

Remediation Report, Site Sensitivity Analysis,
and Risk Management Plan
Former Shell Bulk Petroleum Storage Facility
810 Railway Avenue East
Lot 9; Block 99; Plan 96PA21314 Ext. 0
Rosthern, Saskatchewan

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EnviroAnalytics Group
Remediation Report, SSA, and RMP
Former Shell Bulk Petroleum Storage
Facility
Rosthern, Saskatchewan



EXECUTIVE SUMMARY

Nichols Environmental (Canada) Ltd. (Nichols) was retained by EnviroAnalytics Group (EAG) to prepare a Remediation Report, Site Sensitivity Analysis (SSA), and Risk Management Plan (RMP) for the former Shell Bulk Petroleum Storage Facility (herein referred to as the 'Site'), located at 810 Railway Avenue East in Rosthern, Saskatchewan. Under the National Classification System for Contaminated Sites (NCSCS), the Site is considered Class 2.

The Site was confirmed to have operated in the 1960s, at which time aboveground storage tanks (ASTs) and additional infrastructure were present. In the late 1970s, underground storage tanks (USTs) and a pump island were also installed. The Site was decommissioned in the early to mid-1990s and has remained relatively vacant since that time. The Site is presently zoned for commercial land use and Nichols is of the understanding that the Site is to remain under commercial use. Present-day use includes a support building associated with the west adjacent rail line, and the surrounding land use is a mix of commercial and residential.

A number of environmental assessments have been conducted for the Site dating back to the 1990s. Based on past assessments, the primary substances of potential concern (SOPCs) are petroleum hydrocarbons (PHCs) associated with the historical release of fuel from the ASTs and distribution system. Over time, PHCs appear to have migrated downward from surface through the fine-grained sand present beneath the Site and have spread laterally with groundwater flow to the south-southeast, residing predominantly within the capillary fringe and smear zone at the water table at depths between 2 and 4.5 metres below grade (mbg).

In situ injections were completed for the Site in 2015 and 2019 as a means to help reduce the PHC mass present and to create a barrier to limit further migration of PHCs off-site to the southeast. Based on an evaluation of groundwater PHC concentrations, Nichols is of the opinion that the in situ program has reduced the overall PHC mass present, as overall concentrations appear to have decreased at the locations sampled compared to historical results. Further trend analysis also indicates that PHC concentrations are generally stable or decreasing across the Site. In addition, concentrations of benzene in groundwater generally appear to be less than predicted via a modelling exercise that was utilized (pre-treatments) to project the movement of the plume over 25 years, without taking into account biodegradation. This further supports the reduction of PHC mass via in situ treatments and also demonstrates that over a 25-year period, there is a reduced risk of the plume affecting off-site residential areas further east of the Site.



As residual PHC concentrations remain present on and off-site in soil and/or groundwater, the SSA was undertaken to evaluate what risk these impacts may pose. Through the SSA, three exposure pathways were identified for risk mitigative measures, which have already been implemented for the Site through a restrictive covenant. In order of decreasing sensitivity, these are:

1. Potable water, for which there are no water wells on the Site and installation of potable and non-potable water wells is prohibited via the restrictive covenant. Furthermore, the closest drinking water well is crossgradient (east) of the Site and believed to still be disconnected. Historical plume modelling (pre-remedial treatments) also did not predict any plume expansion toward the east that would intersect residential lands;
2. Freshwater aquatic life, for which there are no receptors on the Site and the nearest is a seasonal water body 230 m to the south. Furthermore, predictive modelling (pre-remedial treatments) demonstrated that the benzene plume would migrate 15 m to the south and 10 m to the east/west over the 25-year projection, which was based on conservative inputs. Therefore, there would be a low risk of impact to this pathway; and
3. Vapour inhalation, for which there has been two soil vapour monitoring events completed within the impacted areas (pre-remedial treatments) that have demonstrated vapour concentrations are below levels that are considered potentially harmful. In addition, the restrictive covenant prohibits the construction of a basement structure on the Site.

Risks will be further managed through a proposed soil management plan and ongoing monitoring.

The statements made in this Executive Summary are subject to the same limitations included in Section 7.2 and are to be read in conjunction with the remainder of this report.



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1.0 SITE DESCRIPTION AND HISTORY

Nichols was retained by EAG to prepare a Remediation Report, SSA, and RMP for the former Shell Bulk Petroleum Storage Facility located at 810 Railway Avenue East in Rosthern, Saskatchewan. Figure 1 depicts the location of the legal lot on which the former Shell Bulk Petroleum Storage Facility resided, relative to the surrounding area.

NCSCS was completed for the Site using the most recent soil and groundwater data. Based on the NCSCS worksheet, the total score for the Site was 55.4, with a site classification category of Class 2 (medium priority for action). The NCSCS ranking tool is presented in Appendix A.

It is Nichols' understanding that there is a restrictive covenant active for the Site, details of which are discussed further in Section 5.0 herein, detailing the RMP. A copy of the restrictive covenant is provided in Appendix B.

1.1 Location and Development Details

Site Name:	Former Shell Bulk Petroleum Storage Facility
Legal Description:	Lot 9; Block 99; Plan 96PA21314 Ext. 0
Location of Site:	810 Railway Avenue East Rosthern, Saskatchewan
LSD:	NW-35-042-03-W3M
Legal Lot Size:	1,870 m ² (0.19 ha)
Current Owner:	Saskatchewan Valley Producer Car Corporation
Site Contact:	EnviroAnalytics Group, Lucia Casabo (phone: 919-960-9311)
Occupant:	Saskatchewan Valley Producer Car Corporation
Site Status:	Decommissioned
SK MOE Operation ID/ Facility Code No.	6090/BU-391

The Site formerly operated as a bulk fuel storage facility. The date of development is uncertain, though it was noted in historical reports that in the 1960s there were seven ASTs, a pump house, a lubricant storage warehouse, storage shed, and office building present. In 1977 the Site was further developed with a pump island, and two USTs were installed. Three ASTs were also present



on the Site in 1977. The pump island and USTs were removed from the Site in 1991 and the balance of the former facility was decommissioned sometime between 1992 and 1998.

1.2 Zoning and Physical Description

The Site is zoned as C2 - Highway Commercial District based on the Rosthern Land Use Bylaw. The zoning permits for development of highway commercial and other compatible commercial/industrial uses. Under this land use, the only residential dwellings permitted are those directly integrated as a part of the principal buildings, for the use of caretakers, owners, or managers. At the time of writing this RMP, it is Nichols' understanding that the Site is to remain under commercial use and that there are no proposed land use changes. The Site is presently vacant, with the exception of a grain auger and support building associated with the west adjacent rail line, and all infrastructure relating to the historical operations has been removed.

Surrounding land use is primarily zoned as C2 - Highway Commercial District with R1 - Low Density Residential District to the west. Neighbouring land uses are identified on Figure 1.

A review of reports indicated that buried utilities no longer exist on the Site, with the exception of a buried sanitary line that enters the north side of the Site from Railway Avenue East. This line is shut off at the main line under Railway Avenue East. Power and communication lines within the area are overhead and underground utilities off-site beneath Railway Avenue East include:

- Water lines for untreated water (152 mm PVC at 2.7 mbg) and treated water (152 mm asbestos-cement pipe at 2.7 mbg);
- Sanitary sewer lines (main line is clay tile at 2.7 mbg); and
- Gas lines (construction type and depth unknown).

A combination of lines also extends east down 3rd Street East and 4th Street East and into the neighbouring lots. Site detail, including historical infrastructure, assessment locations and known aboveground and buried utilities, is presented on Figure 2. Other buried utilities may be present on the Site and in the surrounding area. However, only those utilities that were identified through the historical review are shown.

1.3 Background

Assessment work at the Site appears to have first taken place in the early 1990s under Wardrop Engineering Inc. (Wardrop). From 1992 to 2021, 51 boreholes, 10 test pits, and three soil vapour probes have been completed on the Site and surrounding lands, with those off-site being predominantly to the east and southeast. Of these, 50 boreholes were completed as groundwater monitoring wells, the majority of which were installed between 1999 and 2006. Regular groundwater monitoring was also historically completed for the Site between 2003 and 2012.



Through these assessments, soil PHC impacts have been confirmed on the central and southeast portions of the Site, and groundwater impacts have also been identified both on and off-site within the adjacent roadway to the east.

As a part of the ongoing management of the Site, groundwater contamination plume modelling of benzene was completed in 2009. The assessment was undertaken to determine the relative risk of on-site shallow groundwater impacts migrating to any off-site well using 2008 benzene data, which would pre-date remedial treatments of the Site (discussed further herein). Two-dimensional models were generated for 5, 10, and 25 year projections (2013, 2018, and 2033), which demonstrated that the plume would likely slowly continue to migrate to the south/southeast in association with the observed groundwater flow for the Site, and that there may be some expansion to the east and west through plume diffusion. The migration rate was estimated to be 15 m to the south and 10 m to the east/west over the 25-year projection, wherein the majority of the plume would remain beneath Railway Avenue East and not be considered to pose a significant immediate risk to off-site private water wells in the residential areas further east. Based on a review of the predictions against available analytical data, measured concentrations of benzene are generally lower than model predictions. This notably is the case at the south (BH27) and east boundaries of the plume (BH17), based on the most recent sampling events for these respective areas. However, it should be noted that there appears to have been some fluctuations above/below guidelines at D9 (north) and BH34 (south), which were not captured in the modelling. Otherwise, based on this review it is evident that a conservative approach was taken with the modelling and that impacts are not likely to migrate as far east/west and south as the original predictions.

RMPs were subsequently developed for the Site and neighbouring lands in 2009, and were later updated in 2010, which included the recommendation to install Oxygen Release Compound (ORC) socks into select monitoring wells as a means to help reduce PHC concentrations present. Installation was subsequently undertaken in 2010 at locations off-site (MW6, BH16, BH17, BH30, BH31, BH38, BH39, and BH40), and redone in 2011 and 2012. On-site, ORC socks were installed in D1, D4, BH11, and BH19 in 2012. Environmental Site Assessment Summary reports were also prepared for both on and off-site in 2013, wherein the 2012 field investigation was completed in an attempt to delineate the PHC-plume. Following these investigations, a Corrective Action Plan (CAP) was prepared in 2013 by Tetra Tech WEI Inc. (Tetra Tech), which was subsequently updated in 2015 by EAG Canada and included a detailed review of the applicable assessment criteria for the Site and outlined a proposed course of action to address the residual PHC-impacts that remained. Given the then widespread nature of groundwater impacts, the revised CAP outlined an in situ oxidation approach via injection to address the PHC mass present within the smear zone at the water table.

In situ injections were completed for the Site in 2015, following which groundwater programs were completed in 2016 through 2018. A status report documenting the injection program for the Site



was prepared in 2019 by EAG Canada. Within the status report, measures were proposed to complete a second injection event in 2019, with follow-up groundwater monitoring to be completed thereafter. Further details regarding the 2015 and 2019 injection events, as well as follow-up groundwater programs, are discussed in Section 3.0.

In addition to the aforementioned assessments and remedial activities, soil vapour sampling was completed for the Site in 2012 and 2014. Soil vapour wells (VW1 to VW3) were installed to depths ranging from 1.0 to 1.3 mbg and 1.5 to 1.8 mbg in 2012. Results from both 2012 and 2014 were compared against soil vapour remediation guidelines developed by Intrinsik Corp. in September 2016 for Residential and Commercial/Industrial land uses in Saskatchewan for coarse-grained soils. Analytical indicated that the vapour concentrations were below levels that are considered potentially harmful. Soil vapour sampling has not been completed since this time.

A list of the available historical reports for the Site is provided in Appendix C. A visual conceptual site model (CSM) for the Site is presented in Figure 3, and historical assessment locations with analytical data is provided on Figures 4 through 7 and in Tables 1 through 5.



2.0 LITHOLOGY AND HYDROGEOLOGY

2.1 Regional

As per previous assessments, the geology of the Rosthern area consists of post-Wisconsinan glacial tills deposited within a glaciolacustrine plain. These tills consist of stratified deposits of clay, silt, and sand that were deposited within glacial lakes during period of glacial retreat or stagnation. Surficial sands and gravels may also be found in the area. The till within the Rosthern area is approximately 120 m thick and intertill deposits range from less than 1 to over 30 m in thickness. The glacial till overlies the Upper Cretaceous (Campanian) Lea Park Formation, which is an aquatard comprising grey marine shale with minor sandstone and siltstone sequences.

Groundwater flow at the base of the till is expected to be toward a tributary of the preglacial Tyner Valley, located approximately 6 km east of Rosthern.

The local topography is primarily flat and no watercourses are known to be present on the Site or within the immediate surrounding area. Surface drainage on the Site and in the surrounding area is anticipated to be primarily via infiltration (vegetated/gravel areas). The nearest permanent water body to the Site is Rosthern Creek, located approximately 300 m southeast. Seasonal surface water bodies are also present in all directions from the Site, the closest of which is approximately 230 m to the south.

2.2 Site

Based on the boreholes advanced for the Site and surrounding area, the lithology generally consists of soils of clayey silt fill to a depth of approximately 1 mbg, followed by fine-grained sands, silty sands, and/or sandy silts and silts to depths of 4 to 5 mbg. Beneath the sands and silts resides a clay unit to a minimum depth of 6 mbg (maximum depth assessed). Grain size analysis has determined that there are both fine and coarse-grained soils present for the Site and surrounding area. However, the governing grain size determined to be facilitating the majority of contamination migration and mobility would be considered coarse.

Groundwater monitoring and sampling programs have been completed fairly consistently for the Site since 1999 and over the course of these 22 years, groundwater flow has been predominantly calculated to the south-southeast. Previous reports have indicated that groundwater depth within the sand unit noted is generally around a depth of 2.5 mbg. Hydraulic conductivity for the Site and surrounding area ranges from 10^{-5} m/s (well D5) to 10^{-7} m/s (multiple wells).



2.2.1 Water Wells

A search of the Saskatchewan Water Security Agency (WSA) database identified ten water wells located within approximately 800 m of the Site. The registered wells were drilled to depths ranging from approximately 6.1 to 53.3 mbg, and water depths ranged from approximately 1.8 to 15.2 mbg. Where the WSA logs provide sufficient information to determine the stratigraphy of the soil, it appears the wells were generally completed in units of sand that began at a depth of approximately 4.2 to 30 mbg. The exact locations of wells are not known and of the ten wells, two were for industrial use and eight were for domestic use.

Even though the Town of Rosthern provides potable drinking water within town limits, private water wells are known to exist within town. Based on historical assessment work, a known water well is present on a residence to the east of the Site (as indicated on Figure 2, Lot 11). Previous assessment work identifies this water well as being disconnected.

A copy of the well records and search map is presented in Appendix D.



3.0 IN SITU REMEDIAL PROGRAM

As noted in Section 1.3, in situ injections and groundwater programs were completed for the Site in 2015 and 2019. Groundwater programs to evaluate the effectiveness of the in situ programs were also completed in 2016 through 2018 (post-2015 injections) and in 2020 and 2021 (post-2019 injections). All programs were completed under the direction and/or supervision of EAG and were completed in accordance with the CAP and Status Update that were prepared for the Site.

3.1 Injection Programs

In 2014, Regenesis was retained by EAG to develop both the chemical injection formulation and injection plan best suited to maximize remediation efforts for the Site. Upon review, Regenesis determined that a combination of PersulfOx, a sodium persulfate-based in situ chemical oxidation reagent, and ORC Advanced, an engineered oxygen-release compound designed for enhanced in situ aerobic bioremediation of PHCs in groundwater or saturated soils, would be the most effective chemical amendments for the Site.

The injection program was completed from June 17 to 18, 2015 utilizing a track-mounted Geoprobe direct push rig provided by Intercore Environmental Services Ltd. In total, 28 injection points were advanced to a maximum depth of 5.0 mbg. The program was completed in general accordance with Regenesis recommendations and the 2001 Interstate Technology Regulatory Cooperation Technical/Regulatory Guidelines, Technical and Regulatory Guidance for In-Situ Chemical Oxidation of Contaminated Soil and Groundwater.

Injection points were targeted across an approximate 285 m² area on the southeast portion of the Site, utilizing a layout of three rows with points spaced approximately 2 m apart (Figure 8). The mixture ratio was blended utilizing approximately 25 kg of PersulphOX and 18.1 kg of ORC Advanced into 125 L of water at each injection point. Each point was advanced to the maximum depth then slowly withdrawn to a depth of approximately 1.5 mbg.

Pre- and post-injection groundwater monitoring and sampling events were also completed in June and October 2015, respectively. Subsequent groundwater programs were completed in May 2016, May 2017, and October 2018. Concentrations of PHCs measured in the follow-up programs indicated that concentrations had diminished over most areas surrounding the Site. However, there were select areas that had little change in concentrations.

Given the groundwater concentrations measured along the southeastern portion of the Site, EAG recommended that a second in situ injection be undertaken to provide a "barrier" to address any potential off-site migration of groundwater impacts. Using the treatment surface area, the vertical



treatment interval thickness, and the average PHC concentrations, a treatment volume and reagent dose were calculated by Regenesis.

