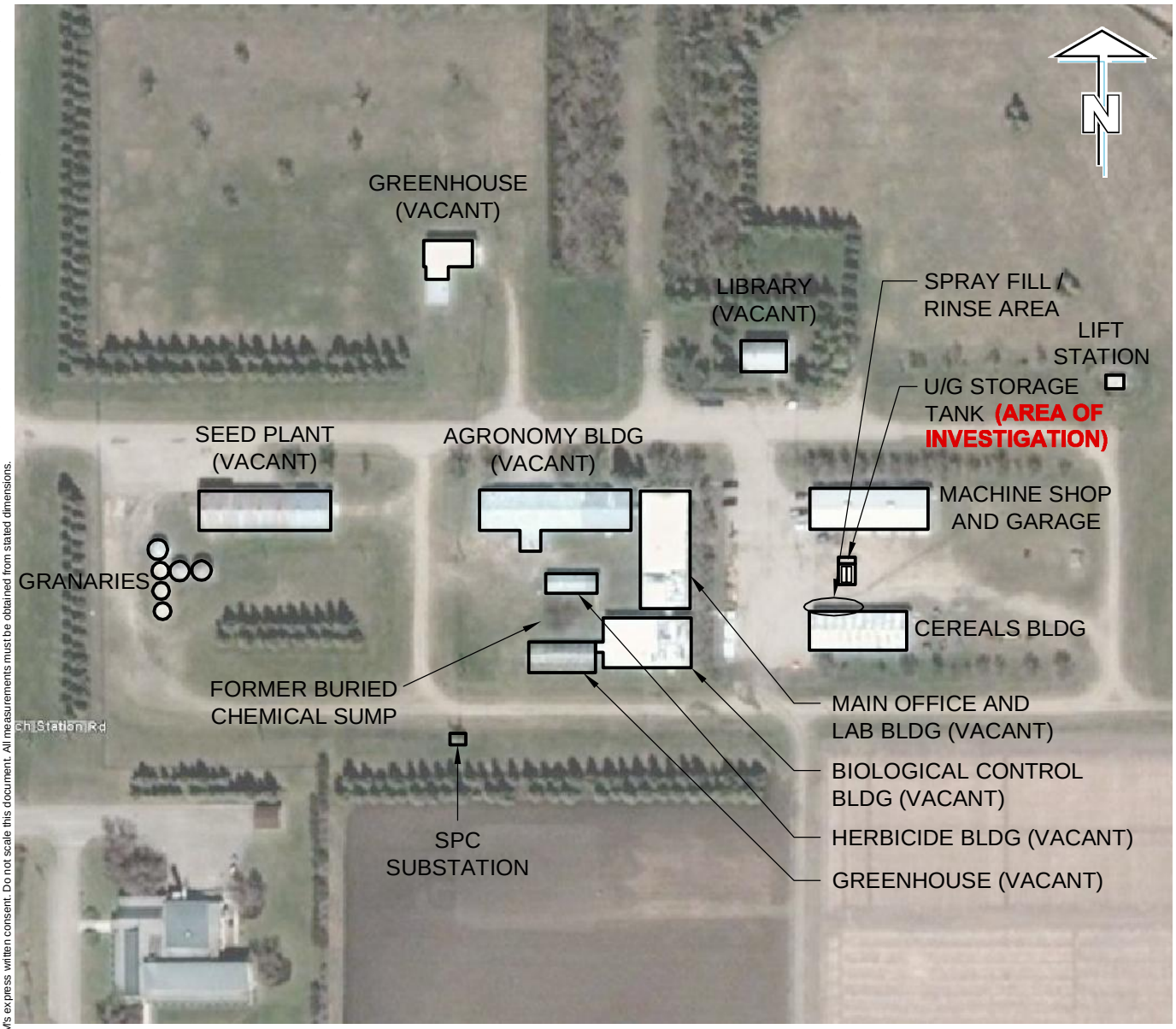


IMAGE SOURCE: GOOGLE EARTH

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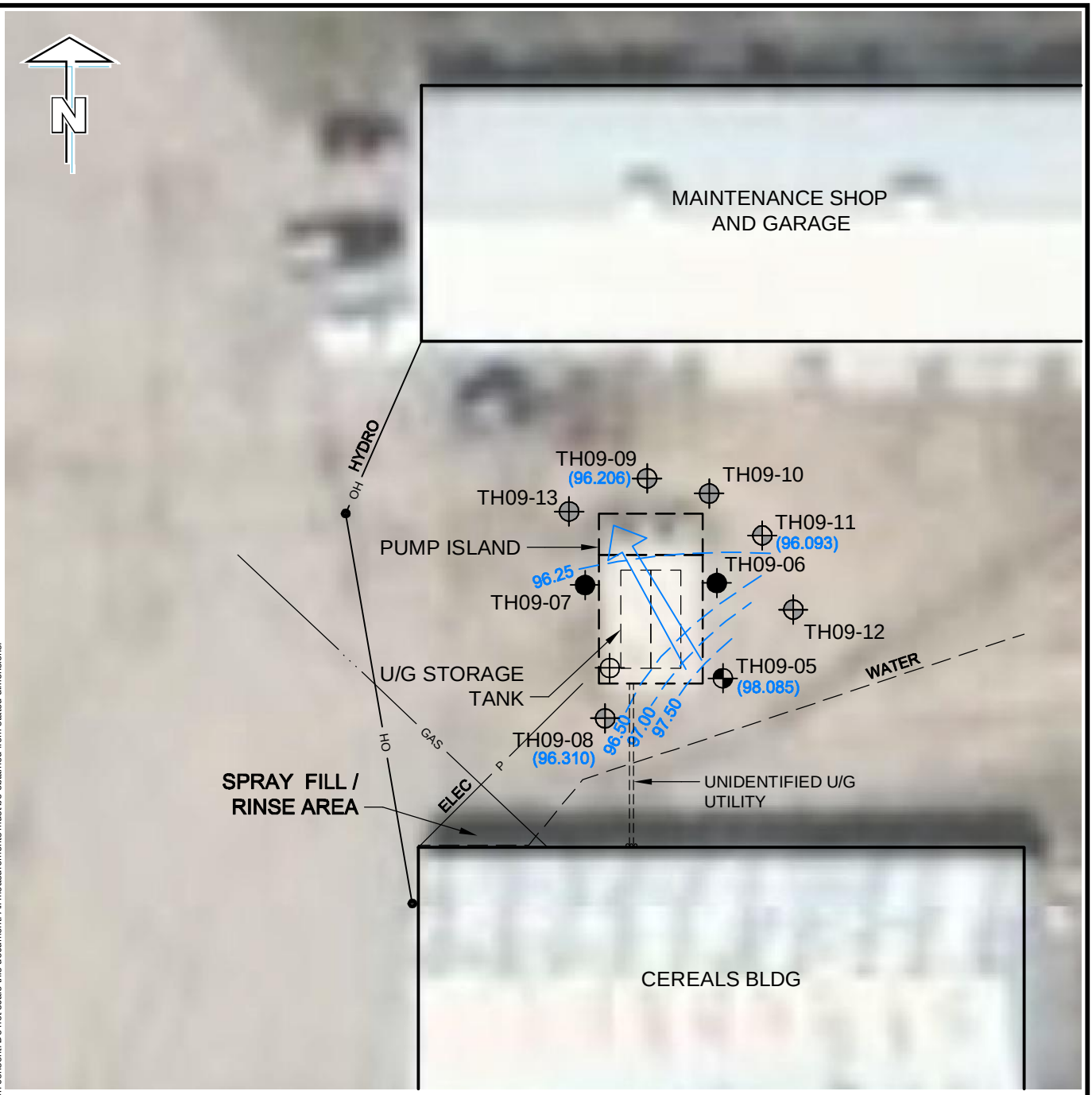
Public Works and Government Services Canada
Phase III Environmental Site Assessment
Regina Research Farm (DFRP 13663) - Regina, SK

Site Plan
Main Complex
Figure - 3



LEGEND

- MONITORING WELL LOCATION (JANUARY 2009)
- MONITORING WELL LOCATION (AUGUST 2009)
- BOREHOLE (JANUARY 2009)
- BOREHOLE (AUGUST 2009)
- MONITORING WELL INSTALLED BY OTHERS
- SHALLOW GROUNDWATER FLOW DIRECTION
- INFERRED SHALLOW GROUNDWATER CONTOUR
- (96.306) GROUNDWATER ELEVATION (m)

0 3 6 m SCALE 1:300

IMAGE SOURCE: GOOGLE EARTH

ISS/REV: A
AECOM FILE NAME: 060120109_02-H-F004_RX.dwg Saved By: vibergj PLOT: 10/03/23 3:28:03 PM A SIZE 8.5" x 11" (215.9mm x 279.4mm)

AECOM

Public Works and Government Services Canada
Phase III Environmental Site Assessment
Regina Research Farm (DFRP 13663) - Regina, SK

Underground Storage Tank Area
Borehole / Monitoring Well Locations

Figure - 4

0 10 20 m SCALE 1:1000

IMAGE SOURCE: GOOGLE EARTH

LEGEND

MONITORING WELL LOCATION (JANUARY 2009)

Public Works and Government Services Canada
Phase III Environmental Site Assessment
Regina Research Farm (DFRP 13663) - Regina, SK

Abandoned Sewage Lagoon Monitoring Well Locations

Figure - 5

AECOM

ISS/REV: A
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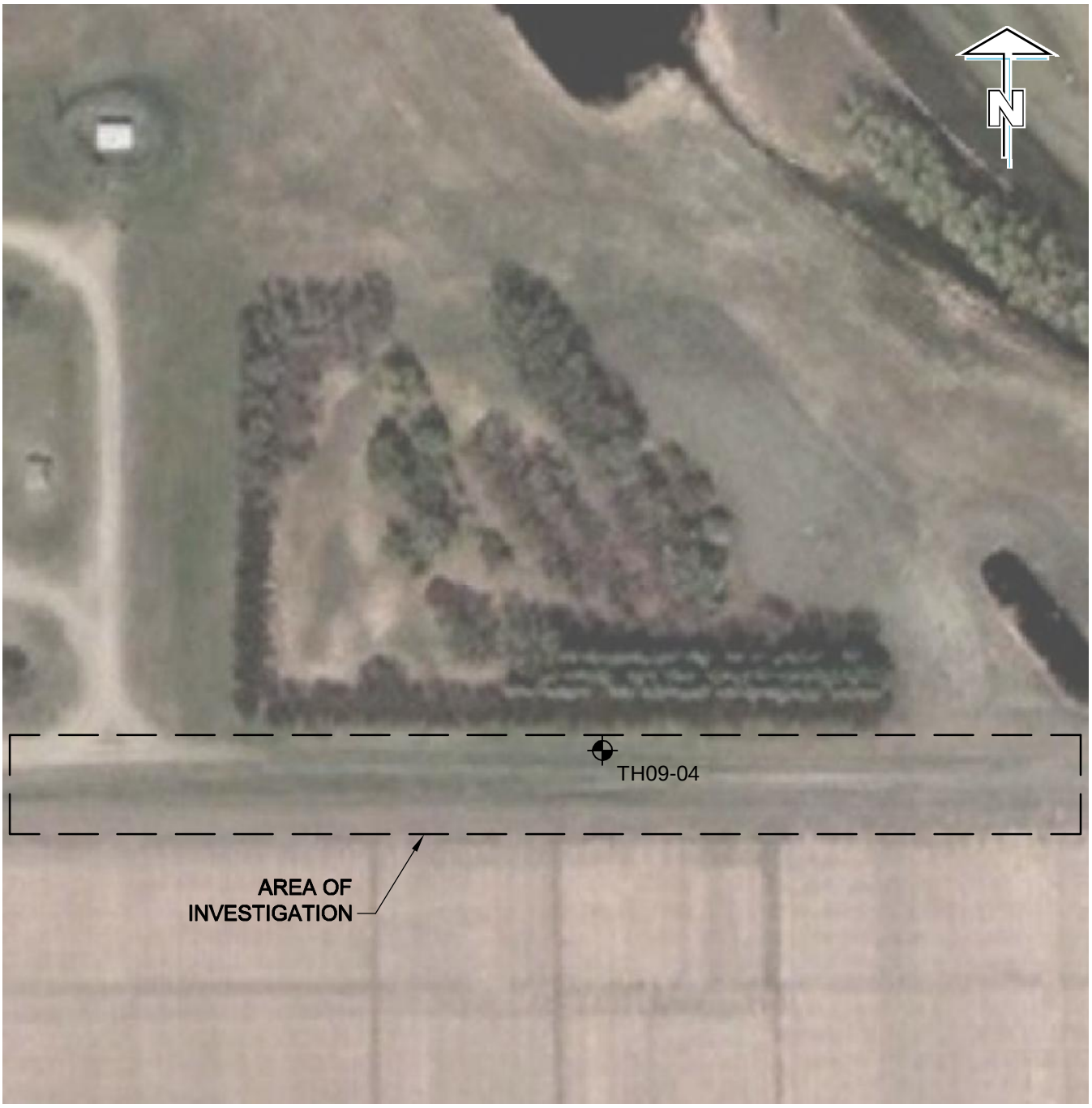


0 10 20 m SCALE 1:1000

IMAGE SOURCE: GOOGLE EARTH

LEGEND

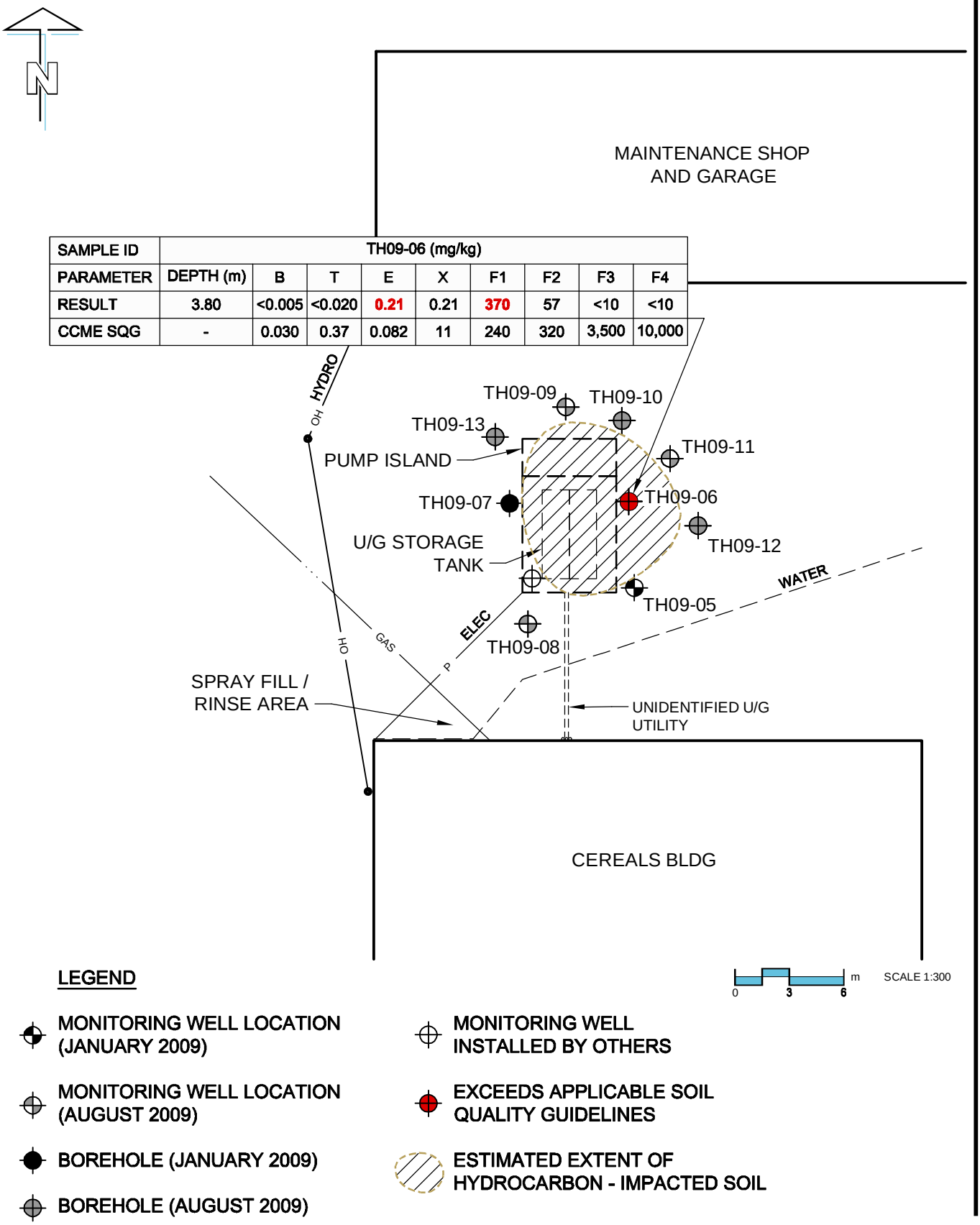
MONITORING WELL LOCATION
(JANUARY 2009)

Public Works and Government Services Canada
Phase III Environmental Site Assessment
Regina Research Farm (DFRP 13663) - Regina, SK

Designated Area for Spray Rinse Water Monitoring Well Location

Figure - 6

AECOM



Public Works and Government Services Canada
Phase III Environmental Site Assessment
Regina Research Farm (DFRP 13663) - Regina, SK

Estimated Extent of Hydrocarbon Impacts to Soil
UST Area
Figure - 7

AECOM

ISS/REV: A
AECOM FILE NAME: 060120109_02-H-F007_RX.dwg Saved By: vibergj PLOT: 10/03/23 1:47:10 PM A SIZE 8.5" x 11" (215.9mm x 279.4mm)

Tables

Phase III Environmental Site Assessment, Regina Research Farm (DFRP 13663) – Regina, Saskatchewan

Table 1. Methods Used for Laboratory Analyses

Sample Type	Parameter	Analytical Method
Water	BTEX/F1	EPA 8260 C / CCME
	CCME Hydrocarbons (F2-F4)	CCME PHC-CWS
Soil	BTEX/F1	CCME CWS-PHC Dec-2000 - Pub# 1310
	CCME Hydrocarbons (F2-F4)	CCME PHC-CWS

Table 2. Applicability of Receptors and Exposure Pathways, CCME Tier II Assessment for BTEX

Potential Exposure Pathway	Applicability (Yes/No)	Rationale
Human Health Guideline		
Soil Ingestion	Yes	Site is accessible to human receptors.
Soil Dermal Contact	Yes	Site is accessible to human receptors.
Soil Inhalation	Yes	Site is accessible to human receptors.
Inhalation of Indoor Air (Basement)	No	Nearby buildings are slab on grade construction.
Inhalation of Indoor Air (Slab on grade)	Yes	Nearby buildings are slab on grade construction.
Off-Site Migration	Yes	Although site is relatively flat, surface runoff is possible.
Groundwater (Drinking water)	Yes	Groundwater drinking water sources located on adjacent properties (within 800 m).
Produce, Meat, and Milk	No	Site land use is mainly commercial and does not include livestock.
Environmental Health Guideline		
Soil Contact	Yes	Site is accessible to ecological receptors.
Soil and Food Ingestion	Yes	Site is accessible to ecological receptors.
Nutrient and Energy Cycling	Yes	Site is accessible to ecological receptors.
Off-Site Migration	Yes	Although site is relatively flat, surface runoff is possible.
Groundwater (livestock)	No	Site land use is commercial, not used for agricultural livestock purposes.
Groundwater (aquatic life)	Yes	Site approx. 300 m south of Wascana Creek.

Table 3. Applicability of Receptors and Exposure Pathways, CWS Tier I Assessment for PHC Fractions F1 – F4

Potential Exposure Pathway	Applicability (Yes/No)	Rationale
Direct Soil Contact (Human)	Yes	Site is accessible to human receptors.
Vapour Inhalation[1]	Yes	Nearby buildings are slab on grade construction.
Ecological Soil Contact	Yes	Site is accessible to ecological receptors.
Protection of Potable Groundwater	Yes	Groundwater drinking water sources located on adjacent properties (within 800 m).
Protection of Groundwater for FAL	Yes	Site approx. 300 m south of Wascana Creek.
Protection of Groundwater for Livestock	No	Site land use does not include livestock.
Offsite Migration	Yes	Although site is relatively flat, surface runoff is possible.
Management Level	Yes	Applicable at all sites.

[1] For soil under or adjacent to building.

Table 4. Groundwater Monitoring Results - UST Area

Monitoring Well	Ground Surface Elevation (m)	Top of MW Elevation (m)	Depth to Groundwater [1] (m)	Liquid Hydrocarbon Thickness (mm)	Groundwater Elevation [2] (m)	Monitoring Well Vapour Concentration [3] (ppm)
Two USTs Located South of Maintenance Shop and Garage						
TH09-05	98.900	98.809	0.724	0	98.085	75
TH09-08	98.936	98.835	2.525	0	96.310	ND
TH09-09	99.029	98.897	2.691	0	96.206	20
TH09-11	98.980	98.847	2.754	0	96.093	ND

[1] Measured from top of monitoring well.

[2] Corrected groundwater elevation if phase-separated liquids are present at the water table. Assumed liquid hydrocarbon specific gravity is 0.75.

[3] Measured using an Eagle hydrocarbon vapour analyser with no methane response.

Notes:

1. ND - Non-detect
2. Elevations measured relative to TBM onsite.

Table 5. Soil Hydrocarbon Laboratory Analysis Results - UST Area

				Petroleum Hydrocarbon Fractions				BTEX			
Sample ID	Date Sampled	Depth (m)	Headspace (ppm)	F1	F2	F3	F4	Benzene	Toluene	Ethylbenzene	Xylenes
TH09-05	1/27/2009	2.30	250	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-06	1/27/2009	3.80	850	**370**	57	<10	<10	<0.0050	<0.020	**0.21**	0.21
TH09-07	1/27/2009	1.40	530	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-08-5	8/28/2009	3.81	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-08-7	8/28/2009	5.33	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-09-5	8/28/2009	3.81	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-09-7	8/28/2009	5.33	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-10-6	8/28/2009	4.57	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-10-7	8/28/2009	5.33	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-11-5	8/28/2009	3.81	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-11-7	8/28/2009	5.33	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-11-17 (duplicate of TH09-11-7)	8/28/2009	5.33	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-12-5	8/28/2009	3.81	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-12-7	8/28/2009	5.33	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-12-17 (duplicate of TH09-12-7)	8/28/2009	5.33	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-13-6	8/28/2009	4.57	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
TH09-13-7	8/28/2009	5.33	0	<12	<10	<10	<10	<0.0050	<0.020	<0.010	<0.040
CCME Canadian Soil Quality Guidelines for Subsoil											
Groundwater check (drinking water, human health)				-	-	-	-	**0.030**	**0.37**	**0.082**	**11**
Inhalation of Indoor Air (slab-on-grade)				-	-	-	-	0.032	1,500	670	170
Canada Wide Standard for Petroleum Hydrocarbons (PHC) in Subsoil											
Protection of Potable Groundwater				**240**	**320**	NA	NA	-	-	-	-
Vapour Inhalation (indoor, slab-on-grade)				320	1,700	NA	NA				
Protection of Groundwater for Aquatic Life				1,800	600	NA	NA				
Management Limit				700	1,000	**3,500**	**10,000**	-	-	-	-

[a] Canadian Council of Ministers of Environment (CCME) Commercial Land Use Soil Quality Guidelines (Updated 2007), Coarse Grained Soil.

[b] Canada Wide Standards (CWS) for Petroleum Hydrocarbons (PHC) in Soil (revised January 2008) - Commercial Land Use, Coarse Grained Soil.

Notes:

1. All results and soil quality guidelines in mg/kg.
2. NA - Not applicable.
3. NC - Not calculated.

XX	Applicable Soil Quality Guideline.
XX	Exceeds applicable Soil Quality Guideline.

Table 6. Groundwater Hydrocarbon Laboratory Analysis Results - UST Area

		Petroleum Hydrocarbon Fractions				BTEX			
Sample ID	Date Sampled	F1 (mg/L)	F2 (mg/L)	F3 (mg/L)	F4 (mg/L)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)
TH09-05 [1]	9/3/2009	<0.1	<0.1	<0.1	<0.1	<0.0004	<0.0004	<0.0004	<0.0008
TH08-5 (duplicate of TH09-05)	9/3/2009	<0.1	<0.1	<0.1	<0.1	<0.0004	<0.0004	<0.0004	<0.0008
TH09-08	9/3/2009	<0.1	<0.1	<0.1	<0.1	<0.0004	<0.0004	<0.0004	<0.0008
TH09-09	9/3/2009	<0.1	<0.1	<0.1	<0.1	<0.0004	<0.0004	<0.0004	<0.0008
TH09-11	9/3/2009	<0.1	<0.1	<0.1	<0.1	0.0006	<0.0004	<0.0004	<0.0008
Trip Blank	9/3/2009	<0.1	<0.1	<0.1	<0.1	<0.0004	<0.0004	<0.0004	<0.0008
CCME Canadian Environmental Quality Guidelines									
Community Water [a, b]		**NG**	**NG**	**NG**	**NG**	**0.005 [a]**	**≤0.024 [b]**	**≤0.0024 [b]**	**≤0.3 [b]**

[1] Groundwater sample was not collected during AECOM Phase I/II ESA completed in February 2009. Monitoring well was dry.

[a] Canadian Council of Ministers of Environment (CCME) Guidelines for Canadian Drinking Water Quality Summary Table, Maximum Allowable Concentration (May 2008).

[b] Canadian Council of Ministers of Environment (CCME) Guidelines for Canadian Drinking Water Quality Summary Table, Aesthetic Objective (May 2008).