In October 2019, Advantage Probe and Injection Corp. (APIC) advanced 40 direct-push holes through which to pump the liquid injection reagent on the Site. The target interval was between approximately 2.5 and 5.5 mbg, within a fine clean sand, and the bottom of the interval was a clay or till layer of distinctly lower permeability.

Injection points were targeted across an approximate 165 m² area on the southeast portion of the Site (Figure 8). The reagent used was Regenesis' PetroFix, which is a carbon-based solution that when injected into the aquifer, adsorbs PHC compounds and promotes anaerobic degradation of PHCs. The reagent was mixed with water for injection into the smear zone of the aquifer, and an estimated 1,240 L was injected during the October 2019 event.

In conjunction with the injection event, monitoring wells MW30A and MW19-1 were also advanced along the south eastern boundary of the Site. Pre- and post-injection groundwater monitoring and sampling events were also completed in October 2019 and June 2020, respectively, with another event completed in July 2021.

3.2 Evaluation of Remedial Program

Linear trend analyses were performed based on the Mann-Kendall statistical method. The results of the trend analyses are used to quantitatively determine if concentrations of an analyte within a monitoring well over time are "Increasing" or "Probably Increasing", are "Decreasing" or "Probably Decreasing", or if the dataset exhibits "No Trend". Detailed methodology for the Mann-Kendall statistical method is presented in Appendix E.

Linear trend analyses were performed on groundwater monitoring wells with at least four sampling events taking place during the summer (June to August). Analysis was conducted using data from each of benzene, toluene, ethylbenzene, xylenes (BTEX) and PHC Fractions 1 and 2, and most analyses show trends that are decreasing or no trend (inferred stable). Those parameters that did not follow this trend are indicated below:

- PHC Fraction 2 in BH19 was noted to be probably increasing, though concentrations of this parameter were below guidelines in 2017 when last sampled;
- Ethylbenzene in D2 was noted to be increasing, where concentrations appeared to rebound in 2021 from at or near method detection limits (MDLs) measured during historical events, but remain below guidelines; and



- PHC Fraction 2 in D9 was noted to be probably increasing, where concentrations appeared to rebound in 2015 from at or near MDLs measured historically. It should be noted that the concentrations in the most recent samples (May 2017) were lower, though still above guidelines.

These three locations remain on or within proximity to the Site, two of which are also outside of the in situ treatment area (D2 and D9). PHC concentrations in D2 (on-site) have historically been below the guidelines, with rebounds noted in the groundwater in 2018 and 2021. With regard to D9 (off-site), benzene or xylenes have historically been the primary SOPC above guidelines and this has changed to PHC Fraction 2 since 2015 (pre- and post-injection), which may be indicative of migration of historical impacts.

Based on the most recent 2021 sampling event, overall concentrations of PHCs appear to have decreased at the locations sampled compared to the most recent previous event. In addition, concentrations of PHCs were also below guidelines to the southeast in BH27. However, it should be noted that decreases appeared to be marginal for select parameters at the locations of MW5, MW19-1, and MW30-A, of which MW5 was upgradient of the injection area and the remaining two were within or downgradient of it.

Based on these results, it is Nichols' opinion that the in situ program has reduced the overall PHC mass present, although continued monitoring would be required to evaluate the overall effectiveness of the intended "barrier", given that downgradient concentrations in MW30A (specifically benzene) appeared to remain similar over the two sampling events.

A summary of the trend analysis is provided in Table 6. Data from the most recent July 2021 monitoring event is presented in Figure 9.



4.0 SITE SENSITIVITY ANALYSIS AND REGULATORY FRAMEWORK

The objective of an SSA is to qualitatively evaluate potential risks to human and ecological receptors from SOPCs. For the Site, this will be done through the following steps:

- Identification of the SOPC;
- Identification of exposure pathways under present and potential future land uses;
- Identification of active and potential future receptor pathways for the Site; and
- Development of an RMP to mitigate potential exposure (Section 5.0).

Evaluation of the Site has been completed against the Saskatchewan Ministry of Environment (MOE) *Environmental Quality Guidelines*, as of July 2017 (2017 SK EQG). Additional documents such as the Canadian Council of Minister of Environment (CCME) Environmental Quality Guidelines may have been used in conjunction.

The MOE has adopted the source-pathway-receptor model in conceptualizing and managing sites and has established tiered endpoints. Under these guidelines there are three acceptable endpoints to address environmentally impacted sites: Tier 1, Tier 2 and Tier 3. The generic Tier 1 guidelines are considered applicable for the majority of the sites in Saskatchewan and are the most protective values as they require the lowest level of understanding of the site and associated impacts. Tier 2 guidelines allow for consideration of site-specific conditions by identifying and controlling exposure scenarios and pathways. Tier 3 guidelines involve risk management and the development of site-specific criteria. The Tier 3 approach requires Ministry designation of a qualified person and is always considered an alternative solution.

In some cases, a contaminated site may be located adjacent to a more sensitive land-use. In such instances, the guidelines for the more sensitive land-use would be considered applicable to the contaminated site within a 30-m buffer zone from the more sensitive land-use boundary. This is done as a means to protect receptors of the more sensitive land-use and has been applied for the Site, the boundary for which is depicted on Figure 2.

Based on a review of the Site, Nichols is of the opinion that the Tier 2 Guidelines would be applicable utilizing the *de minimus* criteria for coarse-grained soils for Commercial or Residential Land Use, and from the following pathways as described further in Section 4.3:

- Human dermal soil contact and soil ingestion;
- Indoor vapour inhalation for slab-on-grade structures under both Commercial and Residential Land use;



- Indoor vapour inhalation for basement structures under Residential Land use;
- Potable groundwater;
- Ecological soil contact;
- Freshwater aquatic life (FAL); and
- Management limits.

4.1 Substances of Potential Concern

Based on past assessments, the primary SOPCs associated with the historical release of fuel from the ASTs and distribution system are PHCs (BTEX and PHC Fractions 1, 2, and/or 3) in soil and/or groundwater. PHCs appear to have migrated downward from surface through the fine-grained sand present and spread laterally with groundwater flow to the south-southeast, residing predominantly within the capillary fringe and smear zone at the water table at depths between 2 and 4.5 mbg. There is a potential for PHC-impacted soil to be encountered within the lower two-thirds of the Site. An estimate as to the area of impact has not been made at this time, given that the most recently collected soil data is from 2014, which pre-dates the in situ programs.

Based on a review of available data, groundwater impacts are estimated to cover an area of 3,364 m² and the estimated plume is shown on Figure 9. NAPL has typically not been encountered on the Site since approximately 1 mm was identified in D1 in June 2004. It should be noted that limited data has been collected from those monitoring wells southeast of the Site across Railway Avenue East (BH39, BH40) and as such, the estimated plume has been extended part way toward the next available monitoring wells that are not impacted.

It should be noted that under the 2017 SK EQG, surface soil guidelines for BTEX and PHC Fractions 1 through 4 are applied up to and including a depth of 3.0 mbg while subsoil guidelines are applied below the depth of 3.0 mbg.

4.2 Exposure Pathways and Modes of Transport

Exposure pathways are routes by which human and ecological receptors may come into contact with SOPCs in soil and groundwater. Based on a review of available data, the main modes of transport under which receptors may be exposed to the identified SOPCs include:

- Migration of PHC vapours through soils to surface given the coarse-grained lithology present;
- Migration of PHC vapours along utility lines;



- Dispersion of PHC impacts via infiltration (leaching) and groundwater flow as surface runoff on the Site and surrounding area is largely via infiltration. The Site itself is a mix of grass and gravel and the adjacent roadways are gravelled; and
- Exposure (dermal, inhalation, ingestion) to PHC-impacted media during ground disturbance activities.

4.3 Receptor Pathways and Risk Evaluation

The Site is presently vacant, with the exception of a building associated with the west adjacent rail line, and future land use is anticipated to remain commercial, with neighbouring land use anticipated to remain a mix of commercial and residential. As there is presently unrestricted access to the Site, both human and ecological receptors have been evaluated.

The CSM for the Site, demonstrating the exposure and receptor pathways, is provided in Figure 3 and an evaluation of the pathway applicability and risk related to the Site is provided below.

Pathways		Applicability	Risk Evaluation
Human Exposure Pathways			
Dermal Soil Contact	Exposure primarily through transfer from hand to mouth from direct contact with impacted media or ingestion of air-suspended particles. May be eliminated if SOPCs are more than 1.5 mbg and either physical, engineering, and/or administrative controls are present.	General soil impacts are present shallower than 1.5 m. As such, both pathways remain applicable. Localized area with xylenes and/or PHC Fraction 2 concentrations above these pathways is present on the north side of the former AST farm (D1, BH45, VW2) at depths of 1.5 and 3.0 mbg. Second localized area is southeast of the AST farm (D4) at 3.0 mbg.	Appears to be a low risk of exposure to soils with concentrations exceeding these pathways at depths shallower than 1.5 mbg. Remains a potential for exposure during ground disturbance work. Soil management plan required to manage exposure risk.
Soil Ingestion			

Pathways		Applicability	Risk Evaluation
Indoor Vapour Inhalation: slab-on-grade and/or basement structures	Exposure via migration of vapours through soils. May be eliminated if there are no occupied buildings within 30 m of the Site and either physical, engineering, and/or appropriate administrative controls are present.	A building is present on-site and new buildings may be constructed in the future. As such, this pathway remains applicable. Localized area with benzene, xylenes, PHC Fraction 1 and/or 2 concentrations above this pathway is present on the north side of the former AST nest (D1, BH11, BH45, VW2) at depths of 1.5 and 3.0 mbg. Second localized area is southeast of the AST nest (D4) at 3.0 mbg. Benzene in groundwater in MW30A exceeds this pathway.	Pre- in situ treatment soil vapour monitoring has demonstrated that soil vapour concentrations would not be expected to pose a risk. The risk would be expected to be reduced over time given degradation of PHCs from treatments and natural attenuation. Restrictive covenant prevents construction of basement structures on the Site, which mitigates risk.
Potable Groundwater	Exposure through ingestion. Must take into consideration future use of an aquifer, even if not presently in use. May be eliminated if there are sufficient physical controls present to prevent the SOPC from reaching potable aquifer, the groundwater present does not meet the definition of a potable water aquifer, and/or the SOPC will attenuate below the applicable endpoint value before reaching the aquifer.	Potable water is municipally provided, though private water wells are known to exist in town. A water well (disconnected) is present on a lot approximately 65 m east of the Site. This is the governing pathway receptor for the Site and multiple soil samples on the Site exceed criteria. Groundwater collected at multiple locations on and off-site also exceed this criteria.	Groundwater on the Site is not presently utilized for potable consumption. As such, the potential for exposure would be considered low. Restrictive covenant prevents installation of a potable water well on the Site, which mitigates risk. Town of Rosthern Bylaw requires buildings be supplied from a connection with water services system or other approved water system.



Pathways		Applicability	Risk Evaluation
Ecological Exposure Pathways			
Soil Contact	Exposure via direct contact with impacted media. May be eliminated if SOPCs are more than 3 mbg or between 1.5 and 3 mbg with sufficient engineering controls to prevent exposure and there is no productive use for the soil at the Site, and administrative controls to address exposure are present.	Site is vacant with little vegetation, but it is assumed vegetation will be present in the future. As such, this pathway remains applicable. Localized area with TEX, PHC Fraction 1, 2 and/or 3 concentrations above this pathway is present on the north side of the former AST nest (D1, BH11, BH45, VW2) at depths of 1.5 and 3.0 mbg. Second localized area is southeast of the AST nest (D4) at 3.0 mbg. Two separate areas with PHC Fraction 2 are also present; northeast of former AST nest (TP2) at 0.5 mbg and off-site location along rail ROW (BH32) at 3.0 mbg. Does not exceed in groundwater.	Appears to be a low risk of exposure to soils with concentrations exceeding these pathways at depths shallower than 1.5 mbg, with the exception of the TP2 location centrally on the Site. Gravel surface likely limits exposure. Restrictive covenant prevents relocation of deeper soils to shallower depths. Soil management plan and development considerations required to manage exposure risk.
Soil Ingestion: Livestock/ Wildlife	Exposure via direct ingestion of impacted soil, plant material, or other food sources, and ingestion of air-suspended particles. May be eliminated if SOPCs are more than 1.5 mbg, administrative, and either physical and/or engineering controls are present.	General soil impacts are present shallower than 1.5 m. This pathway is not applicable under commercial or residential land uses.	No risk present.



Pathways		Applicability	Risk Evaluation
FAL/ Livestock/ Wildlife	Exposure via direct contact/ingestion at the affected water body. May be eliminated if there are no permanent aquatic life-sustaining water bodies within 500 m of the Site or one or more of the following conditions are met: 1) physical controls present to prevent SOPCs from reaching water body; 2) natural attenuation of SOPCs to below endpoint values before reaching water body; 3) no hydrologic connectivity between impacted media and water body demonstrated; or 4) engineering/administrative controls are in place.	Nearest permanent water body is within 500 m. As such, this pathway remains applicable. Livestock and wildlife pathways are not applicable under commercial or residential land uses. FAL is the second governing pathway receptor for the Site and multiple soil samples on the Site exceed criteria. Groundwater collected at multiple locations on and off-site also exceed this criteria.	Closure has been achieved in soil and groundwater prior to reaching receptor and modelling has demonstrated that plume movement is expected to be limited. As such, the potential for exposure would be considered low. Remains a potential for exposure should a permanent water body be constructed on or in proximity to the Site. To manage potential exposure risk, installation of irrigation and/or water features on the Site would be prohibited.
Safety and Aesthetics			
Management Limits	Screening tool for soils with PHC Fraction 1 through 4 impacts to assess potential for free phase, explosive hazards, human health exposure, and impact to buried infrastructure.	This pathway remains applicable for soils only. Localized area with PHC Fraction 1, 2, and/or 3 concentrations above this pathway is present on the north side of the former AST nest (BH45, VW2) at depths of 1.5 and 3.0 mbg.	Appears to be a low risk of exposure to soils with concentrations exceeding these pathways at depths shallower than 1.5 mbg. Remains a potential for exposure during ground disturbance work. Soil management plan required to manage exposure risk.



5.0 RISK MANAGEMENT PLAN

Until such a time that the PHC impacts reach remedial objectives, risk management measures are required, which are outlined further in the following sections. Under previous CAPs, the following options have been considered for remediation of the Site:

1. Remedial excavation;
2. In situ treatment; and
3. Risk management.

As indicated in the previous CAPs, remedial excavation of the impacted soil at this time would not be considered feasible given safety concerns due to the Site lithology and potential for excavations to collapse in on themselves. In addition, removal beneath the roadway would pose logistical challenges and require further consideration toward safe excavation around buried utility lines. Based on these consideration, in situ treatment was undertaken for the Site as summarized in Section 3.0.

Given the residual PHC concentrations that remain in soil and groundwater for the Site, risk management has been further expanded on as this option incorporates a reasonable and practical approach that reduces the risk to receptors until such a time that remedial objectives are met. With respect to the identified impacts in soil, it is likely that the impacts will continue to degrade and likely naturally attenuate over time given the in situ treatments that have been completed to date, as the remaining parameters are predominantly light-end PHCs and in consideration that the source of the impacts (historical infrastructure) has been removed.

Key elements of the RMP will include the following items:

1. The extent of impacts must be defined in both soil and groundwater;
2. The source of contamination must be managed;
3. All receptor pathways are identified;
4. A monitoring program must be put into place and administrative controls established to protect the public from potential exposure to the contamination; and
5. There is a commitment from the owner to undertake this plan and all third-party stakeholders are aware of and have no objection to the RMP.



5.1 Receptors

Through the exposure pathway analysis in Section 4.2, receptors of concern that will require protection through the RMP predominantly include:

- Protection against exposure to impacted soils during ground disturbance activities (dermal contact, soil ingestion, ecological contact, management limits);
- Protection against vapour inhalation for future structures on the Site;
- Protection against consumption of groundwater; and
- Protection of buried utilities and utility workers.

Protection measures for these receptors are further outlined below in Section 5.2.

Utilities may provide preferential migration pathways for groundwater and vapours given the use of coarse bedding materials. Impacted bedding materials encountered during utility work must be managed through a soil management plan (discussed further in Section 5.2.1) and new utility installations will be managed through exposure barriers and development controls (discussed further in Section 5.2.2). It is likely that those utilities beneath Railway Avenue East intersect the contaminant plume. However, given the coarse-grained nature of the surrounding lithology, these utility corridors may not be a significant migration corridor.

A summary of the pathway/receptor assessment and exposure control mechanisms is provided in Table 7, and further details are outlined in the sections below.

5.2 Source Management

The original source (former infrastructure) has largely been removed, leaving residual impacts to be managed to limit exposure of receptors. Management will involve using engineered, physical, and/or administrative controls that include but are not limited to the following:

1. Implementation of a soil management plan for any ground disturbance. Examples of ground disturbance include but are not limited to redevelopment of the lands, landscaping, re-grading or resurfacing, utility upgrades and/or repairs, and further assessment/remediation; and
2. Implementation of exposure barriers and/or development considerations, including groundwater use restrictions (as per the restrictive covenant).