Notes:

1. All results and groundwater quality guidelines in mg/L.
2. NG - No guideline.

≤

XX	Applicable guideline.
XX	Exceeds applicable guideline.

Table 7. Soil Field Duplicate Relative Percent Difference (RPD) Calculations - UST Area

Sample ID	Parameter	Laboratory RDL	Result (mg/kg)	Duplicate Sample ID	Parameter	Laboratory RDL	Result (mg/kg)	RPD (%)
TH09-11-7	F1	12	<12	TH09-11-17	F1	12	<12	NC
	F2	10	<10		F2	10	<10	NC
	F3	10	<10		F3	10	<10	NC
	F4	10	<10		F4	10	<10	NC
	Benzene	0.0050	<0.0050		Benzene	0.0050	<0.0050	NC
	Toluene	0.020	<0.020		Toluene	0.020	<0.020	NC
	Ethylbenzene	0.010	<0.010		Ethylbenzene	0.010	<0.010	NC
	Xylene	0.040	<0.040		Xylene	0.040	<0.040	NC
TH09-12-7	F1	12	<12	TH09-12-17	F1	12	<12	NC
	F2	10	<10		F2	10	<10	NC
	F3	10	<10		F3	10	<10	NC
	F4	10	<10		F4	10	<10	NC
	Benzene	0.0050	<0.0050		Benzene	0.0050	<0.0050	NC
	Toluene	0.020	<0.020		Toluene	0.020	<0.020	NC
	Ethylbenzene	0.010	<0.010		Ethylbenzene	0.010	<0.010	NC
	Xylene	0.040	<0.040		Xylene	0.040	<0.040	NC

Notes:
1. All results in mg/kg.
2. RDL - Reportable Detection Limit.
3. NC - Not Calculated (result < 5x the method detection limit).

XX Exceeds acceptable RPD value.

Table 8. Groundwater Field Duplicate Relative Percent Difference (RPD) Calculations - UST Area

Sample ID	Parameter	Laboratory RDL	Result (mg/L)	Duplicate Sample ID	Parameter	Laboratory RDL	Result (mg/L)	RPD (%)
TH09-05	F1	0.1	<0.1	TH08-05	F1	0.1	<0.1	NC
	F2	0.1	<0.1		F2	0.1	<0.1	NC
	F3	0.1	<0.1		F3	0.1	<0.1	NC
	F4	0.1	<0.1		F4	0.1	<0.1	NC
	Benzene	0.0004	<0.0004		Benzene	0.0004	<0.0004	NC
	Toluene	0.0004	<0.0004		Toluene	0.0004	<0.0004	NC
	Ethylbenzene	0.0004	<0.0004		Ethylbenzene	0.0004	<0.0004	NC
	Xylene	0.0008	<0.0008		Xylene	0.0008	<0.0008	NC

Notes:
1. All results in mg/L.
2. RDL - Reportable Detection Limit.
3. NC - Not Calculated (result < 5x the method detection limit).

XX Exceeds acceptable RPD value.

Appendix A

Phase III Environmental Site Assessment, Regina Research Farm (DFRP 13663) – Regina, Saskatchewan

- **Borehole Logs**

PROJECT: Phase III ESA Regina Research Farm (DFRP 13663)	CLIENT: PWGSC	TESTHOLE NO: TH09-08
LOCATION: UST Area, 5599002.0 m N, 104440.2 m E, Zone 13.		PROJECT NO.: 114177
CONTRACTOR: Earth Drilling	METHOD: Solid Stem Auger	ELEVATION (m): 587.63

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	SOIL DESCRIPTION	ELEVATION (m)
0	GRAVEL	
	CLAY-silty -olive grey -firm, moist -medium plasticity	587
1		
		586
2		
		585
3		
		584
4		
	CLAY-silty -light brown -soft, wet -medium plasticity	583
5		
		582
6	END OF TEST HOLE AT 6.10 m in SILTY CLAY Notes: 1) Monitoring well installed upon completion of test hole.	
		581
7		
		580
8		
		579
9		
		578
10		

SLOTTED PIEZOMETER | SOIL SYMBOL | SAMPLE TYPE | SAMPLE # | ⊗ Vapour Reading ⊗ (ppm) 10 100 1000 | COMMENTS

AECOM

LOGGED BY: Kris Plantz	COMPLETION DEPTH: 6.10 m
REVIEWED BY: Scott Chapman	COMPLETION DATE: 8/28/09
PROJECT ENGINEER: Scott Chapman	Page 1 of 1

ENVIRONMENTAL (VAPOUR ONLY) REGINA RESEARCH FARM (DFRP 13663).GPJ UMA.GDT 3/23/10

PROJECT: Phase III ESA Regina Research Farm (DFRP 13663)	CLIENT: PWGSC	TESTHOLE NO: TH09-09
LOCATION: UST Area, 5599007.9 m N, 104443.4 m E, Zone 13.		PROJECT NO.: 114177
CONTRACTOR: Earth Drilling	METHOD: Solid Stem Auger	ELEVATION (m): 582.72

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	SOIL DESCRIPTION	ELEVATION (m)
0	PEA GRAVEL	
	CLAY-some silt -olive grey -moist, firm -medium plasticity	582
1		
		581
2		
		580
3		
	-trace oxidized inclustions below 3.66 m	579
4		
	-light brown, wet and soft below 4.57 m	578
5		
		577
6	END OF TEST HOLE AT 6.10 m IN CLAY Notes: 1)Monitoring well installed upon completion of testhole.	
		576
7		
		575
8		
		574
9		
		573
10		

SLOTTED PIEZOMETER | SOIL SYMBOL | SAMPLE TYPE | SAMPLE # | ⊗ Vapour Reading ⊗ (ppm) 10 100 1000 | COMMENTS

AECOM

LOGGED BY: Kris Plantz	COMPLETION DEPTH: 6.10 m
REVIEWED BY: Scott Chapman	COMPLETION DATE: 8/28/09
PROJECT ENGINEER: Scott Chapman	Page 1 of 1

ENVIRONMENTAL (VAPOUR ONLY) REGINA RESEARCH FARM (DFRP 13663).GPJ UMA.GDT 3/23/10

PROJECT: Phase III ESA Regina Research Farm (DFRP 13663)	CLIENT: PWGSC	TESTHOLE NO: TH09-10
LOCATION: UST Area, 5599006.4 m N, 104445.6 m E, Zone 13.		PROJECT NO.: 114177
CONTRACTOR: Earth Drilling	METHOD: Solid Stem Auger	ELEVATION (m): 583.14

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Reading ⊗ (ppm) 10 100 1000	COMMENTS	ELEVATION (m)
0		SURFACE GRAVEL					583
		CLAY -grey staining -moist, firm to hard -medium plasticity				-no hydrocarbon staining below 0.61 m	
1							582
2							581
3							580
4							579
5		CLAY -light brown -soft, wet -medium plasticity					578
6		END OF TEST HOLE AT 6.10 m in CLAY Notes: 1)Test hole backfilled with bentonite upon completion of drilling.					577
7							576
8							575
9							574
10							

ENVIRONMENTAL (VAPOUR ONLY) REGINA RESEARCH FARM (DFRP 13663).GPJ UMA.GDT 3/23/10

AECOM

LOGGED BY: Kris Plantz	COMPLETION DEPTH: 6.10 m
REVIEWED BY: Scott Chapman	COMPLETION DATE: 8/28/09
PROJECT ENGINEER: Scott Chapman	Page 1 of 1

PROJECT: Phase III ESA Regina Research Farm (DFRP 13663)	CLIENT: PWGSC	TESTHOLE NO: TH09-11
LOCATION: UST Area, 5599004.8 m N, 104448.9 m E, Zone 13.		PROJECT NO.: 114177
CONTRACTOR: Earth Drilling	METHOD: Solid Stem Auger	ELEVATION (m): 583.35

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	SOIL DESCRIPTION	ELEVATION (m)
0	SURFACE GRAVEL	583
	CLAY -grey staining (no hydrocarbon odour) -moist, firm to hard -medium plasticity	
1	CLAY -olive grey -moist, firm to hard -medium plasticity	582
2		581
3		580
4		579
5	-light brown, soft and wet below 4.57 m	578
6	END OF TEST HOLE AT 6.10 m in CLAY Notes: 1)Monitoring well installed upon completion of test hole.	577
7		576
8		575
9		574
10		

SLOTTED PIEZOMETER | SOIL SYMBOL | SAMPLE TYPE | SAMPLE # | ⊗ Vapour Reading ⊗ (ppm) 10 100 1000 | COMMENTS

AECOM

LOGGED BY: Kris Plantz	COMPLETION DEPTH: 6.10 m
REVIEWED BY: Scott Chapman	COMPLETION DATE: 8/28/09
PROJECT ENGINEER: Scott Chapman	Page 1 of 1

ENVIRONMENTAL (VAPOUR ONLY) REGINA RESEARCH FARM (DFRP 13663).GPJ UMA.GDT 3/23/10

PROJECT: Phase III ESA Regina Research Farm (DFRP 13663)	CLIENT: PWGSC	TESTHOLE NO: TH09-12
LOCATION: UST Area, 5598998.072 m N, 104452.5 m E, Zone 13.		PROJECT NO.: 114177
CONTRACTOR: Earth Drilling	METHOD: Solid Stem Auger	ELEVATION (m): 583.12

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Reading ⊗ (ppm) 10 100 1000	COMMENTS	ELEVATION (m)
0		SURFACE GRAVEL					583
		CLAY -olive grey -moist, hard -medium plasticity					
1							582
2							581
3							580
4							579
		-brown, wet and soft below 4.57 m					
5							578
6		END OF TEST HOLE AT 6.10 m IN CLAY Notes: 1)Testhole backfilled with bentonite upon completion of drilling.					577
7							576
8							575
9							574
10							

AECOM

LOGGED BY: Kris Plantz	COMPLETION DEPTH: 6.10 m
REVIEWED BY: Scott Chapman	COMPLETION DATE: 8/28/09
PROJECT ENGINEER: Scott Chapman	Page 1 of 1

ENVIRONMENTAL (VAPOUR ONLY) REGINA RESEARCH FARM (DFRP 13663).GPJ UMA.GDT 3/23/10

PROJECT: Phase III ESA Regina Research Farm (DFRP 13663)	CLIENT: PWGSC	TESTHOLE NO: TH09-13
LOCATION: UST Area, 5599006.3 m N, 104439.7 m E, Zone 13.		PROJECT NO.: 114177
CONTRACTOR: Earth Drilling	METHOD: Solid Stem Auger	ELEVATION (m): 586.51

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ⊠ SPLIT SPOON ▤ BULK ⊘ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Reading ⊗ (ppm) 10 100 1000	COMMENTS	ELEVATION (m)
0		SURFACE GRAVEL					
		CLAY- some silt -olive grey -moist, firm -medium plasticity					586
1							
							585
2							
							584
3							
							583
4							
		-brown, wet and soft below 4.57 m					582
5							
							581
6		END OF TEST HOLE AT 6.10 m IN CLAY Notes: 1) Testhole backfilled with bentonite upon completion of drilling.					
							580
7							
							579
8							
							578
9							
							577
10							

AECOM

LOGGED BY: Kris Plantz	COMPLETION DEPTH: 6.10 m
REVIEWED BY: Scott Chapman	COMPLETION DATE: 8/28/09
PROJECT ENGINEER: Scott Chapman	Page 1 of 1

ENVIRONMENTAL (VAPOUR ONLY) REGINA RESEARCH FARM (DFRP 13663).GPJ UMA.GDT 3/23/10

Appendix B

Phase III Environmental Site Assessment, Regina Research Farm (DFRP 13663) – Regina, Saskatchewan

- GPS Survey Coordinates

Phase III ESA - AAFC Regina Research Farm (DFRP 13663)

2009 Survey Kris Plantz

2009 Wells & Test Holes			
Name	Grid Northing (m)	Grid Easting (m)	Elevation (m, asl)
TH09-05	5598997.299	104447.355	577.341
TH09-08	5599001.969	104440.208	587.627
TH09-09	5599007.922	104443.405	582.720
TH09-10	5599006.411	104445.610	583.136
TH09-11	5599004.802	104448.900	583.348
TH09-12	5598998.072	104452.460	583.123
TH09-13	5599006.280	104439.687	586.509

Appendix C

Phase III Environmental Site Assessment, Regina Research Farm (DFRP 13663) – Regina, Saskatchewan

- Laboratory Results

Your Project #: 114177-RG, AAFC-REGINA
Site: REGINA, SK
Your C.O.C. #: 109507, 109508

Attention: Scott Chapman
AECOM
99 Commerce Drive
WINNIPEG, MB
CANADA R3P 0Y7

Report Date: 2009/09/04

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A946739
Received: 2009/08/29, 10:00

Sample Matrix: Soil
Samples Received: 14

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS (MeOH extract)	14	2009/08/29	2009/09/02	CAL SOP-00190	EPA 8260C/CCME
CCME Hydrocarbons (F2-F4 in soil)	2	2009/08/29	2009/09/01	CAL SOP-00086	CCME PHC-CWS
CCME Hydrocarbons (F2-F4 in soil)	12	2009/08/29	2009/09/02	CAL SOP-00086	CCME PHC-CWS
Moisture	14	N/A	2009/09/04	CAL SOP-00023	McKeague MSSMA 2.411

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

LINSAY DAME, Project Manager Assistant
Email: Linsay.Dame@MaxxamAnalytics.com
Phone# (403) 291-3077

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

Total cover pages: 1

Maxxam Job #: A946739
Report Date: 2009/09/04

AECOM
Client Project #: 114177-RG, AAFC-REGINA
Site Reference: REGINA, SK
Sampler Initials: KP

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		Q49939	Q49943	Q49944	Q49945	Q49946		
Sampling Date		2009/08/28	2009/08/28	2009/08/28	2009/08/28	2009/08/28		
COC Number		109507	109507	109507	109507	109507		
	Units	**TH09-08-5**	**TH09-08-7**	**TH09-09-5**	**TH09-09-7**	**TH09-10-6**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	25	22	23	22	20	0.3	3395797

RDL = Reportable Detection Limit

Maxxam ID		Q49947	Q49948	Q49949	Q49950	Q49951		
Sampling Date		2009/08/28	2009/08/28	2009/08/28	2009/08/28	2009/08/28		
COC Number		109507	109507	109507	109507	109507		
	Units	**TH09-10-7**	**TH09-11-5**	**TH09-11-7**	**TH09-11-17**	**TH09-12-5**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	22	20	22	22	20	0.3	3395797

RDL = Reportable Detection Limit

Maxxam ID		Q49952	Q49953	Q49954	Q49955		
Sampling Date		2009/08/28	2009/08/28	2009/08/28	2009/08/28		
COC Number		109507	109507	109508	109508		
	Units	**TH09-12-7**	**TH09-12-17**	**TH09-13-6**	**TH09-13-7**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	23	22	20	22	0.3	3395797

RDL = Reportable Detection Limit

Maxxam Job #: A946739
Report Date: 2009/09/04

AECOM
Client Project #: 114177-RG, AAFC-REGINA
Site Reference: REGINA, SK
Sampler Initials: KP

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		Q49939	Q49943	Q49944	Q49945		
Sampling Date		2009/08/28	2009/08/28	2009/08/28	2009/08/28		
COC Number		109507	109507	109507	109507		
	Units	**TH09-08-5**	**TH09-08-7**	**TH09-09-5**	**TH09-09-7**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	3388464
F3 (C16-C34 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	3388464
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	3388464
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3388464
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	61	72	66	86	N/A	3388464

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		Q49946	Q49947	Q49948	Q49949		
Sampling Date		2009/08/28	2009/08/28	2009/08/28	2009/08/28		
COC Number		109507	109507	109507	109507		
	Units	**TH09-10-6**	**TH09-10-7**	**TH09-11-5**	**TH09-11-7**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	3388464
F3 (C16-C34 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	3388464
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	3388464
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3388464
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	73	79	71	81	N/A	3388464

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A946739
Report Date: 2009/09/04

AECOM
Client Project #: 114177-RG, AAFC-REGINA
Site Reference: REGINA, SK
Sampler Initials: KP

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		Q49950	Q49951	Q49952	Q49953		
Sampling Date		2009/08/28	2009/08/28	2009/08/28	2009/08/28		
COC Number		109507	109507	109507	109507		
	Units	**TH09-11-17**	**TH09-12-5**	**TH09-12-7**	**TH09-12-17**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	3388464
F3 (C16-C34 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	3388464
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	3388464
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3388464
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	80	76	75	73	N/A	3388464

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		Q49954	Q49955		
Sampling Date		2009/08/28	2009/08/28		
COC Number		109508	109508		
	Units	**TH09-13-6**	**TH09-13-7**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon					
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	10	3388464
F3 (C16-C34 Hydrocarbons)	mg/kg	<10	<10	10	3388464
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	10	3388464
Reached Baseline at C50	mg/kg	Yes	Yes	N/A	3388464
Surrogate Recovery (%)					
O-TERPHENYL (sur.)	%	70	70	N/A	3388464

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A946739
Report Date: 2009/09/04

AECOM
Client Project #: 114177-RG, AAFC-REGINA
Site Reference: REGINA, SK
Sampler Initials: KP

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		Q49939	Q49943	Q49944	Q49945		
Sampling Date		2009/08/28	2009/08/28	2009/08/28	2009/08/28		
COC Number		109507	109507	109507	109507		
	Units	**TH09-08-5**	**TH09-08-7**	**TH09-09-5**	**TH09-09-7**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3383934
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3383934
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3383934
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3383934
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3383934
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3383934
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	3383934
(C6-C10)	mg/kg	<12	<12	<12	<12	12	3383934
Surrogate Recovery (%)							
4-BROMOFLUOROBENZENE (sur.)	%	92	94	92	91	N/A	3383934
D10-ETHYLBENZENE (sur.)	%	82	87	86	87	N/A	3383934
D4-1,2-DICHLOROETHANE (sur.)	%	86	87	90	87	N/A	3383934
D8-TOLUENE (sur.)	%	105	108	103	106	N/A	3383934

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A946739
Report Date: 2009/09/04

AECOM
Client Project #: 114177-RG, AAFC-REGINA
Site Reference: REGINA, SK
Sampler Initials: KP

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		Q49946	Q49947	Q49948	Q49949		
Sampling Date		2009/08/28	2009/08/28	2009/08/28	2009/08/28		
COC Number		109507	109507	109507	109507		
	Units	**TH09-10-6**	**TH09-10-7**	**TH09-11-5**	**TH09-11-7**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3383934
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3383934
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3383934
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3383934
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3383934
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3383934
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	3383934
(C6-C10)	mg/kg	<12	<12	<12	<12	12	3383934
Surrogate Recovery (%)							
4-BROMOFLUOROBENZENE (sur.)	%	92	94	91	90	N/A	3383934
D10-ETHYLBENZENE (sur.)	%	91	90	81	83	N/A	3383934
D4-1,2-DICHLOROETHANE (sur.)	%	88	89	86	87	N/A	3383934
D8-TOLUENE (sur.)	%	104	107	106	105	N/A	3383934

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A946739
Report Date: 2009/09/04

AECOM
Client Project #: 114177-RG, AAFC-REGINA
Site Reference: REGINA, SK
Sampler Initials: KP

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		Q49950	Q49951	Q49952	Q49953		
Sampling Date		2009/08/28	2009/08/28	2009/08/28	2009/08/28		
COC Number		109507	109507	109507	109507		
	Units	**TH09-11-17**	**TH09-12-5**	**TH09-12-7**	**TH09-12-17**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3383934
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3383934
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3383934
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3383934
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3383934
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3383934
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	3383934
(C6-C10)	mg/kg	<12	<12	<12	<12	12	3383934
Surrogate Recovery (%)							
4-BROMOFLUOROBENZENE (sur.)	%	93	92	92	93	N/A	3383934
D10-ETHYLBENZENE (sur.)	%	85	89	88	91	N/A	3383934
D4-1,2-DICHLOROETHANE (sur.)	%	90	88	90	91	N/A	3383934
D8-TOLUENE (sur.)	%	107	103	105	106	N/A	3383934

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A946739
Report Date: 2009/09/04

AECOM
Client Project #: 114177-RG, AAFC-REGINA
Site Reference: REGINA, SK
Sampler Initials: KP

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		Q49954	Q49955		
Sampling Date		2009/08/28	2009/08/28		
COC Number		109508	109508		
	Units	**TH09-13-6**	**TH09-13-7**	**RDL**	**QC Batch**
Volatiles					
Benzene	mg/kg	<0.0050	<0.0050	0.0050	3383934
Toluene	mg/kg	<0.020	<0.020	0.020	3383934
Ethylbenzene	mg/kg	<0.010	<0.010	0.010	3383934
Xylenes (Total)	mg/kg	<0.040	<0.040	0.040	3383934
m & p-Xylene	mg/kg	<0.040	<0.040	0.040	3383934
o-Xylene	mg/kg	<0.020	<0.020	0.020	3383934
F1 (C6-C10) - BTEX	mg/kg	<12	<12	12	3383934
(C6-C10)	mg/kg	<12	<12	12	3383934
Surrogate Recovery (%)					
4-BROMOFLUOROBENZENE (sur.)	%	91	89	N/A	3383934
D10-ETHYLBENZENE (sur.)	%	90	88	N/A	3383934
D4-1,2-DICHLOROETHANE (sur.)	%	88	87	N/A	3383934
D8-TOLUENE (sur.)	%	106	104	N/A	3383934

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A946739
Report Date: 2009/09/04

AECOM
Client Project #: 114177-RG, AAFC-REGINA
Site Reference: REGINA, SK
Sampler Initials: KP

General Comments

Results relate only to the items tested.

AECOM
Attention: Scott Chapman
Client Project #: 114177-RG, AAFC-REGINA
P.O. #:
Site Reference: REGINA, SK

Quality Assurance Report

Maxxam Job Number: CA946739

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3383934 KB7	Matrix Spike	4-BROMOFLUOROBENZENE (sur.)	2009/09/02		87	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2009/09/02		88	%	30 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2009/09/02		88	%	60 - 140
		D8-TOLUENE (sur.)	2009/09/02		101	%	60 - 140
		Benzene	2009/09/02		110	%	60 - 140
		Toluene	2009/09/02		110	%	60 - 140
		Ethylbenzene	2009/09/02		104	%	60 - 140
		m & p-Xylene	2009/09/02		106	%	60 - 140
		o-Xylene	2009/09/02		104	%	60 - 140
		(C6-C10)	2009/09/02		92	%	60 - 140
	Spiked Blank	4-BROMOFLUOROBENZENE (sur.)	2009/09/02		83	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2009/09/02		100	%	30 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2009/09/02		83	%	60 - 140
		D8-TOLUENE (sur.)	2009/09/02		108	%	60 - 140
		Benzene	2009/09/02		104	%	60 - 140
		Toluene	2009/09/02		107	%	60 - 140
		Ethylbenzene	2009/09/02		103	%	60 - 140
		m & p-Xylene	2009/09/02		104	%	60 - 140
		o-Xylene	2009/09/02		100	%	60 - 140
		(C6-C10)	2009/09/02		91	%	60 - 140
	Method Blank	4-BROMOFLUOROBENZENE (sur.)	2009/09/02		93	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2009/09/02		112	%	30 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2009/09/02		87	%	60 - 140
		D8-TOLUENE (sur.)	2009/09/02		113	%	60 - 140
		Benzene	2009/09/02	<0.0050		mg/kg	
		Toluene	2009/09/02	<0.020		mg/kg	
		Ethylbenzene	2009/09/02	<0.010		mg/kg	
		Xylenes (Total)	2009/09/02	<0.040		mg/kg	
		m & p-Xylene	2009/09/02	<0.040		mg/kg	
		o-Xylene	2009/09/02	<0.020		mg/kg	
		F1 (C6-C10) - BTEX	2009/09/02	<12		mg/kg	
		(C6-C10)	2009/09/02	<12		mg/kg	
	RPD	Benzene	2009/09/02	NC		%	50
		Toluene	2009/09/02	NC		%	50
		Ethylbenzene	2009/09/02	NC		%	50
		Xylenes (Total)	2009/09/02	NC		%	50
		m & p-Xylene	2009/09/02	NC		%	50
		o-Xylene	2009/09/02	NC		%	50
		F1 (C6-C10) - BTEX	2009/09/02	NC		%	50
		(C6-C10)	2009/09/02	NC		%	50
3388464 LSH	Matrix Spike	O-TERPHENYL (sur.)	2009/09/01		76	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2009/09/01		81	%	50 - 130
		F3 (C16-C34 Hydrocarbons)	2009/09/01		73	%	50 - 130
		F4 (C34-C50 Hydrocarbons)	2009/09/01		74	%	50 - 130
	Spiked Blank	O-TERPHENYL (sur.)	2009/09/01		74	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2009/09/01		99	%	80 - 120
		F3 (C16-C34 Hydrocarbons)	2009/09/01		95	%	80 - 120
		F4 (C34-C50 Hydrocarbons)	2009/09/01		80	%	80 - 120
	Method Blank	O-TERPHENYL (sur.)	2009/09/01		83	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2009/09/01	<10		mg/kg	
		F3 (C16-C34 Hydrocarbons)	2009/09/01	<10		mg/kg	
		F4 (C34-C50 Hydrocarbons)	2009/09/01	<10		mg/kg	
	RPD	F2 (C10-C16 Hydrocarbons)	2009/09/01	NC		%	50
		F3 (C16-C34 Hydrocarbons)	2009/09/01	NC		%	50
		F4 (C34-C50 Hydrocarbons)	2009/09/01	NC		%	50

AECOM
Attention: Scott Chapman
Client Project #: 114177-RG, AAFC-REGINA
P.O. #:
Site Reference: REGINA, SK

Quality Assurance Report (Continued)