The proposed management tools are outlined further below in Sections 5.2.1 and 5.2.2.

5.2.1 Soil Management Plan

For the purpose of this RMP, it should be assumed that any soils removed for utility construction or other development will be evaluated and managed separately and if required, segregated for appropriate disposal. Any soil proposed to replace removed impacted soil should be confirmed to be environmentally suitable for use (i.e., free of contaminants). The proposed management plan is as follows:

1. Notification to EAG/Site Custodian that work is to be conducted on the Site.
2. Removed soils are to be segregated and stockpiled for characterization and off-site disposal. Under no circumstances are these soils to be relocated on the Site. These stockpiles are to be stored on-site for no longer than one week in a lined containment cell and covered with a poly liner. If they are to be stored on-site for longer than one week, a lined collection trench is required around the stockpile to collect runoff. Any accumulated runoff will be collected and disposed of off-site at an approved disposal facility (i.e., injection well).
3. A representative number of composite samples of the stockpiled soils need to be collected for landfill characterization to assess potential disposal options. It is recommended that sample collection be completed by and at the discretion of a qualified environmental engineering firm following accepted industry standards for the collection of soil samples. The soil sample should be submitted to an accredited laboratory for analysis of PHCs, as well as the required landfill classification parameters (landfill specific).
4. Once characterized, the soils should be hauled off-site and disposed of at an approved landfill facility (Class II Landfill).
5. A final report should be prepared and submitted to EAG within one year of the removal. The report should outline the reason for the work being done, dates of excavation and disposal, volume of impacted soil removed, clear identification of the areas where soils were removed from, sampling methods, laboratory analysis, confirmation of the final disposal location, and restoration work of the area. In the event of utility work, confirmation should be provided that the installed utilities have been adequately protected (if required).



5.2.2 Exposure Barriers and Development Considerations

In areas where impacts will remain, the following controls are recommended:

1. Land use must remain restricted to commercial. Any change to a more sensitive land use will require a re-evaluation of available soil and groundwater data.
2. As per the restrictive covenant, only slab-on-grade building construction is permitted for any future re-development of the Site. This requirement may be re-evaluated once redevelopment plans are in progress for the Site.
3. As per the restrictive covenant, deep-rooting trees and/or plants are not permitted.
4. Where possible, it is recommended that any grading and drainage plans be reviewed to ensure that runoff is directed to appropriate collection locations, as opposed to draining off-site.
5. Where possible, PVC or other PHC-tolerant materials are recommended for new utility installations on the Site and within Railway Avenue East (adjacent the Site/areas of impact). The installation of clay plugs should be considered for utility installations within these areas, to mitigate groundwater flow along a potential migration pathway.
6. Groundwater monitoring wells must be maintained. If a groundwater monitoring well has been damaged or requires removal, it should be identified to the Site Custodian at the time of discovery (in the event of damage) or as a part of the redevelopment/construction plan and the monitoring well properly decommissioned. Groundwater monitoring wells are to be decommissioned by a qualified environmental engineering firm, following accepted industry standards. It is recommended that a final report be prepared within one year of the decommissioning. The report should outline the reason for the work being done and dates and details of the decommissioning. This is done to mitigate improper monitoring well abandonment, which may allow the monitoring well to become a conduit for potential contaminants to migrate from surface to greater depths.
7. Where possible, irrigation systems and features are recommended to be restricted.
8. Where possible, proposed water features such as dugouts and engineered ponds (stormwater ponds included) should not be allowed on the Site, unless lined and the excavated soils managed via the soil management plan.



5.3 Administrative Controls

Source management will be required for the duration of the RMP to effectively limit exposure of receptors. At this time, an administrative control is in place for the Site through the restrictive covenant, which prohibits the construction of subsurface structures, excluding therefrom any underground utility conduits or subsurface footings, potable or non-potable water wells, deep-rooting trees and/or plants, and the relocation of deeper soils to shallower depths on the Site.

5.3.1 Groundwater Use Restrictions

As per Section 2.2.1, a number of water wells were identified within an 800-m radius of the Site. Given that potable water is supplied via municipal services, these wells are not anticipated to be in use, though the possibility of their use cannot be discounted.

The Site is not presently serviced, and future development in the area will likely require connection to the municipal services. Furthermore, the restrictive covenant for the Site prohibits installation of potable and/or non-potable water wells, thus mitigating the risk present. To further facilitate risk mitigation, it is also recommended that water features for irrigation purposes also not be allowed on the Site. Given the nature of the Site and surrounding area, construction of such features is not anticipated.

5.4 Ongoing Monitoring and Contingency Measures

Ongoing monitoring will include an annual groundwater monitoring and sampling program until such a time that stable-decreasing concentrations are established at the plume periphery. Prior to implementing a long-term monitoring program, a reconnaissance to assess the condition of monitoring wells associated with the Site is recommended. Following this reconnaissance, a plan would be developed to repair or decommission monitoring wells that are damaged, no longer required for the program, or that may be impacted by proposed development of the Site.

As a part of the long-term monitoring program, all remaining available groundwater monitoring wells would be monitored for well headspace, depth to groundwater, and total depth. The proposed monitoring/sampling locations are provided on Figure 10 and the rationale for selection, plus proposed analyses, are summarized in Table 8. Reporting would be conducted in accordance with the monitoring program.

Statistical analyses (Mann-Kendall) will be utilized to evaluate the plume stability, and if the results indicate expansion of the plume via increasing trends of PHC concentrations at the periphery, additional mitigation measures will be taken. These measures may include but are not limited to:



1. Increased frequency of groundwater sampling, which may be triggered by (but not limited to) a statistically significant increase (via Mann-Kendall analyses) in PHC mass in groundwater over three events;
2. Further assessment/delineation, which may be triggered by (but not limited to) a statistically significant increase in PHC mass in groundwater at the periphery of the plume over three events;
3. Additional remedial measures, such as limited remedial excavation or in situ treatment, which may be triggered by (but not limited to) the occurrence of the two aforementioned conditions;
4. Evaluation of the addition of more monitoring wells to the program, which may be triggered by (but not limited to) a statistically significant increase in PHC mass at locations further removed from the source area over three events; and/or
5. Evaluation of the addition of more monitoring wells to the program, increased frequency, and/or further investigation, which would be triggered by the presence of NAPL in any of the monitoring wells. NAPL would otherwise be removed from the affected monitoring wells and levels tracked until such time that trends show decreasing levels. If free-phase product is detected in monitoring wells for two consecutive sampling events, further assessment would be conducted.

A proposed schedule for implementation is outlined in Table 9. After three consecutive events, should statistical analyses confirm plume stability, monitoring and sampling frequency may be reduced to once every three years (with reporting), i.e., if the third event is completed in 2025 and stability is confirmed then the next sampling event would be recommended for 2028, with reporting to follow in 2029. Frequency may be re-evaluated then after two additional sampling events if stability persists and the period between monitoring/sampling events continually increased as long as receptors continue to be protected.

Exposure controls will be evaluated on an as-needed basis as on- and off-site development continues or should the groundwater monitoring program indicate expansion of the plume. There will be a need to tailor exposure controls as development progresses, to ensure protection of receptors and any resulting changes will be submitted by EAG/Site Custodian to the regulator. Changes will also be communicated by EAG/Site Custodian to the affected stakeholders, and the Site Custodian will be responsible for execution of the RMP.

Contingency measures will largely rely on clear communication of expectations of future development plans that involve the Site. These expectations will need to be communicated via affected stakeholders.



5.5 Communication Plan and Commitment

It is recommended that the proposed RMP be reviewed by all current and/or future stakeholders including EAG/Site Custodian, the Site owner, and on/off-site parties that may be subject to restrictions. The following items included in the RMP will be communicated to affected stakeholders (individually) via the EAG representative:

- The Site history;
- Summary of assessments and location of SOPC plumes;
- Risks associated with SOPCs in soil and groundwater;
- Remedial options that were considered/executed;
- Restrictions that will be applied for exposure control measures (i.e., landscaping, utilities, engineered water features, groundwater monitoring well decommissioning, water wells);
- Soil management plan;
- Monitoring and sampling program and access agreements (if applicable);
- Contingencies; and
- Deliverables.

Maintenance of the monitoring network may include, but is not limited to, replacement of the steel protective casings, resetting steel protective casings at grade following site improvements, and decommissioning monitoring wells that are no longer able to be maintained for monitoring or sampling purposes.

At minimum, affected stakeholders should be notified of the potential for impacts (if present) and offered copies of the RMP and future monitoring reports to ensure that all parties remain informed. In addition, utility owners should also be notified of the RMP and potential for contamination. At this time, affected stakeholders include:

- The current Site Owner (Saskatchewan Valley Producer Car Corporation);
- The Town of Rosthern, wherein impacts reside beneath Railway Avenue East and subsequently affect buried utilities under the care of the Town of Rosthern (water and sanitary sewer); and
- Potentially the landowner to the southeast of the Site across Railway Avenue East (Lot 24; Block 27; Plan 101691244), as groundwater has historically been impacted west adjacent to this location.

In the event of any failure of the RMP, results and corrective actions will be communicated to the affected stakeholders and regulator via EAG/Site Custodian. Any modification of the RMP based on site-specific data will also be submitted by EAG/Site Custodian to the regulator for review and acceptance and will also be communicated by EAG/Site Custodian to the affected stakeholders, including an allowance to discuss any concerns.



6.0 REFERENCES

Throughout this project, the following resources were used:

- Canadian Council of Ministers of the Environment (CCME). 2008. National Classification System for Contaminated Sites;
- Connor, J.A., S.K. Farhat, and M. Vanderford, 2014. GSI Mann-Kendall Toolkit for Quantitative Analysis of Plume Concentration Trends. Groundwater. doi: 10.1111/gwat.12277;
- EPA Unified Guidance 530-R-09-007, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities;
- Gilbert, R.O., 1987. Statistical Methods for Environmental Pollution Monitoring. New York, van Nostrand Reinhold;
- Google Earth;
- Heath Canada, Conceptual Site Model Builder;
- Information Services Corporation;
- Interstate Technology Regulatory Cooperation. June 2001. Technical / Regulatory Guidelines, Technical and Regulatory Guidance for In-Situ Chemical Oxidation of Contaminated Soil and Groundwater;
- Ministry of Environment, Government of Saskatchewan:
 - May 2015. Guidance Document: Impacted Sites;
 - June 2015. Saskatchewan Environmental Code;
 - June 2016. Endpoint Selection Standard, Saskatchewan Environmental Code; and
 - July 2017. Saskatchewan Environmental Quality Standards;
- Saskatchewan Water Security Agency; and
- Town of Rosthern Zoning Bylaw, June 2008.



7.0 QUALIFICATIONS AND LIMITATIONS

7.1 Qualifications

Tawnya Anderson, B.Sc., EP, authored the Remediation Report, SSA, and RMP. Tawnya Anderson has a B.Sc. in Environmental Science from the University of Alberta, Augustana Faculty and more than ten years of consulting and industry experience.

Mr. Barry Rakewich, P.Ag., EP, provided peer review of the Remediation Report, SSA, and RMP. Mr. Rakewich is a registered Professional Agrologist in the province of Saskatchewan and has more than 20 years of consulting and industry experience.

7.2 Limitations

In developing the Remediation Report, Site Sensitivity Analysis, and Risk Management Plan for the Site and in rendering our conclusions on the potential presence or level of contamination, Nichols Environmental (Canada) Ltd. gives the benefit of its best judgment based on its experience and in accordance with generally accepted professional standards for this type of investigation. Our conclusions are limited by the following:

- Nichols has not been to the Site. Thus, any activities conducted on the Site following previous assessment work that Nichols is not aware of may have an impact on the conclusions and recommendations presented;
- Nichols has assumed the genuineness of the documents and that the information provided in documents or statements is true and accurate; and
- Soil and groundwater data reviewed in the context of the RMP was limited to documentation available through EnviroAnalytics Group.

This document is intended to provide information to reduce, but not necessarily eliminate, uncertainty regarding the potential for contamination of a property. This document has been prepared for the exclusive use of EnviroAnalytics Group for the purpose of assessing the current environmental conditions that may be present at the Site. Any uses that a third party makes of this document or any reliance on or decisions made based on it, are the responsibility of such third parties. Nichols Environmental (Canada) Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.



8.0 CLOSURE

We trust this meets with your current requirements. Should you have any questions or concerns, please contact the undersigned at your convenience.

Yours truly,
NICHOLS ENVIRONMENTAL (CANADA) LTD.

Tawnya Anderson, B.Sc., EP
Senior Project Manager
anderson@nichols.ca

Reviewed by:



Barry Rakewich, P.Ag., EP
President
rakewich@nichols.ca

Distribution

PDF

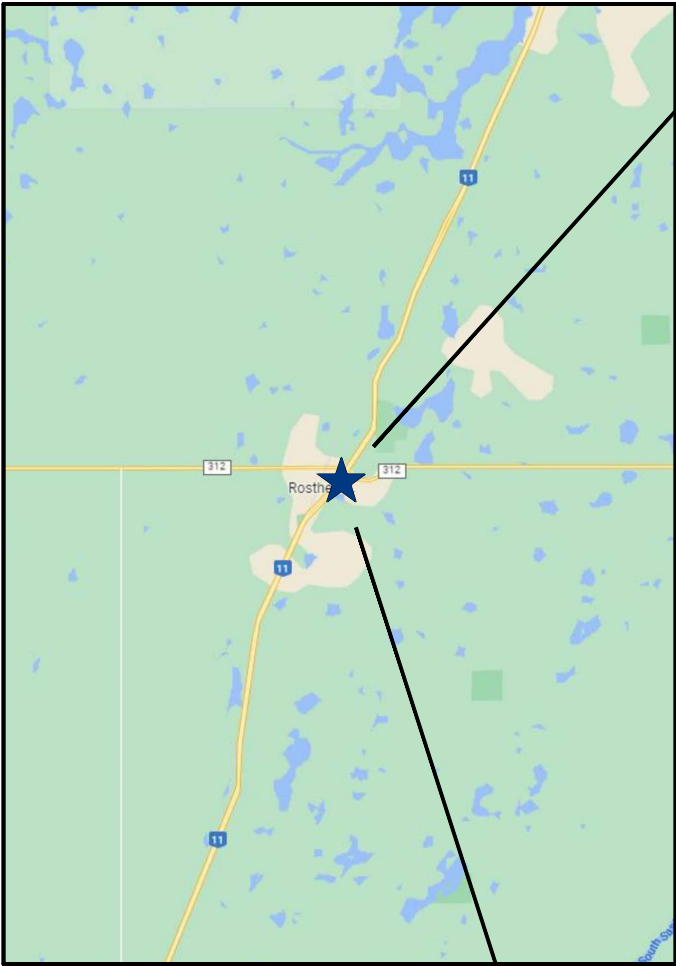
lcasabo@enviroanalyticsgroup.com

Lucia Casabo, EAG

FIGURES

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Reference image scale 1:210,000



Legend:
- - - - - Approximate Site Boundary



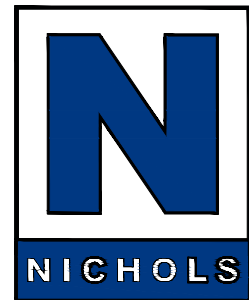
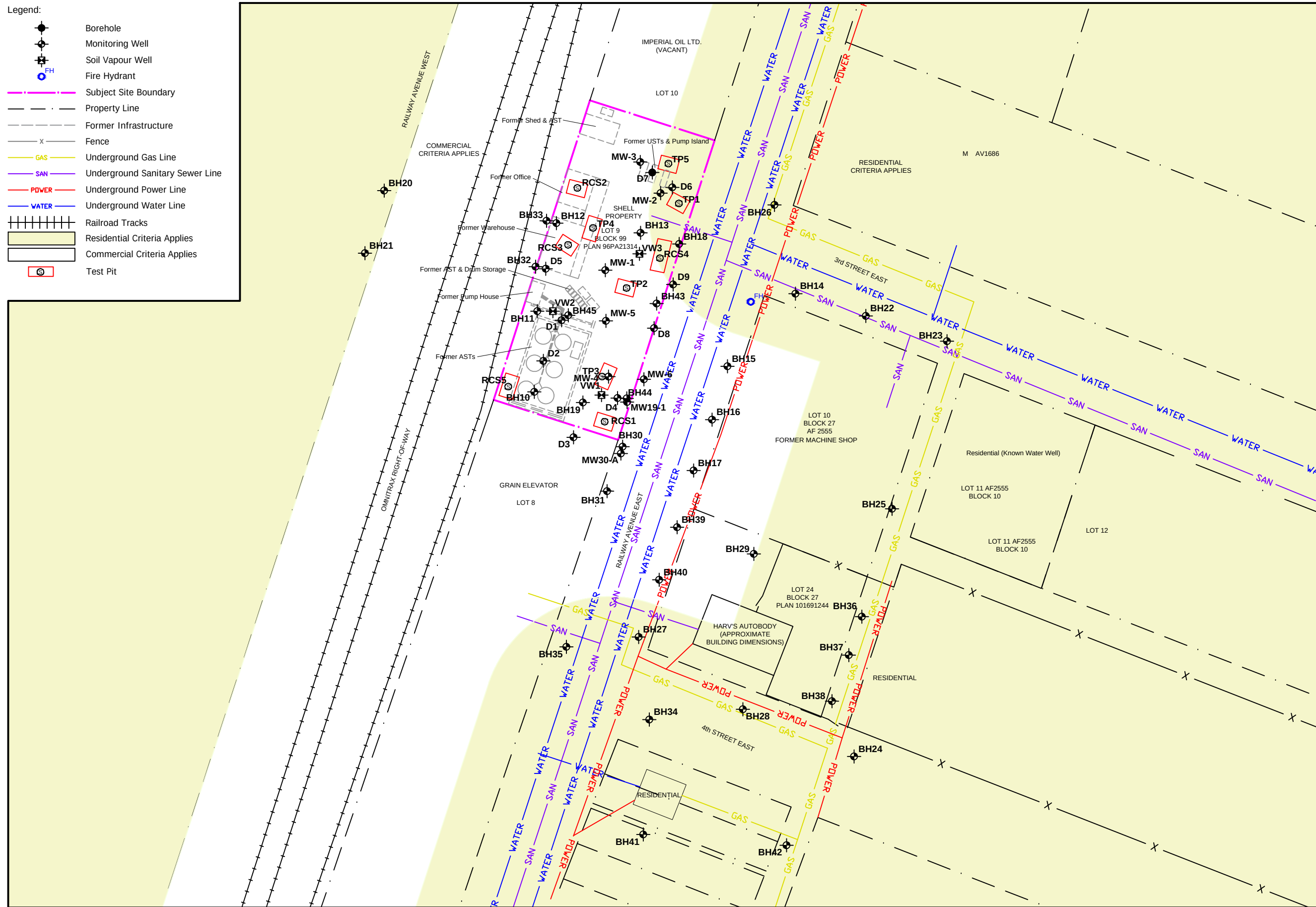
2021 Air Photo Source: Google Earth



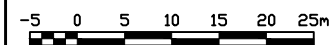
CLIENT	
EnviroAnalytics Group	
PROJECT	
Remediation Report, SSA, and RMP 810 Railway Avenue East Rosthern, Saskatchewan	
DRAWING TITLE	
Site Location and Surrounding Land Use	
BASE/SITE PLAN PROVIDED BY	
Nichols Environmental (Canada) Ltd.	
REVISION DATE	
June 2022	
SCALE	APPROVED
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Figure 1	

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- Legend:
- Borehole
 - Monitoring Well
 - Soil Vapour Well
 - Fire Hydrant
 - Subject Site Boundary
 - Property Line
 - Former Infrastructure
 - Fence
 - Underground Gas Line
 - Underground Sanitary Sewer Line
 - Underground Power Line
 - Underground Water Line
 - Railroad Tracks
 - Residential Criteria Applies
 - Commercial Criteria Applies
 - Test Pit

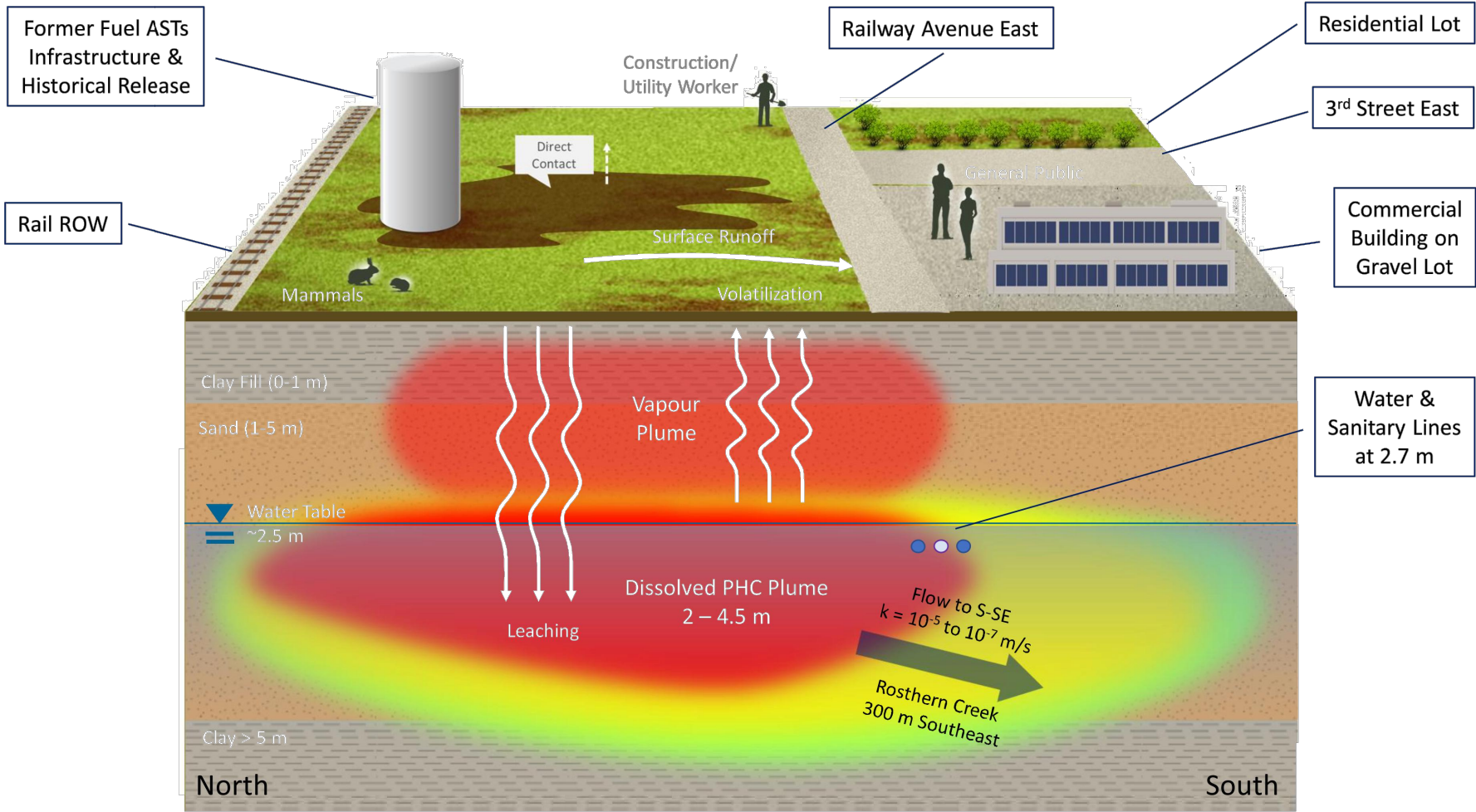


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EnviroAnalytics Group	
PROJECT	
Remediation Report, SSA, and RMP 810 Railway Avenue East Rosthern, Saskatchewan	
DRAWING TITLE	
Site Detail	
BASE/SITE PLAN PROVIDED BY	
Nichols Environmental (Canada) Ltd.	
REVISION DATE	
June 2022	
SCALE	APPROVED
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Figure 2	

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PROJECT	
Remediation Report, SSA, and RMP 810 Railway Avenue East Rosthern, Saskatchewan	
DRAWING TITLE	
Conceptual Site Model	
BASE/SITE PLAN PROVIDED BY	
Nichols Environmental (Canada) Ltd.	
REVISION DATE	
June 2022	
SCALE	APPROVED
NTS	TA/LL
PROJECT NO.	
22-129-EAG	
DRAWING NO.	
Figure 3	

\\FS1-Data\Jobs\2022\22-129-EAG\Drawings\22-129-EAG.dwg Original drawing in colour. Black and white copies may not interpret properly.

RCS2	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
01-Oct-2014	3.75	<0.0050	<0.020	<0.010	<0.040	<12	<10	<10	<10

TP4	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
31-Jul-2007	3.2	<0.0050	<0.020	<0.010	0.056	<12	<10	<10	<10

BH12	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
27-Oct-2000	3.75	<0.02	<0.02	<0.02	<0.02	NM	NM	NM	NM

BH33	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
26-Jul-2004	1.8	<0.03	0.03	<0.03	<0.05	<10	<4	<10	<300

BH20	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	2.3	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10

RCS3	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
01-Oct-2014	3.0	<0.0050	<0.020	0.024	0.65	<12	230	110	<50

BH32	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
26-Jul-2004	3.0	<0.03	<0.03	<0.03	<0.06	<10	590	920	13
4.6	<0.03	<0.03	<0.03	0.26	28	68	130	<300	

BH21	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	3.0	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10

D5	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
16-Sep-1999	3.3	0.54	8.23	10.3	65.9	NM	NM	NM	NM

BH11	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
27-Oct-2000	3.0	0.07	20.9	6.87	560	NM	NM	NM	NM
3.75	0.07	0.13	0.09	0.68	NM	NM	NM	NM	

VW2	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
21-Jun-2012	0.95	0.02	0.06	0.037	0.17	<12	<10	<10	<10
1.5	9.9	19	3.2	25	230	25,000	9,700	210	

D1	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
16-Sep-1999	3.0	24.2	545	169	977	NM	NM	NM	NM

D2	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
16-Sep-1999	3.0	<0.02	0.07	0.06	0.15	NM	NM	NM	NM

TP3	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
31-Jul-2007	2.2	<0.0050	<0.020	<0.010	<0.045	<12	<10	<10	<10
3.2	0.45	2.8	2.1	14	<12	<10	<10	<10	
3.8	0.018	<0.020	0.096	0.45	<12	<10	<10	<10	

BH10	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
27-Oct-2000	3.0	<0.02	<0.02	<0.02	<0.02	NM	NM	NM	NM

BH19	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	3.0	0.18	0.15	0.08	0.59	<10	<10.0	<10.0	<10.0

VW1	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
21-Jun-2012	1.3	0.013	0.044	0.032	0.12	<12	<10	14	<10

D4	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
16-Sep-1999	3.0	17.9	661	224	1600	NM	NM	NM	NM

BH44	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
21-Jun-2012	2.1	<0.0050	<0.020	<0.010	<0.040	<12	<10	<10	<10
3.0	0.04	0.24	0.072	0.55	<12	<10	<10	<10	
3.6	0.016	0.053	0.032	0.17	<12	<10	<10	<10	

RCS1	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
01-Oct-2014	2.6	<0.0050	<0.020	<0.010	<0.040	<12	<10	<10	<10

BH30	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
15-Aug-2003	2.3	<0.03	<0.03	<0.03	0.14	<10	<4	<10	<9

BH31	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
15-Aug-2003	3.4	<0.03	<0.03	<0.03	<0.09	<10	<4	<10	<9

BH35	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
26-Jul-2004	2.3	<0.03	<0.03	<0.03	<0.06	<10	<5	<10	<300

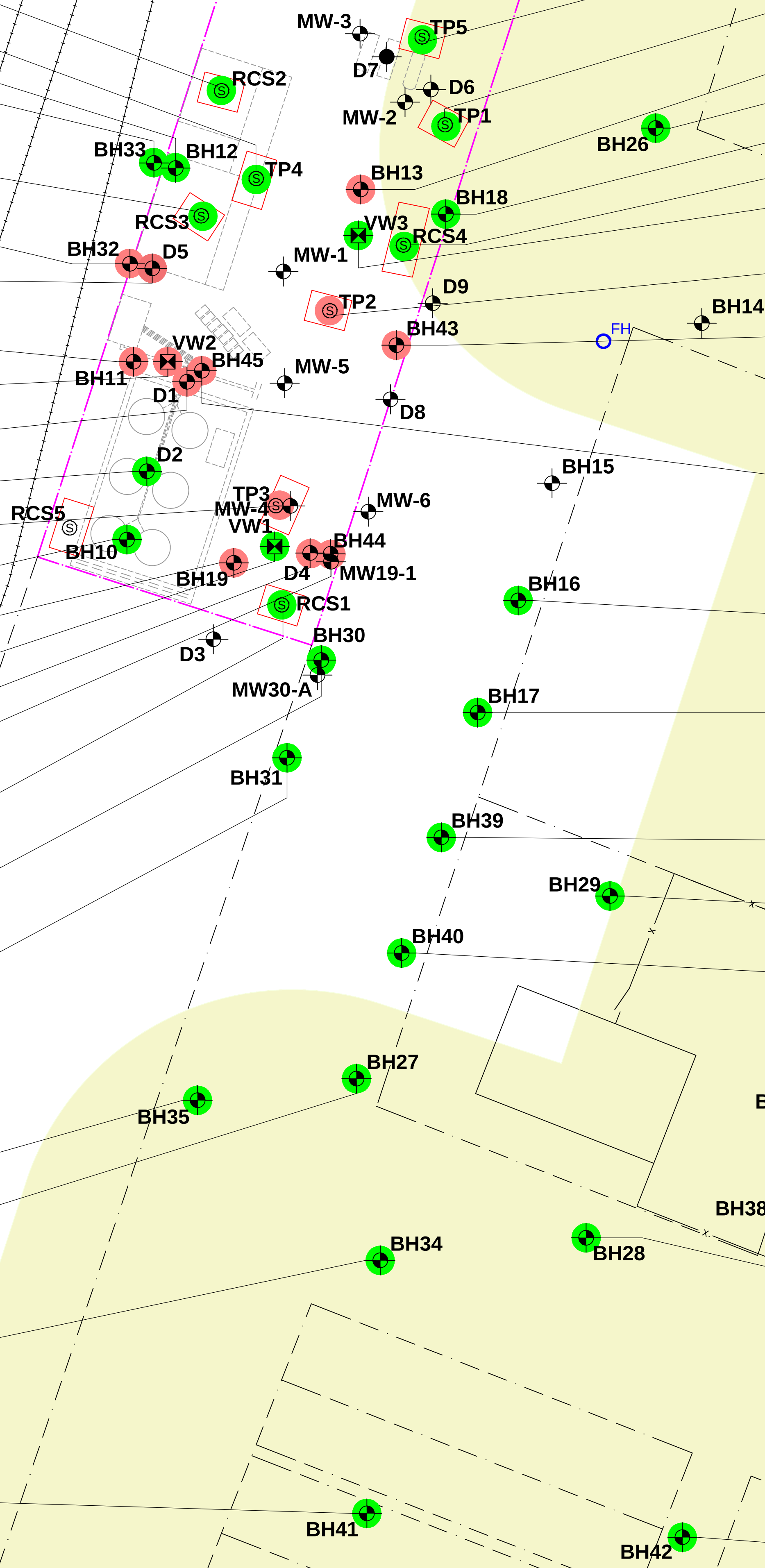
BH27	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	1.5	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10
2.3	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10	

BH34	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
26-Jul-2004	2.3	<0.03	<0.03	<0.03	<0.06	<10	<5	<10	<300

BH41	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
20-Jun-2012	1.5	<0.0050	<0.020	<0.010	<0.040	<12	<10	<10	<10

BH20

BH21



TP5	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
31-Jul-2007	3.6	<0.0050	<0.020	<0.010	<0.045	<12	<10	<10	<10

TP1	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
31-Jul-2007	2.8	<0.0050	<0.020	<0.010	<0.045	<12	<10	<10	<10

BH13	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
27-Oct-2000	3.0	0.04	0.47	0.2	0.95	NM	NM	NM	NM

BH26	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	2.3	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10

BH18	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	2.3	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10

RCS4	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
01-Oct-2014	2.6	<0.0050	<0.020	<0.010	<0.040	<12	<10	<10	<10

VW3	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
21-Jun-2012	0.8	<0.0050	<0.020	<0.010	<0.040	<12	<10	<10	<10

TP2	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
31-Jul-2007	0.5	0.11	0.048	0.26	0.64	<12	509	503	<10
3.2	<0.0050	0.021	0.093	0.95	<12	<10	<10	<10	
4.2	<0.0050	<0.020	<0.010	<0.045	<12	<10	<10	<10	

BH43	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
21-Jun-2012	2.8	0.013	0.023	0.42	1.1	<12	13	<10	<10
3.75	<0.0050	<0.020	<0.010	<0.040	<12	<10	<10	<10	

BH22	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	3.0	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10

BH23	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	3.0	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10

BH45	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
21-Jun-2012	2.2	<0.0050	<0.020	<0.010	<0.040	<12	<10	<10	<10
3.0	5.5	570	350	2,000	7,000	15,000	3,800	<10	
3.6	0.028	0.65	0.48	2.5	<12	12	<10	<10	
4.5	0.016	0.041	0.035	0.13	<12	<10	<10	<10	

BH16	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
30-Nov-2000	2.4	<0.02	<0.02	<0.02	<0.02	NM	NM	NM	NM

BH17	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
30-Nov-2000	4.25	<0.02	<0.02	<0.02	<0.02	NM	NM	NM	NM

BH25	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	1.5	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10

BH39	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
22-Aug-2006	1.75	0.076	<0.025	<0.012	<0.055	<15	<10	<10	<10

BH29	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	1.5	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10

BH40	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
22-Aug-2006	3.75	<0.0063	<0.025	<0.013	<0.056	<15	<10	<10	<10

BH36	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
22-Aug-2006	2.75	<0.0066	<0.027	<0.013	<0.059	<16	<10	<10	<10

BH37	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
22-Aug-2006	0.75	<0.0059	<0.023	<0.012	<0.053	<14	<10	<10	<10
3.0	<0.0060	<0.024	<0.012	<0.054	<14	<10	<10	<10	

BH38	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
22-Aug-2006	2.75	<0.0063	<0.025	<0.013	<0.056	<15	<10	<10	<10

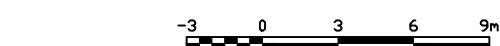
BH28	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	1.5	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10

BH24	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
28-Aug-2002	1.5	<0.04	<0.04	<0.04	<0.04	<10	<10	<10	<10

BH42	Depth (mbg)	B	T	E	X	PHC F1	PHC F2	PHC F3	PHC F4
20-Jun-2012	2.25	<0.0050	<0.020	<0.010	<0.040	<12	<10	<10	<10

- Legend:
- Borehole
 - Monitoring Well
 - Soil Vapour Well
 - Fire Hydrant
 - Subject Site Boundary
 - Property Line
 - Former Infrastructure
 - Fence
 - Railroad Tracks
 - Residential Criteria Applies
 - Commercial Criteria Applies
 - Test Pit
 - Exceeds Guidelines
 - Below Guidelines

2017 EQG Tier 2		
Coarse Grained		
Surface Soil	Com	Res
Benzene	0.078	0.073
Toluene		0.12
Ethylbenzene		0.14
Xylenes		1.9
PHC F1	240	30
PHC F2	260	150
PHC F3	1700	300
PHC F4	3300	2800
Subsoil		
Benzene		0.078
Toluene		0.12
Ethylbenzene		0.14
Xylenes		1.9
PHC F1	240	30
PHC F2	320	150
PHC F3	3500	2500
PHC F4		10000



CLIENT

EnviroAnalytics Group

PROJECT

Remediation Report, SSA, and RMP
810 Railway Avenue East
Rosthern, Saskatchewan

DRAWING TITLE

Historical Soil PHC Data

BASE/SITE PLAN PROVIDED BY

Nichols Environmental (Canada) Ltd.