Maxxam Job Number: CA946739

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3395797	FV	RPD [Q49939-01]	Moisture	2009/09/04	0.4		%	20
		RPD [Q49950-01]	Moisture	2009/09/04	2.3		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Maxxam Analytics

Calgary: 4000 19st St. NE, T2E 6P8 | Ph: (403) 291-3077 | Fax: (403) 735-2240 | Toll free: (800) 386-7247
Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889
www.maxxamanalytics.com

109507 **CHAIN OF CUSTODY**

Page: 1 of 1

Invoice To: Require Report? Yes ☑ No ☐

Company Name: #11233 AECOM
Contact Name: SCOTT CHAPMAN
Address: 99 COMMERCE DRIVE WINNIPEG
Prov: MB PC: R3P 0Y3
Contact #s: Ph: 204 928-8471 Fax: 204 284-2040

Report To:

SAME

Prov: PC:
Ph: Fax:

PO # / AFE #:
Quotation #: A90550
Project #: 114177-RG
Project Name: AAFC - REGINA
Location: REGINA, SK
Sampler's Initials: KP

DETECTION LIMIT REQUIREMENTS:

Check the applicable criterion and indicate land use

☐ AT1 _____
☑ CCME _____
☐ OTHER _____

REPORT DISTRIBUTION:

EMAIL ADDRESS(S):
SCOTT.CHAPMAN@AECOM.COM

SERVICE REQUESTED:

☐ **RUSH** (Please ensure you contact the lab to reserve)
Date Required: _____
☑ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back): BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	☐ Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	WATERS (footnotes defined on back): ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3]: Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	TH09-08-5	SOIL	09/08/28	X																2
2	TH09-08-7			X																2
3	TH09-09-5			X																2
4	TH09-09-7			X																2
5	TH09-10-6			X																2
6	TH09-10-7			X																2
7	TH09-11-5			X																2
8	TH09-11-7			X																2
9	TH09-11-17			X																2
10	TH09-12-5			X																2
11	TH09-12-7			X																2
12	TH09-12-17			X																2

RECEIVED
AUG 29 2009
AN7 10:00

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #: CA9467 39

Relinquished By: KRIS PLANTZ Date/Time: AUG 28/09 14:30
Sign and Print: _____

COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By	Temperature			Ice
	2009.08.28 2:15pm	2	3	2	✓
	CUSTODY SEAL YES / (NO)				

Maxxam Analytics

Calgary: 4000 19st St. NE, T2E 6P8 | Ph: (403) 291-3077 | Fax: (403) 735-2240 | Toll free: (800) 386-7247
Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889
www.maxxamanalytics.com

109508 **CHAIN OF CUSTODY**

Page: 1 of 1

Invoice To: Require Report? Yes ☑ No ☐

Company Name: #11233 AECOM
Contact Name: SCOTT CHAPMAN
Address: 99 COMMERCE DRIVE WINNIPEG
Prov: MB PC:
Contact #s: Ph: 204 928-8471 Fax: 204 284-2040

Report To:

SAME

Prov: PC:
Ph: Fax:

PO # / AFE #:
Quotation #: AQ0550
Project #: 114177-RG
Project Name: AAFC-REGINA
Location: REGINA, SK
Sampler's Initials: KP

DETECTION LIMIT REQUIREMENTS:
Check the applicable criterion and indicate land use
☐ AT1 _____
☑ CCME _____
☐ OTHER _____

REPORT DISTRIBUTION:
EMAIL ADDRESS(S):
SCOTT.CHAPMAN@AECOM.COM

SERVICE REQUESTED:
☐ RUSH (Please ensure you contact the lab to reserve)
Date Required: _____
☑ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back): BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	☐ Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	WATERS (footnotes defined on back): ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3]: Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	TH09-13-6	SOIL	09/08/28	X																	2
2	TH09-13-7			X																	2
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

RECEIVED
AUG 29 2009
AN7 10:00

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #: CA9467J9

Relinquished By: KRIS KLANTZ Date/Time: AUG 28/09 14:30
Sign and Print: _____
COMMENTS/SPECIAL INSTRUCTIONS:

JARS USED & NOT SUBMITTED

Received By: [signature]
2009.08.28 2:15pm
CUSTODY SEAL YES / NO

Temperature			Ice
2	3	2	✓

Your Project #: 114177 REGINA AAFC
Your C.O.C. #: 70924

Attention: Scott Chapman
AECOM
NEW Building
99 Commerce Drive
Winnipeg, MB
CANADA R3P 0Y7

Report Date: 2009/09/09

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A948409
Received: 2009/09/04, 8:40

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS	6	N/A	2009/09/06	CAL SOP-00190	EPA 8260 C / CCME
CCME Hydrocarbons (F2-F4 in water)	6	2009/09/05	2009/09/06	CAL SOP-00087	CCME PHC-CWS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

LINSAY DAME, Project Manager Assistant
Email: Linsay.Dame@MaxxamAnalytics.com
Phone# (403) 291-3077

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

Total cover pages: 1

Maxxam Job #: A948409
Report Date: 2009/09/09

AECOM
Client Project #: 114177 REGINA AAFC

Sampler Initials: KP

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		Q60577	Q60586	Q60587		
Sampling Date		2009/09/03 09:00	2009/09/03 09:15	2009/09/03 09:30		
COC Number		70924	70924	70924		
	Units	**TH 09-05**	**TH 08-5**	**TH 09-08**	**RDL**	**QC Batch**
Extractable Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	mg/L	<0.1	<0.1	<0.1	0.1	3398076
F3 (C16-C34 Hydrocarbons)	mg/L	<0.1	<0.1	<0.1	0.1	3398076
F4 (C34-C50 Hydrocarbons)	mg/L	<0.1	<0.1	<0.1	0.1	3398076
Reached Baseline at C50	mg/L	Yes	Yes	Yes	N/A	3398076
Surrogate Recovery (%)						
O-TERPHENYL (sur.)	%	93	92	99	N/A	3398076

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		Q60588	Q60589	Q60590		
Sampling Date		2009/09/03 09:45	2009/09/03 10:00			
COC Number		70924	70924	70924		
	Units	**TH 09-09**	**TH 09-11**	**TRIP BLANK**	**RDL**	**QC Batch**
Extractable Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	mg/L	<0.1	<0.1	<0.1	0.1	3398076
F3 (C16-C34 Hydrocarbons)	mg/L	<0.1	<0.1	<0.1	0.1	3398076
F4 (C34-C50 Hydrocarbons)	mg/L	<0.1	<0.1	<0.1	0.1	3398076
Reached Baseline at C50	mg/L	Yes	Yes	Yes	N/A	3398076
Surrogate Recovery (%)						
O-TERPHENYL (sur.)	%	109	105	103	N/A	3398076

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A948409
Report Date: 2009/09/09

AECOM
Client Project #: 114177 REGINA AAFC

Sampler Initials: KP

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		Q60577	Q60586	Q60587		
Sampling Date		2009/09/03 09:00	2009/09/03 09:15	2009/09/03 09:30		
COC Number		70924	70924	70924		
	Units	**TH 09-05**	**TH 08-5**	**TH 09-08**	**RDL**	**QC Batch**
Volatiles						
Benzene	ug/L	<0.4	<0.4	<0.4	0.4	3399121
Toluene	ug/L	<0.4	<0.4	<0.4	0.4	3399121
Ethylbenzene	ug/L	<0.4	<0.4	<0.4	0.4	3399121
o-Xylene	ug/L	<0.4	<0.4	<0.4	0.4	3399121
m & p-Xylene	ug/L	<0.8	<0.8	<0.8	0.8	3399121
Xylenes (Total)	ug/L	<0.8	<0.8	<0.8	0.8	3399121
F1 (C6-C10) - BTEX	ug/L	<100	<100	<100	100	3399121
(C6-C10)	ug/L	<100	<100	<100	100	3399121
Surrogate Recovery (%)						
4-BROMOFLUOROBENZENE (sur.)	%	95	94	93	N/A	3399121
D4-1,2-DICHLOROETHANE (sur.)	%	85	86	86	N/A	3399121
D8-TOLUENE (sur.)	%	99	99	100	N/A	3399121

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A948409
Report Date: 2009/09/09

AECOM
Client Project #: 114177 REGINA AAFC

Sampler Initials: KP

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		Q60588	Q60589	Q60590		
Sampling Date		2009/09/03 09:45	2009/09/03 10:00			
COC Number		70924	70924	70924		
	Units	**TH 09-09**	**TH 09-11**	**TRIP BLANK**	**RDL**	**QC Batch**
Volatiles						
Benzene	ug/L	<0.4	0.6	<0.4	0.4	3399121
Toluene	ug/L	<0.4	<0.4	<0.4	0.4	3399121
Ethylbenzene	ug/L	<0.4	<0.4	<0.4	0.4	3399121
o-Xylene	ug/L	<0.4	<0.4	<0.4	0.4	3399121
m & p-Xylene	ug/L	<0.8	<0.8	<0.8	0.8	3399121
Xylenes (Total)	ug/L	<0.8	<0.8	<0.8	0.8	3399121
F1 (C6-C10) - BTEX	ug/L	<100	<100	<100	100	3399121
(C6-C10)	ug/L	<100	<100	<100	100	3399121
Surrogate Recovery (%)						
4-BROMOFLUOROBENZENE (sur.)	%	94	93	93	N/A	3399121
D4-1,2-DICHLOROETHANE (sur.)	%	85	85	84	N/A	3399121
D8-TOLUENE (sur.)	%	100	99	99	N/A	3399121

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A948409
Report Date: 2009/09/09

AECOM
Client Project #: 114177 REGINA AAFC

Sampler Initials: KP

General Comments

Results relate only to the items tested.

AECOM
Attention: Scott Chapman
Client Project #: 114177 REGINA AAFC
P.O. #:
Site Reference:

Quality Assurance Report

Maxxam Job Number: CA948409

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3398076	LSH	Matrix Spike	F2 (C10-C16 Hydrocarbons)	2009/09/06		90	%	70 - 130
			F3 (C16-C34 Hydrocarbons)	2009/09/06		93	%	70 - 130
			F4 (C34-C50 Hydrocarbons)	2009/09/06		117	%	70 - 130
			O-TERPHENYL (sur.)	2009/09/06		95	%	50 - 130
		Spiked Blank	F2 (C10-C16 Hydrocarbons)	2009/09/06		102	%	70 - 130
			F3 (C16-C34 Hydrocarbons)	2009/09/06		95	%	70 - 130
			F4 (C34-C50 Hydrocarbons)	2009/09/06		128	%	70 - 130
			O-TERPHENYL (sur.)	2009/09/06		112	%	50 - 130
		Method Blank	F2 (C10-C16 Hydrocarbons)	2009/09/06	<0.1		mg/L	
			F3 (C16-C34 Hydrocarbons)	2009/09/06	<0.1		mg/L	
			F4 (C34-C50 Hydrocarbons)	2009/09/06	<0.1		mg/L	
			O-TERPHENYL (sur.)	2009/09/06		107	%	50 - 130
		RPD	F2 (C10-C16 Hydrocarbons)	2009/09/06	NC		%	40
			F3 (C16-C34 Hydrocarbons)	2009/09/06	NC		%	40
			F4 (C34-C50 Hydrocarbons)	2009/09/06	NC		%	40
3399121	DV1	Matrix Spike	4-BROMOFLUOROBENZENE (sur.)	2009/09/05		101	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/09/05		83	%	70 - 130
			D8-TOLUENE (sur.)	2009/09/05		103	%	70 - 130
			Benzene	2009/09/05		NC	%	70 - 130
			Toluene	2009/09/05		83	%	70 - 130
			Ethylbenzene	2009/09/05		88	%	70 - 130
			o-Xylene	2009/09/05		86	%	70 - 130
			m & p-Xylene	2009/09/05		103	%	70 - 130
		Spiked Blank	4-BROMOFLUOROBENZENE (sur.)	2009/09/05		101	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/09/05		85	%	70 - 130
			D8-TOLUENE (sur.)	2009/09/05		102	%	70 - 130
			Benzene	2009/09/05		84	%	70 - 130
			Toluene	2009/09/05		94	%	70 - 130
			Ethylbenzene	2009/09/05		99	%	70 - 130
			o-Xylene	2009/09/05		99	%	70 - 130
			m & p-Xylene	2009/09/05		117	%	70 - 130
			(C6-C10)	2009/09/05		88	%	70 - 130
		Method Blank	4-BROMOFLUOROBENZENE (sur.)	2009/09/05		95	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/09/05		86	%	70 - 130
			D8-TOLUENE (sur.)	2009/09/05		101	%	70 - 130
			Benzene	2009/09/05	<0.4		ug/L	
			Toluene	2009/09/05	<0.4		ug/L	
			Ethylbenzene	2009/09/05	<0.4		ug/L	
			o-Xylene	2009/09/05	<0.4		ug/L	
			m & p-Xylene	2009/09/05	<0.8		ug/L	
			Xylenes (Total)	2009/09/05	<0.8		ug/L	
			F1 (C6-C10) - BTEX	2009/09/05	<100		ug/L	
			(C6-C10)	2009/09/05	<100		ug/L	
		RPD	Benzene	2009/09/05	1.6		%	40
			Toluene	2009/09/05	NC		%	40
			Ethylbenzene	2009/09/05	NC		%	40
			o-Xylene	2009/09/05	NC		%	40
			m & p-Xylene	2009/09/05	NC		%	40
			Xylenes (Total)	2009/09/05	NC		%	40
			F1 (C6-C10) - BTEX	2009/09/05	NC		%	40
			(C6-C10)	2009/09/05	NC		%	40