REVISION DATE

June 2022

SCALE

1:300

APPROVED

TA/LL

PROJECT NO.

22-129-EAG

DRAWING NO.

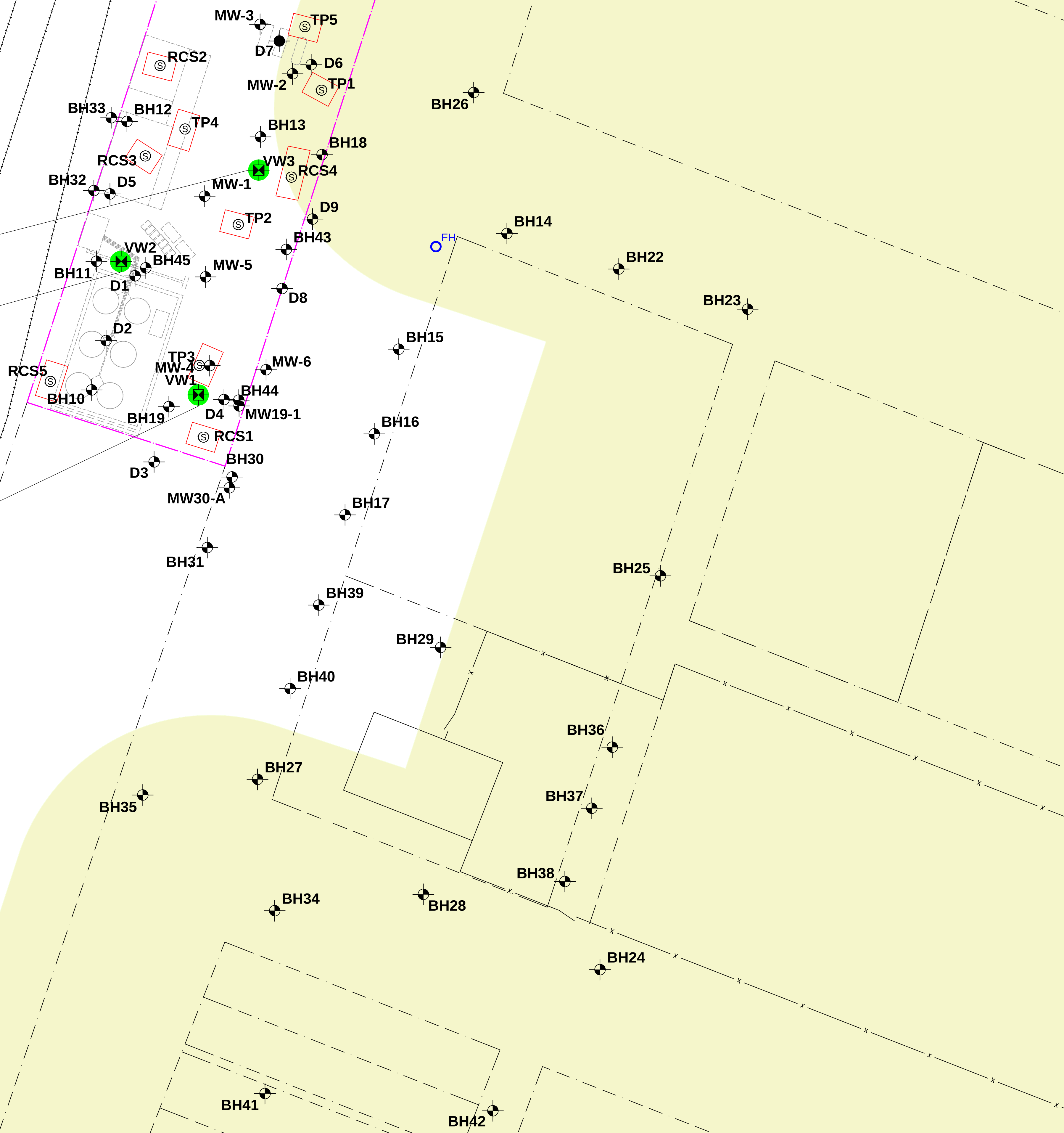
Figure 4

\\FS1\Data\Jobs\2022\22-129-EAG\Drawings\22-129-EAG.dwg Original drawing in colour. Black and white copies may not interpret properly.

VW3	Depth (mbg)	B	T	E	X	PHC F1	PHC F2
24-Jul-2012		< 2.6	< 3.5	< 3.5	< 4.8	49	105
30-Oct-2012	1.5 - 1.8	< 9.1	1620	65	242	< 38	< 38
07-Oct-2014		< 3.3	3.7	< 3.3	< 10	NM	NM

VW2	Depth (mbg)	B	T	E	X	PHC F1	PHC F2
24-Jul-2012		< 1,400	158000	29600	166000	3100000	50600
24-Jul-2012		2240	140000	25300	143000	2800000	45400
30-Oct-2012	1.5 - 1.8	1590	132000	31000	154000	2700000	26200
30-Oct-2012		1980	157000	36600	182000	3270000	68000
07-Oct-2014		1440	9560	17500	47300	NM	NM

VW1	Depth (mbg)	B	T	E	X	PHC F1	PHC F2
24-Jul-2012		Well Flooded					
30-Oct-2012	1.0 - 1.3	< 41	< 150	< 54	< 180	84000	< 170
30-Oct-2012		< 42	< 153	< 55	< 183	85552	< 173
07-Oct-2014		< 3.3	8	< 3.3	< 10	NM	NM



- Legend:
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 - Below Guidelines

Intrinsik (2016)			
Coarse Grained Commercial			
Soil Vapour	1.0 m	1.5 m	2.0 m
	ug/m ³		
Benzene	2.1E+04	2.4E+04	2.7E+04
Toluene	1.3E+07	1.5E+07	1.7E+07
Ethylbenzene	3.6E+06	4.2E+06	4.8E+06
Xylenes	6.4E+05	7.4E+05	8.4E+05
PHC F1 (C6-C8)	7.7E+07	9.3E+07	1.1E+08
PHC F1 (>C8-C10)	4.0E+06	4.9E+06	5.7E+06



CLIENT	EnviroAnalytics Group
PROJECT	Remediation Report, SSA, and RMP 810 Railway Avenue East Rosthern, Saskatchewan
DRAWING TITLE	Historical Soil Vapour PHC Data
BASE/SITE PLAN PROVIDED BY	Nichols Environmental (Canada) Ltd.
REVISION DATE	June 2022
SCALE	1:300
APPROVED	T/LL
PROJECT NO.	22-129-EAG
DRAWING NO.	Figure 5

\\FS1\Data\Jobs\2022\22-129-EAG\Drawings\22-129-EAG.dwg Original drawing in colour. Black and white copies may not interpret properly.

BH13									
B	T	E	X	PHC F1	PHC F2				
26-Jul-2003	<0.001	<0.009	<0.002	NM	NM				
14-Aug-2005	<0.001	<0.004	<0.004	<0.008	<0.1				
30-Aug-2005	<0.001	<0.004	<0.004	<0.008	<0.1				
D5									
B	T	E	X	PHC F1	PHC F2				
16-Sep-1999	0.0033	0.21	1.01	10.2	NM				
29-Aug-2002	0.0033	0.0146	0.0007	0.07	NM				
11-Jun-2004	<0.001	<0.001	0.0006	0.0183	NM				
30-Aug-2005	<0.001	<0.001	<0.004	0.0176	0.2				
02-Jun-2009	<0.001	<0.001	<0.001	0.0024	<0.1				
13-Aug-2009	<0.001	<0.001	<0.001	0.0014	<0.1				
03-Jul-2014	<0.001	<0.001	<0.001	<0.008	<0.1				
BH12									
B	T	E	X	PHC F1	PHC F2				
26-Jul-2003	<0.001	0.0009	0.0054	0.224	NM				
21-Jun-2005	<0.001	<0.001	0.0006	0.0166	NM				
30-Aug-2005	<0.001	<0.001	0.0007	0.0172	<0.1				
30-Aug-2006	<0.001	<0.001	<0.001	0.005	<0.1				
01-Aug-2007	<0.001	<0.001	<0.001	<0.008	<0.1				
BH11									
B	T	E	X	PHC F1	PHC F2				
01-Dec-2000	0.0015	2.17	0.703	11.3	NM				
10-Jul-2001	0.0132	0.181	0.1	3	NM				
07-Nov-2001	0.0044	0.0007	0.0191	0.0307	NM				
29-Aug-2002	0.0033	0.0024	0.0071	0.049	NM				
03-Jul-2003	<0.002	0.001	0.002	0.01	NM				
11-Sep-2003	0.0007	0.0009	0.0005	0.0078	NM				
13-Nov-2003	<0.002	0.009	0.0024	0.074	NM				
13-Jun-2004	<0.001	0.0009	0.0002	0.005	NM				
26-Jul-2004	<0.001	0.0027	0.02	1.3	NM				
05-Oct-2004	<0.009	0.127	0.019	2.15	NM				
10-May-2005	<0.002	0.004	0.008	0.48	0.2				
25-Aug-2005	<0.009	0.0021	0.0093	0.734	0.7				
05-Oct-2005	<0.002	0.002	0.008	0.498	0.2				
29-Aug-2006	<0.002	0.015	0.009	0.94	0.3				
03-Aug-2007	<0.002	0.011	0.021	0.89	0.8				
08-Jul-2008	<0.001	0.0077	0.034	0.58	0.4				
16-Sep-2008	<0.009	0.0053	0.01	0.48	0.5				
02-Jun-2009	<0.001	0.0012	0.009	0.18	0.5				
13-Aug-2009	<0.001	0.0032	0.0086	0.37	0.5				
06-May-2010	<0.001	0.0005	0.0064	0.32	0.5				
30-Jun-2011	<0.001	0.0011	0.0066	0.12	0.2				
25-Jul-2012	<0.001	0.0019	0.34	0.94	0.5				
03-Jul-2014	<0.001	0.0008	0.008	1.3	0.5				
02-Jun-2015	<0.001	0.0015	0.002	0.16	0.6				
06-Oct-2015	<0.001	0.0013	0.004	0.76	0.9				
05-May-2016	<0.001	0.00076	0.016	0.31	0.46				
24-May-2017	<0.001	0.0012	0.023	0.39	0.58				
D1									
B	T	E	X	PHC F1	PHC F2				
25-Aug-2005	0.124	0.656	0.441	2.01	1.9				
13-Aug-2009	0.038	1.1	0.37	2.7	<0.1				
06-May-2010	0.0497	0.39	0.021	0.9	1.1				
26-Jun-2011	0.0451	0.39	0.17	1.3	1.1				
02-Jun-2015	0.001	0.096	0.16	1.5	1.3				
06-Oct-2015	0.0012	0.01	0.12	0.85	0.98				
05-May-2016	<0.001	0.01	0.001	0.41	0.76				
24-May-2017	0.00055	0.017	0.18	0.8	1.5				
20-Oct-2018	0.001	0.011	0.29	1.3	2				
19-Oct-2019	0.00011	0.0102	0.42	0.49	1.3				
22-Jun-2020	<0.001	0.0024	0.23	1.1	2.5				
03-Jul-2021	<0.001	0.0058	0.077	0.34	0.81				
D2									
B	T	E	X	PHC F1	PHC F2				
10-Jul-2001	0.0046	0.006	<0.0002	NM	NM				
21-Jun-2005	<0.001	<0.001	<0.001	0.0111	NM				
25-Aug-2005	<0.001	0.005	0.0008	0.028	<0.1				
02-Jun-2009	<0.001	<0.001	<0.001	0.0044	<0.1				
13-Aug-2009	<0.001	<0.001	<0.001	0.0032	<0.1				
02-Jun-2015	<0.001	0.0018	0.0012	0.011	<0.10				
06-May-2016	<0.001	0.0009	0.0015	0.04	<0.10				
05-May-2016	<0.001	0.0008	0.0045	0.03	0.1				
24-May-2017	<0.001	0.012	0.017	0.07	0.16				
20-Oct-2018	<0.001	0.0048	0.01	0.024	0.14				
19-Oct-2019	<0.001	0.0013	0.0067	0.037	<0.1				
22-Jun-2020	<0.001	<0.001	0.0015	0.0086	<0.10				
03-Jul-2021	<0.001	0.0033	0.004	0.1	0.23				
BH10									
B	T	E	X	PHC F1	PHC F2				
20-May-2000	<0.0002	0.0005	0.0016	0.0002	NM				
01-Dec-2000	<0.0002	0.0005	0.0016	0.0002	NM				
07-Nov-2001	<0.0002	<0.0002	<0.0002	<0.0002	NM				
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM				
03-Jul-2003	<0.001	<0.001	<0.001	<0.001	NM				
11-Sep-2003	<0.001	0.0018	0.0012	0.011	<0.10				
13-Nov-2003	<0.001	0.0009	0.0015	0.04	<0.10				
05-May-2016	<0.001	0.0008	0.0045	0.03	0.1				
24-May-2017	<0.001	0.012	0.017	0.07	0.16				
20-Oct-2018	<0.001	0.0048	0.01	0.024	0.14				
19-Oct-2019	<0.001	0.0013	0.0067	0.037	<0.1				
22-Jun-2020	<0.001	<0.001	0.0015	0.0086	<0.10				
03-Jul-2021	<0.001	0.0033	0.004	0.1	0.23				
BH19									
B	T	E	X	PHC F1	PHC F2				
26-Aug-2002	0.006	0.099	0.108	0.029	NM				
03-Jul-2003	0.785	0.573	0.556	0.83	NM				
11-Sep-2003	0.056	0.032	0.18	1.064	NM				
13-Nov-2003	0.009	0.007	0.005	0.502	NM				
13-Jun-2004	0.161	0.0165	0.114	0.68	NM				
26-Jul-2004	0.117	0.011	0.189	0.962	NM				
05-Oct-2004	0.026	0.004	0.005	0.426	NM				
30-Aug-2005	0.296	0.004	0.145	1.4	0.5				
05-Oct-2005	0.069	0.004	0.169	0.664	0.3				
29-Aug-2006	0.149	0.004	0.164	0.78	0.2				
01-Aug-2007	0.012	0.0025	0.0184	0.0358	0.3				
08-Jul-2008	0.037	0.008	0.24	0.72	0.6				
16-Sep-2008	0.037	0.008	0.24	0.72	0.6				
02-Jun-2009	0.01	0.004	0.028	0.2	0.2				
13-Aug-2009	0.1	0.91	0.61	1.8	2.7				
06-May-2010	0.0026	0.029	0.031	0.11	0.4				
30-Jun-2011	0.0009	0.02	0.021	0.13	0.6				
25-Jul-2012	0.0009	0.02	0.21	0.7	0.8				
02-Jun-2014	0.062	1.2	0.49	2	1.7				
02-Jun-2015	0.39	3.3	0.38	1.2	1.3				
06-May-2016	1.49	0.6	0.6	1.2	1.4				
24-May-2017	0.49	3.5	0.66	3.1	4.3				
D4									
B	T	E	X	PHC F1	PHC F2				
16-Sep-1999	5.4	20.2	2.13	17.7	NM				
24-Sep-1999	2.4	10.2	2.3	16.4	NM				
10-Jul-2001	7.03	0.928	0.343	9.905	NM				
10-Jul-2001	1.65	0.43	0.018	1.17	NM				
07-Nov-2001	0.233	0.149	0.432	1.4	NM				
29-Aug-2002	0.001	0.004	0.003	0.02	<0.1				
29-Aug-2006	1.37	1.37	0.78	2.83	<0.1				
02-Jun-2009	1.1	1.6	0.55	3.2	1.7				
13-Aug-2009	0.001	0.001	0.001	0.001	<0.1				
06-May-2010	0.0019	0.057	0.007	0.018	<0.1				
30-Jun-2011	0.07	0.65	0.27	1.4	0.7				
25-Jul-2012	0.001	0.001	0.001	0.001	<0.1				
02-Jun-2014	0.36	0.41	0.29	1.2	0.95				
02-Jun-2015	0.34	0.3	0.12	0.72	0.67				
06-May-2016	0.04	0.4	0.4	0.8	0.46				
05-May-2016	0.16	0.1	0.048	0.25	0.31				
24-May-2017	0.08	1.5	0.26	2.7	1.8				
MW19-2									
B	T	E	X	PHC F1	PHC F2				
20-May-2000	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
BH10									
B	T	E	X	PHC F1	PHC F2				
1-Jun-2003	0.054	0.04	0.097	0.04	NM				
05-Oct-2005	0.162	0.045	0.146	0.62	0.5				
05-Oct-2005	0.064	0.038	0.063	0.47	0.2				
29-Aug-2006	0.04	0.047	0.15	0.37	NM				
02-Jun-2009	0.001	0.001	0.001	0.001	<0.1				
06-May-2010	0.0047	0.013	0.028	0.056	0.4				
25-Jul-2012	<0.001	<0.001	<0.001	<0.001	<0.1				
02-Jun-2014	0.001	0.001	0.001	0.001	<0.1				
02-Jun-2015	0.004	0.085	0.24	1.1	0.9				
06-May-2016	0.001	0.001	0.004	0.09	0.2				
03-Jul-2014	0.2	0.051	0.078	0.37	0.15				
MW19-3									
B	T	E	X	PHC F1	PHC F2				
20-May-2000	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9	1.1	2.2				
03-Jul-2003	0.064	0.03	0.9						