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

AECOM
Attention: Scott Chapman
Client Project #: 114177 REGINA AAFC
P.O. #:
Site Reference:

Quality Assurance Report (Continued)

Maxxam Job Number: CA948409

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Maxxam Analytics

Maxxam Analytics International Corporation o/a Maxxam Analytics
2021 41 ave N.E, Calgary, Alberta Canada T2E 6P2 Tel:(403) 291-3077 Toll-free:800-653-6266 Fax:(905) 817-5779 www.maxxamanalytics.com

CHAIN OF CUSTODY RECORD

CA7482W7

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#11233 AECOM	Company Name:	#6914 AECOM	Quotation #:	A90550	MAXXAM JOB #:	BOTTLE ORDER #: 70924
Contact Name:	Scott Chapman	Contact Name:	Kris Plantz	P.O. #:			
Address:	99 Commerce Drive WINNIPEG MB R3P 0Y7	Address:	99 Commerce Drive Winnipeg MB R3P 0Y7	Project #:	114177	CHAIN OF CUSTODY #: C#70924-01-01	PROJECT MANAGER: LINSAY DAME
Phone:	(204)928-8471 Fax: (204)284-2040	Phone:	(204) -4775 x381 Fax: (204)284-2040	Project Name:	REGINA AAFC		
Email:	scott.chapman@aecom.com	Email:	~~kris.plantz@aecom.com~~; scott.chapman@aecom.	Site Location:	REGINA AAFC		
				Sampled By:	KP		

REGULATORY CRITERIA:

SPECIAL INSTRUCTIONS

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

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

ANALYSIS REQUESTED (Please be specific):

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: _____ Time Required: _____ ☐
Rush Confirmation Number: _____ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	Regulated Metals (CCME/AT1) - Dissolved	~~AT1 BTEX and F1-F2~~ BTEX, F1-F4	Mercury - Low Level (Dissolved)	# of Bottles	Comments
1		TH09-05	SEPT 3/09	9:00	GW				X		5	
2		TH08-5		9:15					X		5	
3		TH09-08		9:30					X		5	
4		TH09-09		9:45					X		5	
5		TH09-11		10:00					X		5	
6		TRIP BLANK							X		5	
7												
8												
9												
10												

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted
KRIS PLANTZ	09/09/03	12:45		09/09/03	1250pm	

RECEIVED SEP 9 2003

Laboratory Use Only

Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
☐	MKI 8:40 5.3.4 / 7.2.2 / 4.6.6	☐ Yes ☐ No

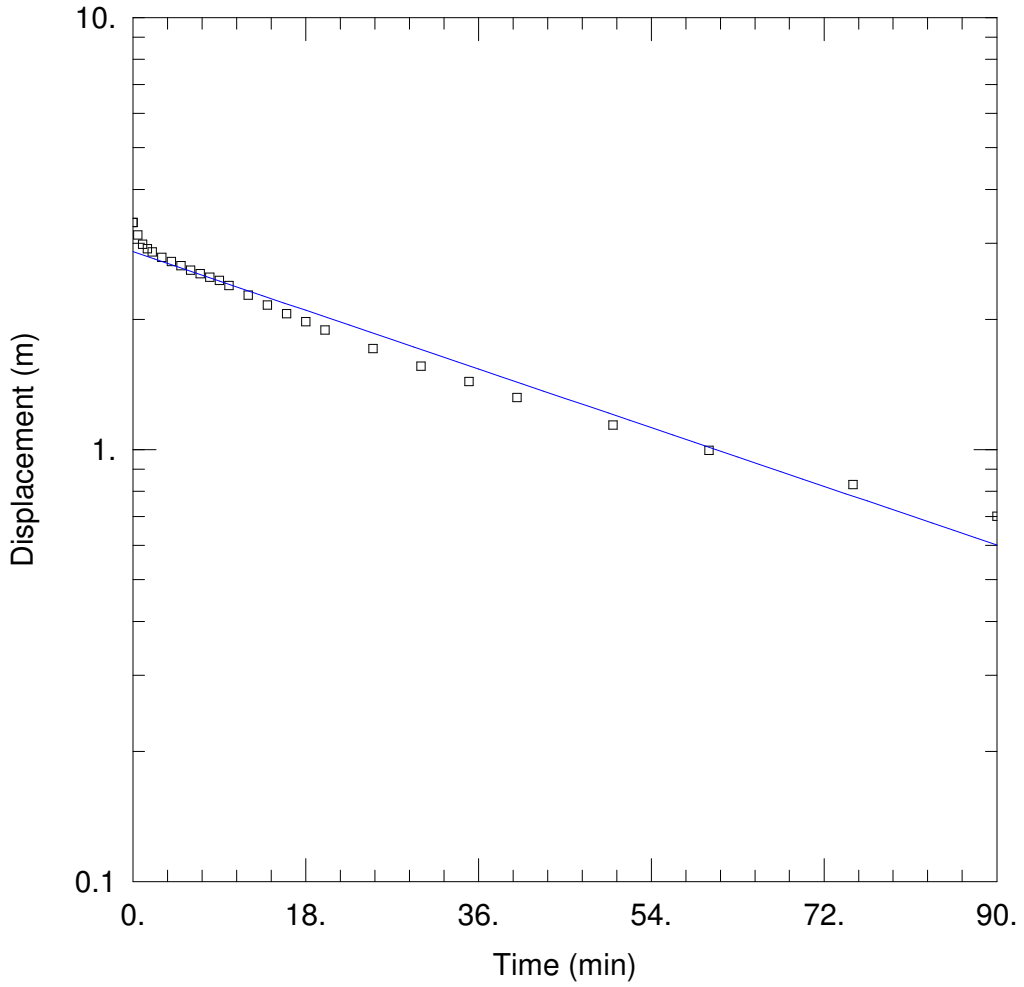
*IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

Appendix D

Phase III Environmental Site Assessment, Regina Research Farm (DFRP 13663) – Regina, Saskatchewan

- Hydraulic Conductivity Test



K-TEST

Data Set: C:\...\114177 Regina.aqt
Date: 10/26/09 Time: 14:51:57

PROJECT INFORMATION

Company: AECOM (Canada) Ltd.
Client: PWGSC
Project: 114177
Test Location: Regina
Test Well: MW09-8
Test Date: September 3, 2009

AQUIFER DATA

Saturated Thickness: 3.575 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW09-8)

Initial Displacement: 3.355 m
Wellbore Radius: 0.0375 m
Screen Length: 3.048 m
Gravel Pack Porosity: 0.3
Casing Radius: 0.025 m
Well Skin Radius: 0.0625 m
Total Well Penetration Depth: 3.575 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.034E-07 m/sec
y0 = 2.871 m

Appendix E

Phase III Environmental Site Assessment, Regina Research Farm (DFRP 13663) – Regina, Saskatchewan

- NCSCS Scoring

CCME National Classification System for Contaminated Sites (2008)
Summary of Site Conditions

Subject Site:	**Regina Research Farm - Two USTs Located South of the Manitenance Building and Garage**	
Civic Address: *(or other description of location)*	AAFC - Regina, Saskatchewan (DFRP 13663)	
Site Common Name : *(if applicable)*	Regina Research Farm	
Site Owner or Custodian: *(Organization and Contact Person)*	Agriculture and Agri-Food Canada (AAFC) DFRP 13663	
Legal description *or* metes and bounds:		
Approximate Site area:	2,000 m^2	
PID(s) : *(or Parcel Identification Numbers [PIN] if untitled Crown land)*		
Centre of site: *(provide latitude/longitude or UTM coordinates)*	Latitude: Longitude:	50.409540 degrees _____ min _____ secs -104.568437 degrees _____ min _____ secs
	UTM Coordinate:	Northing 5584256.0 Easting 530665.0
Site Land Use:	Current:	Commercial
	Proposed:	Commercial
Site Plan	See main report.	
Provide a brief description of the Site:	Two USTs located south of the Maintenance Building and Garage. Area includes concrete pad over USTs and fuel pump island.	
Affected media and Contaminants of Potential Concern (COPC):	Ethylbenzene and PHC F1 exceeds CCME commercial criteria in soil.	

Please fill in the "letter" that best describes the level of information available for the site being assessed:

Site Letter Grade **C**

If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

Scoring Completed By:	**Scott Chapman**
Date Scoring Completed:	**25-Nov-09**

CCME National Classification System (2008)

(I) Contaminant Characteristics

Regina Research Farm - Two USTs Located South of the Manitenance Building and Garage

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
1. Residency Media (replaces physical state)				
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? **yes** = has an exceedance or strongly suspected to have an exceedance **no** = does not have an exceedance or strongly suspected not to have an exceedance			The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline). Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at http://www.ccme.ca/publications/cegg_rcge.html?category_id=124. For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guide-res_recom/index_e.html.	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	Yes	Hydrocarbon contamination (ethylbenzene and PHC Fraction F1) exceeding the applicable commerical criteria was detected in soil.		
Yes / No / Do Not Know				
B. Groundwater	No			
Yes / No / Do Not Know				
C. Surface water	No			
Yes / No / Do Not Know				
D. Sediment	No			
Yes / No / Do Not Know				
"Known" -score	2			
"Potential" - score	---			
2. Chemical Hazard				
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?	High		The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site. The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file. *See Attached Reference Material for Contaminant Hazard Rankings.*	Hazard as defined in the revised NCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
High / Medium / Low / Do Not Know				
"Known" -score	8			
"Potential" - score	---	PHC Fraction F1 is a high degree chemical hazard. Ethylbenzene is a medium degree chemical hazard.		
3. Contaminant Exceedence Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?	Low (1x to 10x)		Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the *most conservative media-specific and land-use appropriate CCME* environmental quality guidelines. **Ranking should be based on contaminant with greatest exceedance of CCME guidelines.** Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines Mobile NAPL = Contaminant is a non-aqueous phase liquid (i.e., due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (i.e., greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Other standards may include local background concentration or published toxicity benchmarks. Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria. Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (i.e., CEF=>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
Mobile NAPL / High (>100x) / Medium (10x to 100x) / Low (1x to 10x) / Do Not Know				
"Known" -score	2			
"Potential" - score	---			
		Concentration of ethlylbenzene in the soil sample was 0.21 mg/kg. Criteria is 0.082 mg/kg; therefore <10 x criteria.		

CCME National Classification System (2008)

(I) Contaminant Characteristics

Regina Research Farm - Two USTs Located South of the Manitenance Building and Garage

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
4. Contaminant Quantity (known or strongly suspected)				
What is the known or strongly suspected quantity of all contaminants? >10 hectare (ha) or 5000 m^3 2 to 10 ha or 1000 to 5000 m^3 <2 ha or 1000 m^3 Do Not Know	<2 ha or 1000 m3	**Soil:** The area of contamination has been horizontally delineated. The estimated volume of contamination is 390 m^3.	Measure or estimate the area or quantity of total contamination (i.e, all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.
"Known" -score	2			
"Potential" - score	---			
5. Modifying Factors				
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment? Yes No Do Not Know	No	Hydrocarbons are not considered persistent chemicals.	Persistent chemicals, e.g., PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics: (a) in air, (i) its half-life is equal to or greater than 2 days, or (ii) it is subject to atmospheric transport from its source to a remote area; (b) in water, its half-life is equal to or greater than 182 days; (c) in sediments, its half-life is equal to or greater than 365 days; or (d) in soil, its half-life is equal to or greater than 182 days. This list does not include metals or metalloids, which in their elemental form do not degrade. However metals and metalloids form chemical species in the environment, many of which are not readily bioavailable.	*Examples of Persistent Substances are provided in attached Reference Materials*
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location? Yes No Do Not Know	Yes	Yes, hydrocarbons can damage underground utilities. Utilities are present in the area.		Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.
How many different contaminant classes have representative CCME guideline exceedances? one two to four five or more Do Not Know	one	One class only for ethylbenzene, PHC F1	For the purposes of the revised NCS ranking system, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, PAHs, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	*Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.*
"Known" - Score	2			
"Potential" - Score	---			

Contaminant Characteristic Total

Raw Total Scores- "Known"	16
Raw Total Scores- "Potential"	0
Raw Combined Total Scores	16
Total Score (Raw Combined / 40 * 33)	**13.2**

CCME National Classification System (2008)

(II) Migration Potential (Evaluation of contaminant migration pathways)

Regina Research Farm - Two USTs Located South of the Manitenance Building and Garage