Original drawing in colour. Black and white copies may not interpret properly.

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BH20	B	T	E	X	PHC F1	PHC F2
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
08-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1

BH21	B	T	E	X	PHC F1	PHC F2
26-Jul-2000	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
11-Sep-2003	0.001	0.001	0.0013	0.0077	NM	NM
13-Nov-2003	<0.0004	<0.0004	<0.0004	<0.0012	NM	NM
05-Oct-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
21-Jun-2005	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
01-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
08-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
03-Jul-2014	<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15

D9	B	T	E	X	PHC F1	PHC F2
29-Aug-2002	<0.0002	0.0178	0.0011	0.0609	NM	NM
03-Jul-2003	0.0018	0.0018	0.0026	0.056	NM	NM
11-Sep-2003	0.001	0.008	0.0052	0.273	NM	NM
13-Nov-2003	0.001	0.002	0.0016	0.1035	NM	NM
26-Jul-2004	<0.0004	0.0037	0.0012	0.216	NM	NM
05-Oct-2004	<0.0004	0.0016	0.0007	0.129	NM	NM
21-Jun-2005	<0.0004	<0.0004	<0.0004	0.052	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	0.0103	<0.1	<0.1
23-Aug-2006	<0.0004	<0.0004	0.0016	0.0059	<0.1	<0.13
20-Jun-2009	<0.0004	<0.0004	0.0007	<0.0008	<0.1	<0.1
13-Aug-2009	0.0006	<0.0004	0.0011	<0.0008	<0.1	<0.1
06-May-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
14-Sep-2010	0.0068	<0.0004	0.0011	0.0046	<0.1	<0.1
28-Jun-2011	0.016	0.0013	0.041	0.07	0.2	<0.1
28-Sep-2011	0.0007	<0.0004	<0.0004	<0.0008	<0.1	<0.1
25-Jul-2012	0.03	0.00087	0.022	0.042	<0.10	0.2
29-Oct-2012	0.00084	<0.00040	<0.00040	<0.00080	<0.10	<0.10
02-Jun-2015	<0.0004	<0.0004	0.0015	0.0094	<0.10	3
06-Oct-2015	<0.0004	<0.0004	0.00094	0.0032	<0.10	1.5
05-May-2016	<0.0004	<0.0004	0.0011	0.0022	0.11	130
24-May-2017	<0.0004	<0.0004	<0.0006	<0.00095	<0.10	1.7

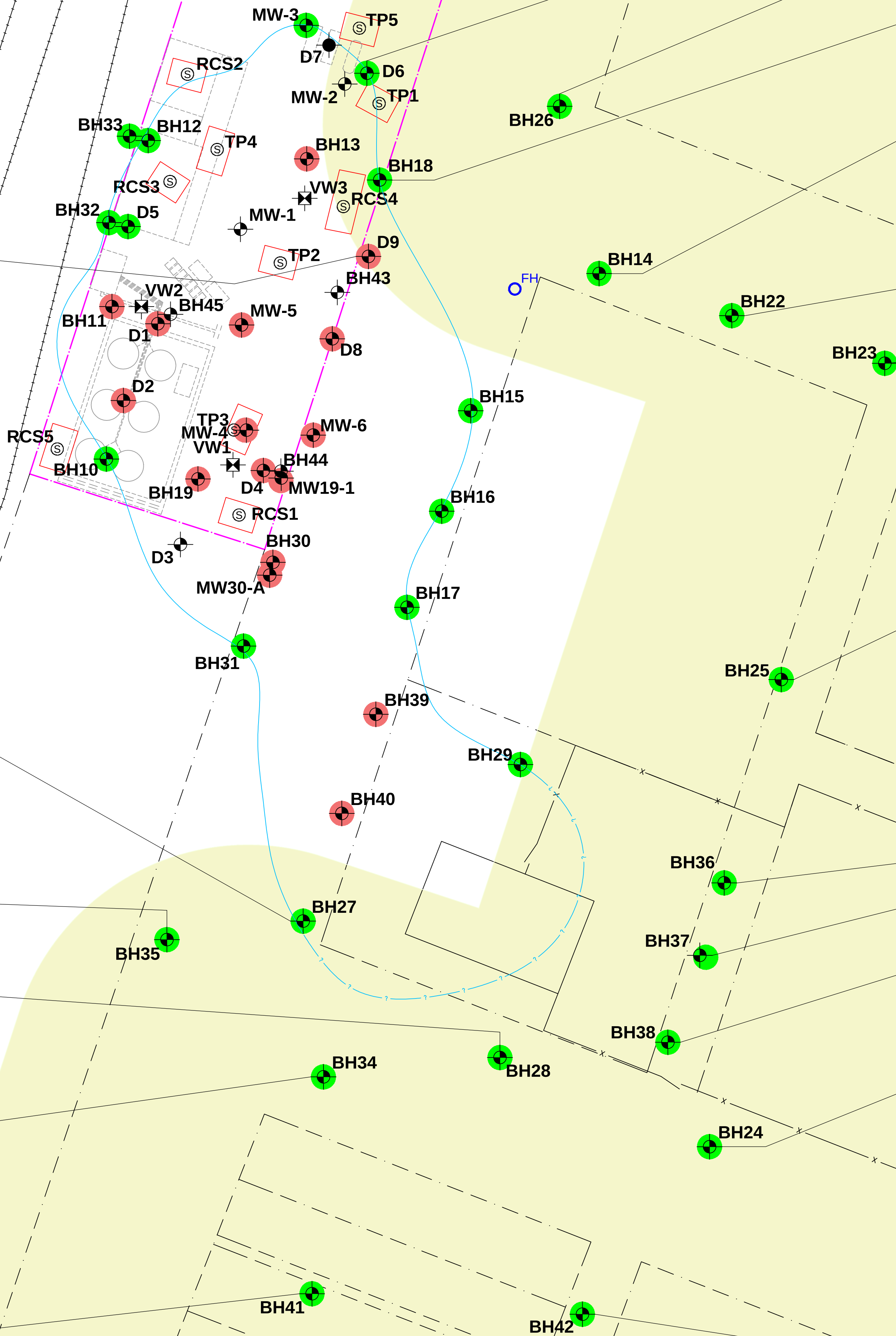
BH27	B	T	E	X	PHC F1	PHC F2
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
03-Jul-2003	<0.0004	<0.0004	<0.0004	<0.0012	NM	NM
19-Feb-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
26-Jul-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
23-Aug-2006	0.124	<0.0004	<0.0004	<0.0008	<0.1	<0.13
01-Aug-2007	0.0948	<0.0004	<0.0004	<0.0008	<0.1	<0.12
08-Jul-2008	0.025	<0.0004	<0.0004	<0.0008	<0.1	<0.1
02-Jun-2009	0.0026	0.0019	<0.0004	0.0016	<0.1	<0.1
13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
06-May-2010	0.0015	0.0007	<0.0004	0.0013	<0.1	<0.1
14-Sep-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
28-Jun-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
28-Sep-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
18-May-2012	0.029	0.0016	0.0013	0.0041	<0.10	<0.10
26-Jul-2012	0.19	0.0011	0.03	0.076	0.25	<0.10
29-Oct-2012	0.57	0.00086	<0.00040	0.0049	<0.10	<0.10
02-Jun-2015	0.074	0.0019	<0.0004	0.0012	<0.10	<0.10
20-Oct-2019	0.23	<0.0004	<0.0004	0.004	<0.10	<0.10
22-Jun-2020	0.35	0.0017	0.00073	0.0041	<0.10	<0.10
03-Jul-2021	0.0022	<0.0004	<0.0004	<0.00089	<0.10	<0.10

BH35	B	T	E	X	PHC F1	PHC F2
26-Jul-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
29-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
16-Sep-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1

BH28	B	T	E	X	PHC F1	PHC F2
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
05-Oct-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
01-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
08-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
16-Sep-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1

BH34	B	T	E	X	PHC F1	PHC F2
26-Jul-2004	<0.0009	<0.0009	<0.0009	<0.002	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
01-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
08-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
02-Jun-2009	0.15	0.0005	0.0004	0.0076	<0.1	<0.1
13-Aug-2009	0.038	<0.0004	<0.0004	<0.0008	<0.1	<0.1
06-May-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
14-Sep-2010	0.0007	<0.0004	<0.0004	<0.0008	<0.1	<0.1
28-Jun-2011	0.063	<0.0004	<0.0004	<0.0008	<0.1	<0.1
18-May-2012	0.0099	0.00077	0.00067	0.002	<0.10	<0.10
26-Jul-2012	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
30-Oct-2012	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10

BH41	B	T	E	X	PHC F1	PHC F2
25-Jul-2012	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10



D6	B	T	E	X	PHC F1	PHC F2
07-Nov-2001	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
21-Jun-2005	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
29-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1

BH26	B	T	E	X	PHC F1	PHC F2
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.1
08-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
03-Jul-2014	<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15

BH18	B	T	E	X	PHC F1	PHC F2
29-Aug-2002	<0.0002	0.0028	<0.0002	<0.0002	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
08-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
02-Jun-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
03-Jul-2014	<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15

BH14	B	T	E	X	PHC F1	PHC F2
01-Dec-2000	0.0044	0.0032	0.0026	0.0113	NM	NM
07-Nov-2001	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
01-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
02-Jun-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
20-Oct-2018	<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
20-Oct-2019	<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
22-Jun-2020	<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10

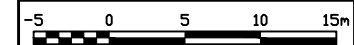
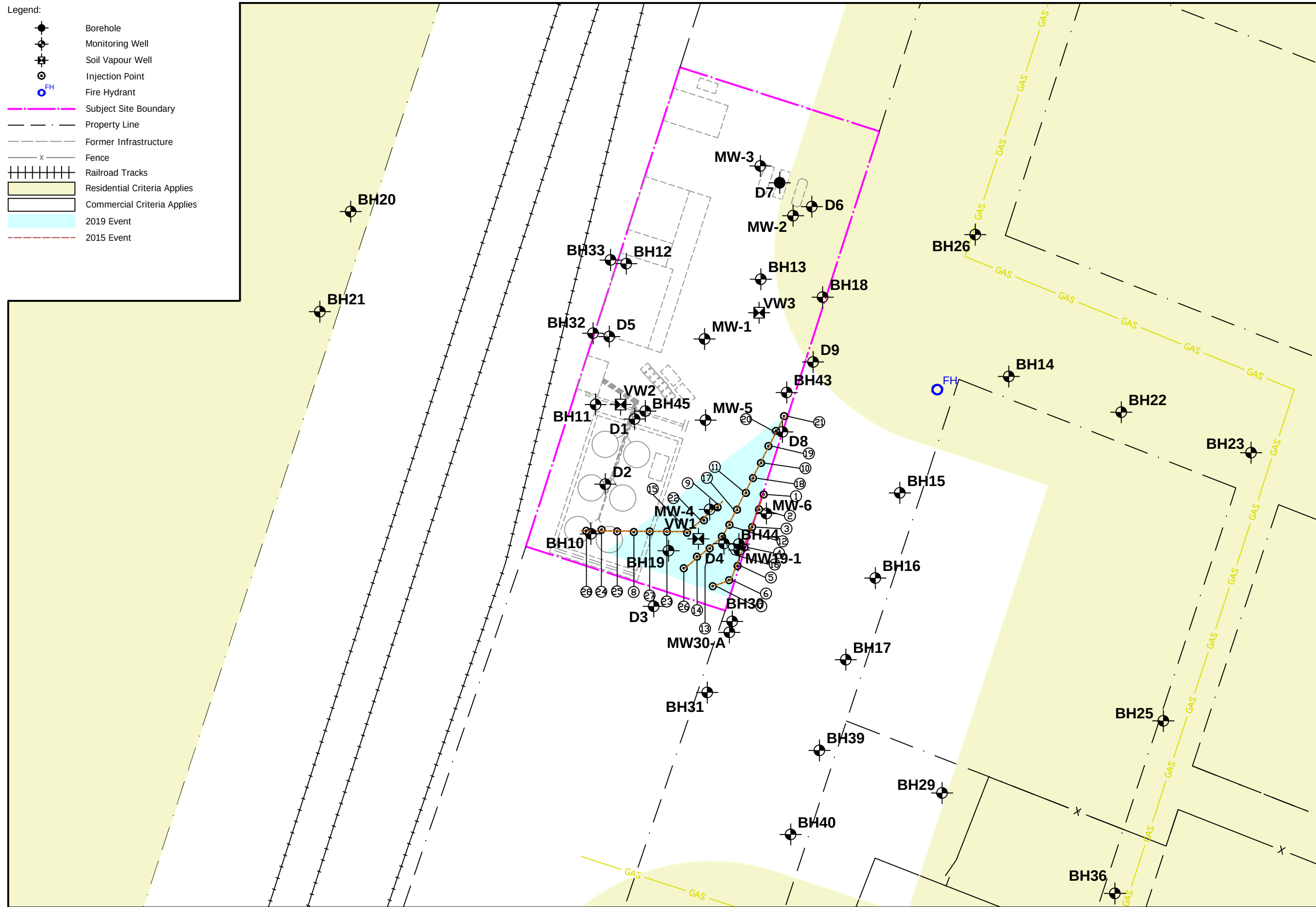
BH22	B	T	E	X	PHC F1	PHC F2
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13

BH23	B	T	E	X	PHC F1	PHC F2
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
26-Jul-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
05-Oct-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
06-Oct-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
01-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
08-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
02-Jun-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
06-May-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
14-Sep-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
28-Jun-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
28-Sep-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
25-Jul-2012	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
29-Oct-2012	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10

BH25	B	T	E	X	PHC F1	PHC F2
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
26-Jul-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
05-Oct-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
06-Oct-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
01-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
08-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
16-Sep-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
02-Jun-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
06-May-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
14-Sep-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
28-Jun-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
28-Sep-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
25-Jul-2012	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10

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- Legend:
- Borehole
 - Monitoring Well
 - Soil Vapour Well
 - Injection Point
 - Fire Hydrant
 - Subject Site Boundary
 - Property Line
 - Former Infrastructure
 - Fence
 - Railroad Tracks
 - Residential Criteria Applies
 - Commercial Criteria Applies
 - 2019 Event
 - 2015 Event



CLIENT	
EnviroAnalytics Group	
PROJECT	
Remediation Report, SSA, and RMP 810 Railway Avenue East Rosthern, Saskatchewan	
DRAWING TITLE	
In Situ Injection Areas (2015 and 2019)	
BASE/SITE PLAN PROVIDED BY	
Nichols Environmental (Canada) Ltd.	
REVISION DATE	
June 2022	
SCALE	APPROVED
1:500	TA/LL
PROJECT NO.	
22-129-EAG	
DRAWING NO.	
Figure 8	

\\FS1\Data\Jobs\2022\22-129-EAG\Drawings\22-129-EAG.dwg Original drawing in colour. Black and white copies may not interpret properly.