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation
1. Groundwater Movement			
A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.			
i) For **potable groundwater environments**, 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For **non-potable environments** (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the applicable non potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.	12	Groundwater in the vicinity to the site is used for drinking water. No exceedances of the Drinking Water Criteria.	Review chemical data and evaluate groundwater quality. The evaluation method concentrates on 1) a potable or non-potable groundwater environment; 2) the groundwater flow system and its potential to be an exposure pathway to known or potential receptors An aquifer is defined as a geologic unit that yields groundwater in usable quantities and drinking water quality. The aquifer can currently be used as a potable water supply or could have the potential for use in the future. Non-potable groundwater environments are defined as areas that are serviced with a reliable alternative water supply (most commonly provided in urban areas). The evaluation of a non-potable environment will be based on a site specific basis. Physical evidence includes significant sheens, liquid phase contamination, or contaminant saturated soils. Seeps and springs are considered part of the groundwater pathway. In Arctic environments, the potability and evaluation of the seasonal active layer (above the permafrost) as a groundwater exposure pathway will be considered on a site-specific basis.
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	9		
iii) Meets GCDWQ for **potable environments**; meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for **non-potable environments** **or** Absence of groundwater exposure pathway (i.e., there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).	0		
	0		
Score	0		
NOTE: If a score is assigned here for Known COPC Exceedances, then you can skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)			
B. Potential for groundwater pathway.			
a. Relative Mobility High Moderate Low Insignificant Do Not Know	Do Not Know		Organics Koc (L/kg) / Metals with higher mobility at acidic conditions / Metals with higher mobility at alkaline conditions Koc < 500 (i.e., log Koc < 2.7) — pH < 5 — pH > 8.5 Koc = 500 to 5000 (i.e., log Koc = 2.7 to 3.7) — pH = 5 to 6 — pH = 7.5 to 8.5 Koc = 5,000 to 100,000 (i.e., log Koc = 3.7 to 5) — pH > 6 — pH < 7.5 Koc > 100,000 (i.e., log Koc > 5)
Score	2		
b. Presence of engineered sub-surface containment? No containment Partial containment Full containment Do Not Know	Do Not Know		Review the existing engineered systems or natural attenuation processes for the site and determine if full or partial containment is achieved. Full containment is defined as an engineered system or natural attenuation processes, monitored as being effective, which provide for full capture and/or treatment of contaminants. All chemicals of concern must be contained for "Full Containment" scoring. Natural attenuation must have sufficient data, and reports cited with monitoring data to support steady state conditions and the attenuation processes. If there is no containment or insufficient natural attenuation process, this category is evaluated as high. If there is less than full containment or if uncertain, then evaluate as medium. In Arctic environments, permafrost will be evaluated, as appropriate, based on detailed evaluations, effectiveness and reliability to contain/control contaminant migration.
Score	1.5		
c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway 3 m or less including no confining layer or discontinuous confining layer 3 to 10 m > 10 m Do Not Know	Do Not Know		The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow. Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway. The evaluation of this category is based on: 1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or 2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (e.g., water table aquifer, first hydrostratigraphic unit or other groundwater pathway).
Score	0.5		
d. Hydraulic conductivity of confining layer >10^{-4} cm/s or no confining layer 10^{-4} to 10^{-6} cm/s <10^{-6} cm/s Do Not Know	Do Not Know		Determine the nature of geologic materials and estimate hydraulic conductivity from published material (or use "Range of Values of Hydraulic Conductivity and Permeability" figure in the Reference Material sheet). Unfractured clays should be scored low. Silts should be scored medium. Sand, gravel should be scored high. The evaluation of this category is based on: 1) The presence and hydraulic conductivity ("K") of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as a drinking water source, groundwater exposure pathway or 2) The presence and permeability ("k") of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated water table aquifer, first hydrostratigraphic unit or other groundwater pathway.

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation
Score	0.5		
B. Potential for groundwater pathway.			
e. Precipitation infiltration rate (Annual precipitation factor x surface soil relative permeability factor) High Moderate Low Very Low None Do Not Know	Do Not Know		Precipitation Refer to Environment Canada precipitation records for relevant areas. Divide annual precipitation by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). Permeability For surface soil relative permeability (i.e., infiltration) assume: gravel (1), sand (0.6), loam (0.3) and pavement or clay (0). Multiply the surface soil relative permeability factor with precipitation factor to obtain the score for precipitation infiltration rate.
Score	0.4		
f. Hydraulic conductivity of aquifer $>10^{-2}$ cm/s 10^{-2} to 10^{-4} cm/s $<10^{-4}$ cm/s Do Not Know	Do Not Know		Determine the nature of geologic materials and estimate hydraulic conductivity of all aquifers of concern from published material (refer to "Range of Values of Hydraulic Conductivity and Permeability" in the Reference Material sheet).
Score	1		
Potential groundwater pathway total	5.9		
Allowed Potential score	---	Note: If a "known" score is provided, the "potential" score is disallowed.	
Groundwater pathway total	**0**		
2. Surface Water Movement			
A. Demonstrated migration of COPC in surface water above background conditions			
Known concentrations of surface water: i) Concentrations exceed background concentrations and exceed CCME CWQG for protection of aquatic life, irrigation, livestock water, and/or recreation (whichever uses are applicable at the site) by >1 X; or There is known contact of contaminants with surface water based on site observations. or In the absence of CWQG, chemicals have been proven to be toxic based on site specific testing (e.g. toxicity testing; or other indicator testing of exposure).	12	No surface water present at the UST area. Area is relatively flat and surface water runoff from the UST Area is directed offsite. As such, no analytical data was collected. No surface water bodies near UST Area aside from dugouts with closest water body (river) is approximately 290 m to the north of the UST Area. However, the potential for hydrocarbon impacted runoff is low.	Collect all available information on quality of surface water near to site. Evaluate available data against Canadian Water Quality Guidelines (select appropriate guidelines based on local water use, e.g., recreation, irrigation, aquatic life, livestock watering, etc.). The evaluation method concentrates on the surface water flow system and its potential to be an exposure pathway. Contamination is present on the surface (above ground) and has the potential to impact surface water bodies. Surface water is defined as a water body that supports one of the following uses: recreation, irrigation, livestock watering, aquatic life.
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	8		
iii) Meets CWQG or absence of surface water exposure pathway (i.e., Distance to nearest surface water is > 5 km.)	0		
Score	Go to Potential ---		
NOTE: If a score is assigned here for Demonstrated Migration in Surface Water, then you can skip Part B (Potential for migration of COPCs in surface water) and go to Section 3 (Surface Soils)			
B. Potential for migration of COPCs in surface water			
a. Presence of containment No containment Partial containment Full containment Do Not Know	Full containment	The contamination is in a clay soil located approximately 3.8 m below ground surface.	Review the existing engineered systems and relate these structures to site conditions and proximity to surface water and determine if full containment is achieved: score low if there is full containment such as capping, berms, dikes; score medium if there is partial containment such as natural barriers, trees, ditches, sedimentation ponds; score high if there are no intervening barriers between the site and nearby surface water. Full containment must include containment of all chemicals.
Score	0.5		
b. Distance to Surface Water 0 to <100 m 100 - 300 m >300 m Do Not Know	100 - 300 m	Nearest surface water body is approximately 290 m north of the site.	Review available mapping and survey data to determine distance to nearest surface water bodies.
Score	2		

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(II) Migration Potential (Evaluation of contaminant migration pathways)

Regina Research Farm - Two USTs Located South of the Manitenance Building and Garage

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation
c. Topography Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is intermediate Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	At/below and flat	Contamination was measured at 3.8 m below ground surface. Ground is flat and surfaced with asphalt in most locations.	Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (e.g., trench, above ground, etc.).
Score	0		
d. Run-off potential High (rainfall run-off score > 0.6) Moderate (0.4 < rainfall run-off score <0.6) Low (0.2 < rainfall run-off score <0.4) Very Low (0 < rainfall run-off score < 0.2) None (rainfall run-off score = 0) Do Not Know	Very Low (0 < rainfall run-off	Due to low rainfall in the Regina area and low permeability of site soil, runoff potential is very low.	Rainfall Refer to Environment Canada precipitation records for relevant areas. Divide rainfall by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). The former definition of "annual rainfall" did not include the precipitation as snow. This minor adjustment has been made. The second modification was the inclusion of permeability of surface materials as an evaluation factor. Permeability For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the infiltration factor with precipitation factor to obtain rainfall run off score.
Score	0.4		
e. Flood potential 1 in 2 years 1 in 10 years 1 in 50 years Do Not Know	1 in 50 years	Not located in a flood prone area	Review published data such as flood plain mapping or flood potential (e.g., spring or mountain run-off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.
Score	0.2		
Potential surface water pathway total	3.1		
Allowed Potential score	3.1	Note: If a "known" score is provided, the "potential" score is disallowed.	
Surface water pathway total	**3.1**		
3. Surface Soils (potential for dust, dermal and ingestion exposure)			
A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)			
COPCs measured in surface soils exceed the CCME soil quality guideline.	12	Contamination was measured at 3.8 m below ground surface. Although surface samples were not collected from all borehole locations, field hydrocarbon headspace measurements indicate impacted soil is at depth only (>1.5 m). Also, majority of PHC-impacted soil is beneath the concrete pad covering the USTs.	Collect all available information on quality of surface soils (i.e., top 1.5 metres) at the site. Evaluate available data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (i.e, agricultural, residential/parkland, commercial, or industrial), and soil texture if applicable (i.e., coarse or fine).
Strongly suspected that soils exceed guidelines	9		
COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	0		
	0		
Score	0		
NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you can skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)			
B. Potential for a surface soils (top 1.5 m) migration pathway			
a. Are the soils in question covered? Exposed Vegetated Landscaped Paved Do Not Know	Do Not Know	Surface is landscaped in some locations.	Consult engineering or risk assessment reports for the site. Alternatively, review photographs or perform a site visit. Landscaped surface soils must include a minimum of 0.5 m of topsoil.
Score	4		
b. For what proportion of the year does the site remain covered by snow? 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know	Do Not Know		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).
Score	3		
Potential surface soil pathway total	7		
Allowed Potential score	---	**Note: If a "known" score is provided, the "potential" score is disallowed.**	
Soil pathway total	**0**		

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation
4. Vapour			
A. Demonstrated COPCs in vapour.			
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	Contamination only identified in soils, refueling facility is outdoors.	Consult previous investigations, including human health risk assessments, for reports of vapours detected.
Strongly suspected (based on observations and/or modelling)	9		
Vapour has not been measured and volatile hydrocarbons have not been found in site soils or groundwater.	0		
	Go to Potential		
Score	---		
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you can skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)			
B. Potential for COPCs in vapour			
a. Relative Volatility based on Henry's Law Constant, H' (dimensionless) High (H' > 1.0E-1) Moderate (H' = 1.0E-1 to 1.0E-3) Low (H' < 1.0E-3) Not Volatile Do Not Know		Moderate level constants for BTEX parameters	Reference: US EPA Soil Screening Guidance (Part 5 - Table 36) *Provided in Attached Reference Materials*
	Moderate		
Score	2.5		
b. What is the soil grain size? Fine Coarse Do Not Know		Coarse grained soils are present.	Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours. Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 µm mean diameter (D50 < 75 µm). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 µm mean diameter (D50 > 75 µm).
	Coarse		
Score	4		
c. Is the depth to the source less than 10m? Yes No Do Not Know		Maximum depth observed is approximately 6 m	Review groundwater depths below grade for the site.
	Yes		
Score	2		
d. Are there any preferential pathways? Yes No Do Not Know		Utility lines are present in area which potentially intersect the contaminated area	Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathyways.
	Yes		
Score	2		
Potential vapour pathway total	10.5		
Allowed Potential score	10.5	Note: If a "known" score is provided, the "potential" score is disallowed.	
Vapour pathway total	**10.5**		
5. Sediment Movement			
A. Demonstrated migration of sediments containing COPCs			
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	No sediments sampled in investigation, no water bodies near site (approximately 190 m away). Sediment exposure pathway is not applicable.	Review sediment assessment reports. Evidence of migration of contaminants in sediments must be reported by someone experienced in this area.
Strongly suspected (based on observations and/or modelling)	9		
Sediments have been contained and there is no indication that sediments will migrate in future. **or** Absence of sediment exposure pathway (i.e., within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0		
	0		
Score	0		
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you can skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)			

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(II) Migration Potential (Evaluation of contaminant migration pathways)

Regina Research Farm - Two USTs Located South of the Manitenance Building and Garage

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation
B. Potential for sediment migration			
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?	Do Not Know		Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.
Yes			
No			
Do Not Know	2		
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?	Do Not Know		Review existing sediment assessments. If the sediments present at the site are in a river, select "no" for this question.
Yes			
No			
Do Not Know	2		
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?	Do Not Know		Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional may become scoured. If the sediments present at
Yes			
No			
Do Not Know	2		
Potential sediment pathway total	6		
Allowed Potential score	---	Note: If a "known" score is provided, the "potential" score is disallowed.	
Sediment pathway total	**0**		
6. Modifying Factors			
Are there subsurface utility conduits in the area affected by contamination?	Do Not Know		Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.
Yes			
No			
Do Not Know			
Known	---		
Potential	2	Lines are present, unknown if they have been impacted	

Migration Potential Total	
Raw "known" total	0
Raw "potential" total	15.6
Raw combined total	15.6
Total (max 33)	**8.0**

Note: If "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.