D1	B	T	E	X	PHC F1	PHC F2
25-Aug-2005	0.124	0.656	0.441	2.01	1.9	0.4
13-Aug-2009	0.038	1.1	0.37	2.7	<0.1	1.2
06-May-2010	0.0087	0.3	0.091	0.9	1.1	0.5
28-Jun-2011	0.0051	0.39	0.17	1.3	1.1	1.2
02-Jun-2015	0.0021	0.095	0.16	1.5	1.3	1.4
06-Oct-2015	0.0012	0.03	0.12	0.85	0.98	1.3
05-May-2016	<0.0004	0.01	0.093	0.41	0.76	1.3
24-May-2017	0.00055	0.017	0.18	0.8	1.5	1.1
20-Oct-2018	0.001	0.031	0.29	1.3	2	1.6
19-Oct-2019	0.00061	0.016	0.22	0.93	1.3	1.1
22-Jun-2020	<0.0004	0.024	0.23	1.1	2.5	2.1
03-Jul-2021	<0.0004	0.0058	0.077	0.34	0.81	1.6

D2	B	T	E	X	PHC F1	PHC F2
10-Jul-2001	0.0046	0.006	<0.0002	NM	NM	NM
21-Jun-2005	<0.0004	<0.0004	<0.0004	0.0111	NM	NM
25-Aug-2005	<0.0004	0.005	0.0008	0.028	<0.1	<0.1
02-Jun-2009	<0.0004	<0.0004	<0.0004	0.0044	<0.1	<0.1
13-Aug-2009	<0.0004	<0.0004	<0.0004	0.0032	<0.1	<0.1
02-Jun-2015	<0.0004	0.0018	0.0012	0.011	<0.10	<0.10
06-Oct-2015	<0.0004	0.0009	0.0015	0.014	<0.10	<0.10
05-May-2016	<0.0004	0.0028	0.0045	0.033	0.1	<0.10
24-May-2017	<0.0004	0.012	0.017	0.07	0.16	0.12
20-Oct-2018	<0.0004	0.0048	0.031	0.094	0.19	0.14
19-Oct-2019	<0.0004	0.0013	0.0067	0.037	<0.1	<0.10
22-Jun-2020	<0.0004	<0.0004	0.0015	0.0086	<0.10	<0.10
03-Jul-2021	<0.0004	0.0033	0.024	0.1	0.23	0.16

BH10	B	T	E	X	PHC F1	PHC F2
20-May-2000	<0.0002	0.0005	0.0016	0.0022	NM	NM
01-Dec-2000	<0.0002	0.0005	0.0016	0.0022	NM	NM
07-Nov-2001	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
03-Jul-2003	<0.0004	<0.0004	<0.0004	<0.0015	NM	NM
11-Sep-2003	<0.006	0.21	0.055	2.78	NM	NM
13-Nov-2003	<0.0004	0.0004	0.0013	0.0207	NM	NM
11-Jun-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
26-Jul-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
05-Oct-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
21-Jun-2005	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
01-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
08-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
02-Jun-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
03-Jul-2014	<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15
02-Jun-2015	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
06-Oct-2015	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
05-May-2016	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
24-May-2017	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
20-Oct-2018	<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
19-Oct-2019	<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
22-Jun-2020	<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
03-Jul-2021	<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10

MW4	B	T	E	X	PHC F1	PHC F2
14-Aug-1992	8.8	22	2.1	14	57	130
05-May-2016	0.5	2.1	0.5	2.3	2.1	2.1
24-May-2017	0.83	4.1	0.86	4	5.4	2
03-Jul-2021	0.066	0.38	0.31	1.4	3.3	1.3

MW5	B	T	E	X	PHC F1	PHC F2
20-May-1999	0.773	1.88	0.822	4.36	NM	NM
29-Aug-2002	0.156	0.151	0.136	1.28	NM	NM
30-Aug-2005	0.069	0.293	0.202	1.26	0.8	0.1
05-Oct-2005	0.07	0.308	0.188	1.09	0.3	0.81
01-Aug-2007	0.4014	2.35	1.42	6.83	4	1.8
02-Jun-2009	0.02	0.18	0.097	0.76	1.4	0.7
13-Aug-2009	0.037	0.29	0.16	1.4	1	0.4
03-Jul-2014	0.0048	0.015	0.022	0.072	<0.3	0.48
02-Jun-2015	0.0038	0.32	0.26	0.84	0.69	2
05-May-2016	0.0032	0.41	0.43	1.4	1.1	3.5
24-May-2017	0.0012	0.15	0.21	0.57	0.71	0.52
20-Oct-2018	0.0009	0.02	0.18	0.33	0.5	0.42
19-Oct-2019	<0.0004	0.0066	0.089	0.19	0.36	0.37
22-Jun-2020	0.00042	0.0094	0.064	0.11	0.24	0.34
03-Jul-2021	0.004	0.0064	0.12	0.12	0.37	0.51

MW6	B	T	E	X	PHC F1	PHC F2
30-Aug-2005	0.148	0.032	0.31	0.91	1.1	<0.1
08-Jul-2008	2	1.5	0.74	2.1	1	0.6
02-Jun-2009	0.25	0.11	1.2	4.5	2	0.7
13-Aug-2009	0.11	0.055	0.78	3	2	0.4
02-Oct-2014	0.16	0.016	0.55	1.3	1.7	1.2
02-Jun-2015	0.084	0.047	0.37	1.1	1.5	0.6
06-Oct-2015	0.079	0.024	0.38	1	1.6	0.75
24-May-2017	0.005	0.0041	0.23	0.42	1.1	0.6
19-Oct-2019	0.0021	0.0014	0.064	0.048	0.2	0.35
22-Jun-2020	0.013	0.00078	0.16	0.14	0.24	0.12
03-Jul-2021	0.008	0.0013	0.11	<0.00089	0.4	0.37

MW19-1	B	T	E	X	PHC F1	PHC F2
22-Jun-2020	0.044	0.013	0.38	1.1	2.2	0.98
03-Jul-2021	0.044	0.004	0.29	0.43	0.91	0.55

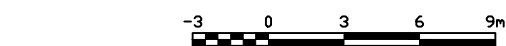
MW30A	B	T	E	X	PHC F1	PHC F2
22-Jun-2020	2.8	5.4	1.4	6.9	5.5	2.3
03-Jul-2021	2.9	4.3	0.76	4	2.7	1.5

BH27	B	T	E	X	PHC F1	PHC F2
29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
03-Jul-2003	<0.0004	<0.0004	<0.0004	<0.0012	NM	NM
19-Feb-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
26-Jul-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
23-Aug-2006	0.124	<0.0004	<0.0004	<0.0008	<0.1	<0.13
01-Aug-2007	0.0948	<0.0004	<0.0004	<0.0008	<0.1	<0.12
08-Jul-2008	0.025	<0.0004	<0.0004	<0.0008	<0.1	<0.1
02-Jun-2009	0.0026	0.0019	<0.0004	0.0016	<0.1	<0.1
13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
06-May-2010	0.0015	0.0007	<0.0004	0.0013	<0.1	<0.1
14-Sep-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
28-Jun-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
28-Sep-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
18-May-2012	0.029	0.0016	0.0013	0.0041	<0.10	<0.10
26-Jul-2012	0.19	0.0011	0.03	0.076	0.25	<0.10
29-Oct-2012	0.57	0.00086	<0.00040	0.0049	<0.10	<0.10
02-Jun-2015	0.074	0.0019	<0.0004	0.0012	<0.10	<0.10
20-Oct-2019	0.23	<0.0004	<0.0004	0.004	<0.10	<0.10
22-Jun-2020	0.35	0.0017	0.00073	0.0041	<0.10	<0.10
03-Jul-2021	0.0022	<0.0004	<0.0004	<0.00089	<0.10	<0.10

Legend:

- Borehole
- Monitoring Well
- Soil Vapour Well
- Fire Hydrant
- Subject Site Boundary
- Property Line
- Former Infrastructure
- Fence
- Railroad Tracks
- Estimated Area of Groundwater Contamination
- Residential Criteria Applies
- Commercial Criteria Applies
- 2019 Event
- Test Pit
- Exceeds Guidelines
- Below Guidelines

2017 EQG Tier 2		
Coarse Grained Res		
Groundwater	Cor	ppm
Benzene		0.005
Toluene		0.021
Ethylbenzene		0.14
Xylenes		0.09
PHC F1	2.2	0.81
PHC F2		1.1



CLIENT
EnviroAnalytics Group

PROJECT
Remediation Report, SSA, and RMP
810 Railway Avenue East
Rosthern, Saskatchewan

DRAWING TITLE
Current Groundwater PHC Data

BASE/SITE PLAN PROVIDED BY
Nichols Environmental (Canada) Ltd.

REVISION DATE
June 2022

SCALE
1:300

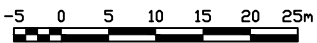
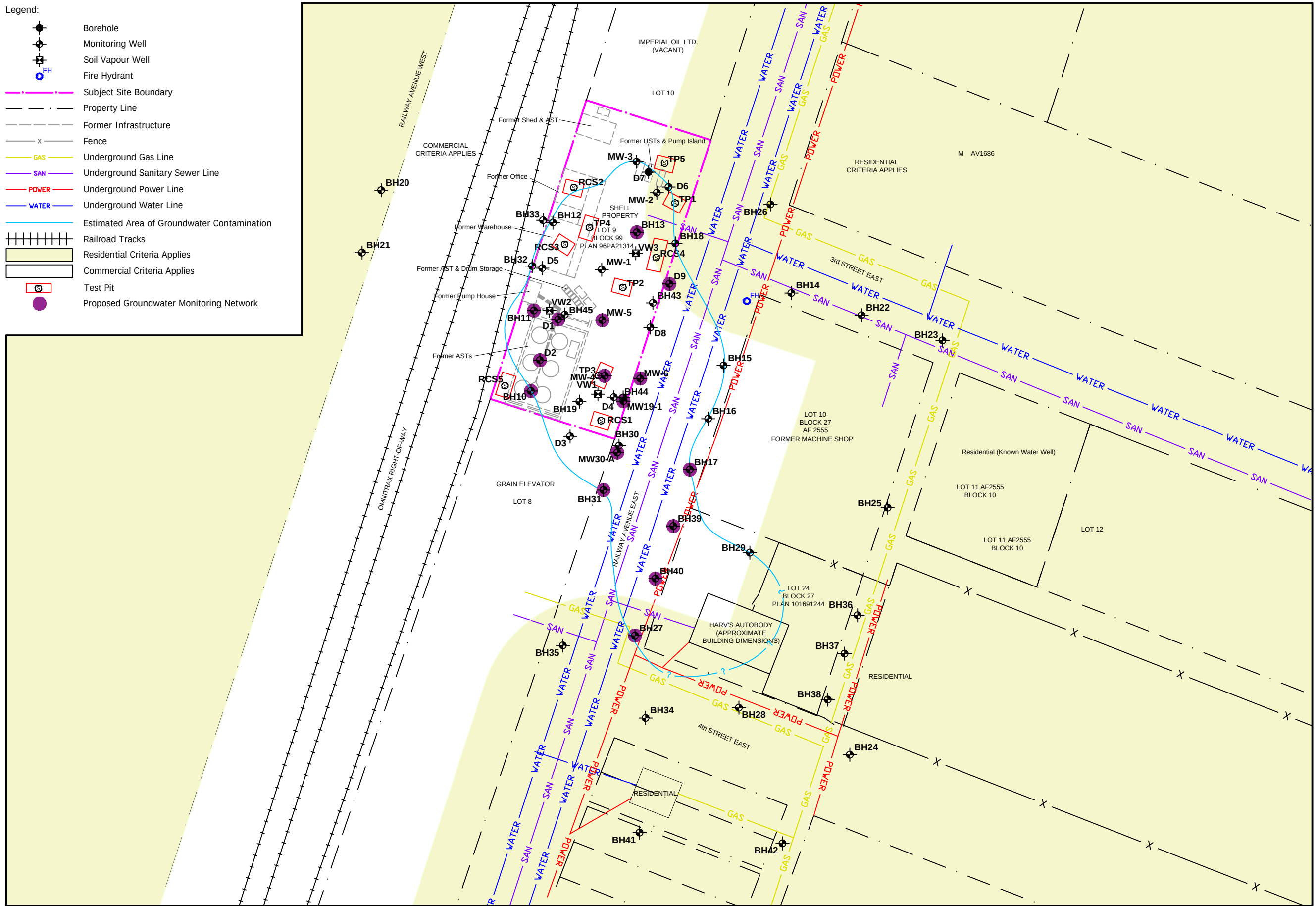
APPROVED
T/LL

PROJECT NO.
22-129-EAG

DRAWING NO.
Figure 9

\\FS1\Do to\Jobs\2022\22-129-EAG\Drawings\22-129-EAG.dwg Original drawing in colour. Black and white copies may not interpret properly.

- Legend:
- Borehole
 - Monitoring Well
 - Soil Vapour Well
 - Fire Hydrant
 - Subject Site Boundary
 - Property Line
 - Former Infrastructure
 - Fence
 - Underground Gas Line
 - Underground Sanitary Sewer Line
 - Underground Power Line
 - Underground Water Line
 - Estimated Area of Groundwater Contamination
 - Railroad Tracks
 - Residential Criteria Applies
 - Commercial Criteria Applies
 - Test Pit
 - Proposed Groundwater Monitoring Network



CLIENT	
EnviroAnalytics Group	
PROJECT	
Remediation Report, SSA, and RMP 810 Railway Avenue East Rosthern, Saskatchewan	
DRAWING TITLE	
Proposed Groundwater Monitoring Network	
BASE/SITE PLAN PROVIDED BY	
Nichols Environmental (Canada) Ltd.	
REVISION DATE	
June 2022	
SCALE	APPROVED
1:800	TA/LL
PROJECT NO.	
22-129-EAG	
DRAWING NO.	
Figure 10	

TABLES



TABLE: 1

TITLE: SOIL ANALYSES - PETROLEUM HYDROCARBONS (COMMERCIAL)

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

2017 EQG Tier 2*	Coarse Grained			Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2	Fraction 3	Fraction 4
	Commercial	Dermal Contact		120	980	2500	720	19000	10000	23000	30000
		Vapour Inhalation (Basement)		---	---	---	---	---	---	---	---
		Vapour Inhalation (Slab)		0.9	1200	530	140	320	1700	NA	NA
		Protection of Groundwater - Potable		0.078	0.95	0.14	1.9	240	320	NA	NA
		Soil Ingestion		110	82000	36000	560000	19000	10000	23000	RES
		Ecological Contact		180	250	300	350	320	260	1700	3300
		Protection of Groundwater - Livestock		---	---	---	---	---	---	---	---
		Protection of Groundwater - Aquatic Life		0.17	0.12	540	41	970	380	NA	NA
		Management Limit		---	---	---	---	700	1000	3500	10000