CCME National Classification System (2008)

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Regina Research Farm - Two USTs Located South of the Manitenance Building and Garage

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
1. Human				
A. Known exposure				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site*)	22		*Where adverse effects on humans are documented, the site should be automatically designated as a Class 1 site (i.e., action required). There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites). This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1 for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this is typically either $>10^{-5}$ or $>10^{-6}$). Known impacts can also be evaluated based on blood testing (e.g. blood lead >10 ug/dL) or other health based testing. This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 0.2 for non-carcinogenic chemicals and incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10^{-6} or 10^{-5}).	Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet. Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site. **Selected References:** Health Canada – Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Heath Screening Level Risk Assessments (www.hc-sc.gc.ca/ewh-semt/pubs/contamsite/index_e.html) United States Environmental Protection Agency, Integrated Risk Information System (IRIS) – http://toxnet.nml.nih.gov
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10			
No quantified or suspected exposures/impacts in humans.	0			
	0			
Score	0	Contamination in the soil is approxiately 3 m below ground surface and human exposure pathways are not suspected.		
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)				
B. Potential for human exposure				
a) Land use (provides an indication of potential human exposure scenarios) Agricultural Residential / Parkland Commercial Industrial Do Not Know	Commercial		Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (e.g., children).
Score	1	Commercial landuse in area of maintenance garage		
b. Indicate the level of accessibility to the contaminated portion of the site (e.g., the potential for coming in contact with contamination) Limited barriers to prevent site access; contamination not covered Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered. Controlled access or remote location and contaminants are covered Do Not Know	Controlled or remote		Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.	
Score	0	Controlled access and contaminants are at depth and covered with concrete in certain locations.		
B. Potential for human exposure				
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential). i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know	No		If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.	Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.
Score	0	Covered, no potential for contact.		
ii) inhalation (i.e., inhalation of dust, vapour) Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)? Yes No Do Not Know	Yes		If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances) relative to buildings. Refer to (II) Migration Potential worksheet, 4B.a), *Potential for COPCs in Vapour* for a definition of volatility.	Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion. Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts. General Notes; Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links. Selected References; Canadian Council of Ministers of the Environment (CCME). 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 1332. www.ccme.ca Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
Score	3			
Dust - If there is contaminated surface soil (e.g. top 1.5 m) , indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero. Fine Coarse Surface soil is not contaminated or absent (bedrock) Do Not Know Texture	Not contaminated		Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2006)) then these soils are more likely to generate dusts.	
Score	0			
inhalation total	3	No potential for dust as impacts are at depth.		

CCME National Classification System (2008)

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Regina Research Farm - Two USTs Located South of the Manitenance Building and Garage

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for human exposure				
iii) Ingestion (i.e., ingestion of food items, water and soils [for children]), including traditional foods.			Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (e.g., provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure. The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of flow and contaminant transport.	**Selected References:** Guidelines for Canadian Drinking Water Quality: www.hc-sc.gc.ca/hecs-sesc/water/publications/drinking_water_quality_guidelines/toc.htm Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable. Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.
Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future).				
0 to 100 m				
100 to 300 m				
300 m to 1 km				
1 to 5 km				
No drinking water present				
Do Not Know				
	300 m to 1 km			
Score	2	Potable wells located approximately 800 m from UST Area.		
Is an alternative water supply readily available?				
Yes				
No				
Do Not Know				
	Yes			
Score	0	Bottled water is available.		
Is human ingestion of contaminated soils possible?			If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.	
Yes				
No				
Do Not Know				
	No			
Score	0	Contamination is at depth.		
Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings?			Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (e.g., large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.	
Yes				
No				
Do Not Know				
	No			
Score	0			
Ingestion total	2	Commercial landuse in area.		
Human Health Total "Potential" Score	6	Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.		
Allowed "Potential" Score	---			
2. Human Exposure Modifying Factors				
a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.)	No			
Yes				
No				
Do Not Know				
Known	0			
Potential	---			
Raw Human "known" total	0			
Raw Human "potential" total	0			
Raw Human Exposure Total Score	0	Groundwater is used as a potable water source within 1 km of the Former UST Area.		
Human Health Total (max 22)	**0.0**			
3. Ecological				
A. Known exposure				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.	18		Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (i.e., a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites). This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification. This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects, such as site observations, tissue testing, toxicity testing and quantitative community assessments.	CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life. www.ccme.ca CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses. www.ccme.ca Sensitive receptors- review: Canadian Council on Ecological Areas; www.ccea.org. Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in *A Framework for Ecological Risk Assessment: General Guidance* (CCME 1996). Notes: Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	12			
No quantified or suspected exposures/impacts in terrestrial or aquatic organisms	0			
	Go to Potential			
Score	---			
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)				

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Regina Research Farm - Two USTs Located South of the Manitenance Building and Garage

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for ecological exposure (for the contaminated portion of the site)				
a) Terrestrial			Review zoning and land use maps. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the worksheet that future land use is the consideration).	
i) Land use				
Agricultural (or Wild lands)			Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (e.g., herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
Residential/Parkland				
Commercial	Commercial			
Industrial				
Do Not Know				
Score	1	Soil impacts are located in commerical portion of the Site		
ii) Uptake potential				
Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site?	No		If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	
Yes				
No				
Do Not Know				
Score	0	Impacts are at depth >3.0 m below grade. Eco-Soil pathway is not applicable .		
iii) Ingestion (i.e., wildlife or domestic animals ingesting contaminated food items, soils or water)				
Are terrestrial animals likely to be ingesting contaminated water at the site?			Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.	
Yes				
No				
Do Not Know	No			
Score	0			
Are terrestrial animals likely to be ingesting contaminated soils at the site?			Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.	
Yes				
No				
Do Not Know	No			
Score	0			
Can the contamination identified bioaccumulate?			Bioaccumulation of contaminants within food items is considered possible if: 1) The Log(Kow) of the contaminant is greater than 4 (as per the chemical characteristics work sheet) and concentrations in soils exceed the most conservative CCME soil quality guideline for the intended land use, or 2) The contaminant in collected tissue samples exceeds the Canadian Tissue Residue Guidelines.	
Yes				
No				
Do Not Know	No			
Score	0			
Distance to sensitive terrestrial ecological area			It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: www.ccea.org.	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
0 to 300 m				
300 m to 1 km				
1 to 5 km				
> 5 km				
Do Not Know				
	Do Not Know			
Score	1.5			
Raw Terrestrial Total Potential	2.5	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
Allowed Terrestrial Total Potential	2.5			
B. Potential for ecological exposure (for the contaminated portion of the site)				
b) Aquatic			"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species.	
i) Classification of aquatic environment				
Sensitive				
Typical			"Typical aquatic environments" include those in areas other than those listed above.	
Not Applicable (no aquatic environment present)				
Do Not Know				
Not Applicable (no aquatic environm				
Score	0			
ii) Uptake potential				
Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact?		Not sampled.	Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge). 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the area of daylighting groundwater.	
Yes				
No (or Not Applicable)				
Do Not Know	Do Not Know			
Score	0.5			
Distance from the contaminated site to an important surface water resource			It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: www.ccea.org.	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and fens and other aquatic environments.
0 to 300 m				
300 m to 1 km				
1 to 5 km				
> 5 km				
Do Not Know				
	0 to 300 m			
Score	3			

CCME National Classification System (2008)

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Regina Research Farm - Two USTs Located South of the Manitenance Building and Garage

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
Are aquatic species (i.e., forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues?			Bioaccumulation of food items is possible if: 1) The Log(Kow) of the contaminant is greater than 4 (as per the chemical characteristics work sheet) and concentrations in sediments exceed the CCME ISQGs. 2) The contaminant in collected tissue samples exceeds the CCME tissue quality guidelines.	
Yes				
No				
Do Not Know	No			
Score	0			
Raw Aquatic Total Potential	3.5	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
Allowed Aquatic Total Potential	3.5			
4. Ecological Exposure Modifying Factors				
a) Known occurrence of a species at risk.			Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as Eco Explorer. Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act (http://www.sararegistry.gc.ca/species/schedules_e.cfm?id=1). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCMWLAP. 2005. Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists. Ministry of Sustainable Resource Management and Water, Land and Air Protection. http://srmwww.gov.bc.ca/atrisk/red-blue.htm
Is there a potential for a species at risk to be present at the site?		Not present at the UST Area.		
Yes				
No				
Do Not Know	No			
	0			
Score	---			
b) Potential impact of aesthetics (e.g., enrichment of a lake or tainting of food flavor).				
Is there evidence of aesthetic impact to receiving water bodies?	No		Documentation may consist of environmental investigation reports, press articles, petitions or other records.	This Item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
Yes				
No	0			
Do Not Know	---	Not present at the UST Area.		
Is there evidence of olfactory impact (i.e., unpleasant smell)?	No		Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.	
Yes				
No	0			
Do Not Know	---			
Is there evidence of increase in plant growth in the lake or water body?	No		A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients e.g., nitrogen or phosphorous releases to an aquatic body can act as a fertilizer.	
Yes				
No	0			
Do Not Know	---			
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different?	No		Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	
Yes	0			
No	---			
Do Not Know				
Ecological Modifying Factors Total - Known	**0**			
Ecological Modifying Factors Total - Potential	**---**			
Raw Ecological Total - Known	0			
Raw Ecological Total - Potential	6			
Raw Ecological Total	6			
Ecological Total (Max 18)	**6.0**			
5. Other Potential Contaminant Receptors				
a) Exposure of permafrost (leading to erosion and structural concerns)				Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity?	No		Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.	
Yes				
No	0			
Do Not Know	---	No		
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment?	No		Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	
Yes				
No	0			
Do Not Know	---			
Other Potential Receptors Total - Known	**0**			
Other Potential Receptors Total - Potential	**0**			

Exposure Total		
Raw Human Health + Ecological Total - Known	0	
Raw Human Health + Ecological Total - Potential	6	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.
Raw Total	6	
Exposure Total (max 34)	**4.4**	

CCME National Classification System (2008)
Score Summary

Scores from individual worksheets are tallied in this worksheet.
Refer to this sheet after filling out the revised NCS completely.

I. Contaminant Characteristics	Known	Potential
1. Residency Media	2	---
2. Chemical Hazard	8	---
3. Contaminant Exceedance Factor	2	---
4. Contaminant Quantity	2	---
5. Modifying Factors	2	---
Raw Total Score	16	0
Raw Total Score (Known + Potential)	16	
Adjusted Total Score (Raw Total / 40 *33)	**13.2**	(max 33)

II. Migration Potential	Known	Potential
1. Groundwater Movement	0	---
2. Surface Water Movement	---	3.1
3. Soil	0	---
4. Vapour	---	10.5
5. Sediment Movement	0	---
6. Modifying Factors	---	2
Raw Total Score	0	15.6
Raw Total Score (Known + Potential)	15.6	
Adjusted Total Score (Raw Total / 64 * 33)	**8.0**	(max 33)

III. Exposure	Known	Potential
1. Human Receptors		
A. Known Impact	0	
B Potential		
a. Land Use		---
b. Accessibility		---
c. Exposure Route		
i. Direct Contact		---
ii. Inhalation		---
iii. Ingestion		---
2. Human Receptors Modifying Factors	0	---
Raw Total Human Score	0	0
Raw Total Human Score (Known + Potential)	0	
Adjusted Total Human Score	0.0	(maximum 22)
3. Ecological Receptors		
A. Known Impact	---	
B. Potential		
a. Terrestrial		2.5
b. Aquatic		3.5
4. Ecological Receptors Modifying Factors	0	---
Raw Total Ecological Score	0	6
Raw Total Ecological Score (Known + Potential)	6	
Adjusted Total Ecological Score	6.0	(maximum 18)
5. Other Receptors	0	0
Total Other Receptors Score (Known + Potential)	0	
Total Exposure Score (Human + Ecological + Other)	**6.0**	
Adjusted Total Exposure Score (Total Exposure / 46 * 34)	**4.4**	(max 34)

Site Score

Regina Research Farm - Two USTs
Located South of the Manitenance
Building and Garage

Site Letter Grade	**C**
Certainty Percentage	**75%**
% Responses that are "Do Not Know"	**-10%**
Total NCSCS Score for site	**25.7**
Site Classification Category	**N**

Site Classification Categories*:

Class 1 - High Priority for Action (Total NCS Score >70)
Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
Class N - Not a Priority for Action (Total NCS Score <37)
Class INS - Insufficient Information (>15% of responses are "Do Not Know")

* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.

Appendix F

Phase III Environmental Site Assessment, Regina Research Farm (DFRP 13663) – Regina, Saskatchewan

- Site Photographs

Photograph 1 ↑
View of UST Area, facing north.

Photograph 2 ↑
View of UST Area, facing west.

Photograph 3 ↑
View of UST Area, facing east.

Photograph 4 ↑
View of UST Area, facing south.