Surface Soil				Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2	Fraction 3	Fraction 4	Soil Type
Land Use		Commercial		0.078	0.12	0.14	1.9	240	260	1700	3300	
Discovery Reporting Standards**				0.046	0.12	0.073	0.99	30	150	300	2800	
Sample ID	Depth (mbg)	Date	OVC									
On Site												
D1	3.0	16-Sep-1999	3300	24.2	545	169	977	NM	NM	NM	NM	NM
D2	3.0	16-Sep-1999	220	< 0.02	0.07	0.06	0.15	NM	NM	NM	NM	NM
D4	3.0	16-Sep-1999	2200	17.9	661	224	1600	NM	NM	NM	NM	NM
BH10	3.0	27-Oct-2000	160	< 0.02	< 0.02	< 0.02	< 0.02	NM	NM	NM	NM	NM
BH11	3.0	27-Oct-2000	770	0.07	20.9	6.87	560	NM	NM	NM	NM	NM
BH13	3.0	27-Oct-2000	2200	0.04	0.47	0.2	0.95	NM	NM	NM	NM	NM
BH19	3.0	28-Aug-2002	180	0.18	0.15	0.08	0.59	< 10	< 10.0	< 10.0	< 10.0	NM
TP2	0.5	31-Jul-2007	130	0.11	0.048	0.26	0.64	< 12	509	503	< 10	FINE
TP3	2.2	31-Jul-2007	25	< 0.0050	< 0.020	< 0.010	< 0.045	< 12	< 10	< 10	< 10	COARSE
BH43	2.8	21-Jun-2012	90	0.013	0.023	0.42	1.1	< 12	13	< 10	< 10	COARSE
BH44	2.1	21-Jun-2012	ND	< 0.0050	< 0.020	< 0.010	< 0.040	< 12	< 10	< 10	< 10	COARSE
	3.0		210	0.04	0.24	0.072	0.55	< 12	< 10	< 10	< 10	COARSE
BH45	2.2	21-Jun-2012	35	< 0.0050	< 0.020	< 0.010	< 0.040	< 12	< 10	< 10	< 10	COARSE
	3.0		11000	< 4.0	480	270	1300	7800	10000	2500	< 10	COARSE
				5.5	570	390	2000	7000	15000	3800	< 10	COARSE
VW1	1.3	21-Jun-2012	ND	0.013	0.044	0.032	0.12	< 12	< 10	14	< 10	FINE
VW2	0.95	21-Jun-2012	ND	0.02	0.06	0.037	0.17	< 12	< 10	< 10	< 10	COARSE
	1.5		190	9.9	19	3.2	25	230	25000	9700	210	COARSE
VW3	0.8	21-Jun-2012	20	< 0.0050	< 0.020	< 0.010	< 0.040	< 12	< 10	< 10	< 10	FINE
RCS1	2.6	1-Oct-2014	--	< 0.0050	< 0.020	< 0.010	< 0.040	< 12	< 10	< 10	< 10	COARSE
RCS3	3.0	1-Oct-2014	--	<0.0050	<0.020	0.024	0.65	<12	230	110	<50	COARSE
RCS4	2.6	1-Oct-2014	--	< 0.0050	< 0.020	< 0.010	< 0.040	< 12	< 10	< 10	< 10	COARSE
Off Site												
BH16	2.4	30-Nov-2000	350	< 0.02	< 0.02	< 0.02	< 0.02	NM	NM	NM	NM	NM
BH29	1.5	28-Aug-2002	120	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	COARSE
BH30	2.3	15-Aug-2003	340	< 0.03	< 0.03	< 0.03	0.14	< 10	< 4	< 10	< 9	COARSE
BH32	3.0	26-Jul-2004	ND	< 0.03	< 0.03	< 0.03	< 0.06	< 10	590	920	13	COARSE
BH33	1.8	26-Jul-2004	ND	< 0.03	0.03	< 0.03	< 0.05	< 10	< 4	< 10	< 300	COARSE
BH39	1.75	22-Aug-2006	75	0.076	< 0.025	< 0.012	< 0.055	< 15	< 10	< 10	< 10	COARSE

BOLD = Applicable Guideline Criteria

BOLD = Parameter Exceeds Recommended Guideline Criteria

Fraction 1 = C₆ to C₁₀ (-BTEx)

Fraction 2 = > C₁₀ to C₁₆

Fraction 3 = > C₁₆ to C₃₄

Fraction 4 = C₃₅+

*Saskatchewan Environmental Quality Guidelines. July 2017.

**Saskatchewan Discharge and Discovery Reporting Standard. October 2017.

(All concentrations in mg/kg = ppm, unless noted)

NA = Not applicable. Calculated value exceeds 1,000,000 mg/kg or pathway excluded.

ND = Non-detect (<0.1 ppmv OVC)

NM = Not Measured

OVC = Organic Vapour Concentration (ppmv)

RES = Residual PHC formation. Calculated value exceeds 30,000 mg/kg and solubility limit for PHC fraction.

--- = No Value Provided in Guidelines



TABLE: 1

TITLE: SOIL ANALYSES - PETROLEUM HYDROCARBONS (COMMERCIAL)

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

2017 EQG Tier 2*	Coarse Grained			Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2	Fraction 3	Fraction 4
	Commercial	Dermal Contact		120	980	2500	720	19000	10000	23000	30000
		Vapour Inhalation (Basement)		---	---	---	---	---	---	---	NA
		Vapour Inhalation (Slab)		1.2	1600	760	210	320	1700	---	---
		Protection of Groundwater - Potable		0.078	0.95	0.14	1.9	240	320	NA	---
		Soil Ingestion		NC	NC	NC	NC	NA	NA	NA	NA
		Ecological Contact		360	500	600	700	640	520	3400	6600
		Protection of Groundwater - Livestock		---	---	---	---	---	---	---	NA
		Protection of Groundwater - Aquatic Life		0.17	0.12	540	41	970	380	NA	---
		Management Limit		---	---	---	---	700	1000	3500	10000

Subsoil				Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2	Fraction 3	Fraction 4	Soil Type
Land Use Commercial				0.078	0.12	0.14	1.9	240	320	3500	10000	
Discovery Reporting Standards**				0.046	0.12	0.073	0.99	30	150	300	2800	
Sample ID	Depth (mbg)	Date	OVC									
On Site												
D5	3.3	16-Sep-1999	3300	0.54	8.23	10.3	65.9	NM	NM	NM	NM	NM
BH11	3.75	27-Oct-2000	350	0.07	0.13	0.09	0.68	NM	NM	NM	NM	NM
BH12	3.75	27-Oct-2000	110	< 0.02	< 0.02	< 0.02	< 0.02	NM	NM	NM	NM	NM
TP2	3.2	31-Jul-2007	200	< 0.0050	0.021	0.093	0.95	< 12	< 10	< 10	< 10	COARSE
	4.2		5	< 0.0050	< 0.020	< 0.010	< 0.045	< 12	< 10	< 10	< 10	COARSE
TP3	3.2	31-Jul-2007	95	0.45	2.8	2.1	14	< 12	< 10	< 10	< 10	COARSE
	3.8		25	0.018	< 0.020	0.096	0.45	< 12	< 10	< 10	< 10	COARSE
TP4	3.2	31-Jul-2007	ND	< 0.0050	< 0.020	< 0.010	0.056	< 12	< 10	< 10	< 10	COARSE
BH43	3.75	21-Jun-2012	5	< 0.0050	< 0.020	< 0.010	< 0.040	< 12	< 10	< 10	< 10	COARSE
BH44	3.6	21-Jun-2012	25	0.016	0.053	0.032	0.17	< 12	< 10	< 10	< 10	COARSE
BH45	3.6	21-Jun-2012	170	0.028	0.65	0.48	2.5	< 12	12	< 10	< 10	COARSE
	4.5		20	0.016	0.041	0.035	0.13	< 12	< 10	< 10	< 10	COARSE
RCS2	3.75	1-Oct-2014	--	< 0.0050	< 0.020	< 0.010	< 0.040	< 12	< 10	< 10	< 10	COARSE
Off Site												
BH17	4.25	30-Nov-2000	230	< 0.02	< 0.02	< 0.02	< 0.02	NM	NM	NM	NM	NM
BH31	3.4	15-Aug-2003	40	< 0.03	< 0.03	< 0.03	< 0.09	< 10	< 4	< 10	< 9	COARSE
BH32	4.6	26-Jul-2004	100	< 0.03	< 0.03	< 0.03	0.26	28	68	130	< 300	COARSE
BH40	3.75	22-Aug-2006	ND	< 0.0063	< 0.025	< 0.013	< 0.056	< 15	< 10	< 10	< 10	FINE

BOLD = Applicable Guideline Criteria

BOLD = Parameter Exceeds Recommended Guideline Criteria

*Saskatchewan Environmental Quality Guidelines. July 2017.

**Saskatchewan Discharge and Discovery Reporting Standard. October 2017.

(All concentrations in mg/kg = ppm, unless noted)

Fraction 1 = C₆ to C₁₀ (-BTEx)

Fraction 2 = > C₁₀ to C₁₆

Fraction 3 = > C₁₆ to C₃₄

Fraction 4 = C₃₅+

NA = Not applicable. Calculated value exceeds 1,000,000 mg/kg or pathway excluded.

NC = Not calculated. Insufficient data to allow derivation.

ND = Non-detect (<0.1 ppmv OVC)

NM = Not Measured

OVC = Organic Vapour Concentration (ppmv)

RES = Residual PHC formation. Calculated value exceeds 30,000 mg/kg and solubility limit for PHC fraction.

--- = No Value Provided in Guidelines



TABLE: 2

TITLE: SOIL ANALYSES - PETROLEUM HYDROCARBONS (RESIDENTIAL)

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

2017 EQG Tier 2*	Residential	Coarse Grained	Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2	Fraction 3	Fraction 4
		Dermal Contact	78	640	1700	480	12000	6800	15000	21000
		Vapour Inhalation (Basement)	0.1	130	60	16	40	190	NA	NA
		Vapour Inhalation (Slab)	0.073	95	44	12	30	150	NA	NA
		Protection of Groundwater - Potable	0.078	0.95	0.14	1.9	240	320	NA	NA
		Soil Ingestion	110	22000	10000	150000	12000	6800	15000	21000
		Ecological Contact	31	75	55	95	210	150	300	2800
		Protection of Groundwater - Livestock	---	---	---	---	---	---	---	---
		Protection of Groundwater - Aquatic Life Management Limit	0.17	0.12	540	41	970	380	NA	NA
Surface Soil			---	---	---	---	700	1000	2500	10000

Surface Soil				Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2	Fraction 3	Fraction 4	Soil Type
Land Use Residential				0.073	0.12	0.14	1.9	30	150	300	2800	
Discovery Reporting Standards**				0.046	0.12	0.073	0.99	30	150	300	2800	
Sample ID	Depth (mbg)	Date	OVC									
On Site												
BH18	2.3	28-Aug-2002	80	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	COARSE
	2.3			< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	
TP1	2.8	31-Jul-2007	5	< 0.0050	< 0.020	< 0.010	< 0.045	< 12	< 10	< 10	< 10	NM
Off Site												
BH20	2.3	28-Aug-2002	20	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	COARSE
BH21	3.0	28-Aug-2002	40	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	COARSE
BH22	3.0	28-Aug-2002	ND	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	COARSE
BH23	3.0	28-Aug-2002	ND	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	COARSE
BH24	1.5	28-Aug-2002	80	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	FINE
BH25	1.5	28-Aug-2002	ND	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	COARSE
BH26	2.3	28-Aug-2002	40	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	COARSE
BH27	1.5	28-Aug-2002	2090	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	FINE
	2.3		320	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	COARSE
BH28	1.5	28-Aug-2002	280	< 0.04	< 0.04	< 0.04	< 0.04	< 10	<10	<10	<10	COARSE
BH34	2.3	26-Jul-2004	110	< 0.03	< 0.03	< 0.03	< 0.06	< 10	< 5	< 10	< 300	COARSE
BH35	2.3	26-Jul-2004	10	< 0.03	< 0.03	< 0.03	< 0.06	< 10	< 5	< 10	< 300	COARSE
BH36	2.75	22-Aug-2006	ND	< 0.0066	< 0.027	< 0.013	< 0.059	< 16	< 10	< 10	< 10	FINE
BH37	0.75	22-Aug-2006	100	< 0.0059	< 0.023	< 0.012	< 0.053	< 14	< 10	< 10	< 10	FINE
	3.0		ND	< 0.0060	< 0.024	< 0.012	< 0.054	< 14	< 10	< 10	< 10	COARSE
BH38	2.75	22-Aug-2006	ND	< 0.0063	< 0.025	< 0.013	< 0.056	< 15	< 10	< 10	< 10	COARSE
BH41	1.5	20-Jun-2012	ND	< 0.0050	< 0.020	< 0.010	< 0.040	< 12	< 10	< 10	< 10	NM
BH42	2.25	20-Jun-2012	ND	< 0.0050	< 0.020	< 0.010	< 0.040	< 12	< 10	< 10	< 10	NM

BOLD = Applicable Guideline Criteria

BOLD = Parameter Exceeds Recommended Guideline Criteria

*Saskatchewan Environmental Quality Guidelines. July 2017.

**Saskatchewan Discharge and Discovery Reporting Standard. October 2017.

(All concentrations in mg/kg = ppm, unless noted)

Fraction 1 = C₆ to C₁₀ (-BTX)

Fraction 2 = > C₁₀ to C₁₆

Fraction 3 = > C₁₆ to C₃₄

Fraction 4 = C₃₅+

NA = Not applicable. Calculated value exceeds 1,000,000 mg/kg or pathway excluded.

ND = Non-detect (<0.1 ppmv OVC)

NM = Not Measured

OVC = Organic Vapour Concentration (ppmv)

--- = No Value Provided in Guidelines



TABLE: 2

TITLE: SOIL ANALYSES - PETROLEUM HYDROCARBONS (RESIDENTIAL)

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

2017 EQG Tier 2*	Coarse Grained			Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2	Fraction 3	Fraction 4
	Residential	Dermal Contact		78	640	1700	480	12000	6800	15000	21000
		Vapour Inhalation (Basement)		0.1	130	60	16	40	190	NA	NA
		Vapour Inhalation (Slab)		0.14	180	86	23	30	150	NA	NA
		Protection of Groundwater - Potable		0.078	0.95	0.14	1.9	240	240	NA	NA
		Soil Ingestion		NC	NC	NC	NC	NA	NA	NA	NA
		Ecological Contact		62	150	110	190	420	300	600	5600
		Protection of Groundwater - Livestock		---	---	---	---	---	---	---	NA
		Protection of Groundwater - Aquatic Life		0.17	0.12	540	41	970	380	NA	NA
		Management Limit		---	---	---	---	700	1000	2500	10000
Subsoil	Residential										

Subsoil				Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2	Fraction 3	Fraction 4	Soil Type
Land Use Residential				0.078	0.12	0.14	1.9	30	150	2500	10000	
Discovery Reporting Standards**				0.046	0.12	0.073	0.99	30	150	300	2800	
Sample ID	Depth (mbg)	Date	OVC									
On Site												
TP5	3.6	31-Jul-2007	ND	< 0.0050	< 0.020	< 0.010	< 0.045	< 12	< 10	< 10	< 10	COARSE

BOLD = Applicable Guideline Criteria

BOLD = Parameter Exceeds Recommended Guideline Criteria

*Saskatchewan Environmental Quality Guidelines. July 2017.

**Saskatchewan Discharge and Discovery Reporting Standard. October 2017.

(All concentrations in mg/kg = ppm, unless noted)

Fraction 1 = C₆ to C₁₀ (-BTEx)

Fraction 2 = > C₁₀ to C₁₆

Fraction 3 = > C₁₆ to C₃₄

Fraction 4 = C₃₅+

NA = Not applicable. Calculated value exceeds 1,000,000 mg/kg or pathway excluded.

ND = Non-detect (<0.1 ppmv OVC)

OVC = Organic Vapour Concentration (ppmv)

--- = No Value Provided in Guidelines



Nichols Environmental (Canada) Ltd.

TABLE: 3

TITLE: VAPOUR ANALYSES - PETROLEUM HYDROCARBONS

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

2017 EQG Tier 2*	Coarse Grained		Benzene	Toluene	Ethylbenzene	Xylenes	Aliphatic C6 - C8	Aliphatic >C8 - C10
	Commercial	1.0 mbg	21,000	13,000,000	3,600,000	640,000	77,000,000	4,000,000
		1.5 mbg	24,000	15,000,000	4,200,000	740,000	93,000,000	4,900,000
		2.0 mbg	27,000	17,000,000	4,800,000	840,000	110,000,000	5,700,000

Sample ID	Depth (mbg)	Date	Note						
VW1	1.0 - 1.3	24-Jul-2012	Well Flooded	--	--	--	--	--	--
		30-Oct-2012		< 41	< 150	< 54	< 180	84000	< 170
		30-Oct-2012	A	< 42	< 153	< 55	< 183	85552	< 173
		7-Oct-2014		<3.3	8	<3.3	<10	NM	NM
VW2	1.5 - 1.8	24-Jul-2012		< 1,400	158000	29600	166000	3100000	50600
		24-Jul-2012	Duplicate	2240	140000	25300	143000	2800000	45400
		30-Oct-2012		1590	132000	31000	154000	2700000	26200
		30-Oct-2012	Duplicate	1980	157000	36600	182000	3270000	68000
		7-Oct-2014		1440	9560	17500	47300	NM	NM
VW3	1.5 - 1.8	24-Jul-2012		< 2.6	< 3.5	< 3.5	< 4.8	49	105
		30-Oct-2012		< 9.1	1620	65	242	< 38	< 38
		7-Oct-2014		<3.3	3.7	<3.3	<10	NM	NM

BOLD = Applicable Guideline Criteria

BOLD = Parameter Exceeds Recommended Guideline Criteria

BOLD = Concentrations within ten times of the soil vapour guidelines.

*Intrinsic. Development of Soil Vapour Remediation Guidelines Applicable in Saskatchewan for Residential and Commercial/Industrial Land Uses at Various Depths for Fine- and Coarse-Grained Soils. September 2016.

(All concentrations in ug/m³, unless noted)

A = Corrected soil vapour analytical results through mass balance (for samples with Helium > 1%).

NGR = No Guideline Required

NM = Not Measured



TABLE: 4

TITLE: GROUNDWATER ANMLYSES - PETROLEUM HYDROCARBONS (COMMERCIAL)

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

2017 EQG Tier 2*	Coarse Grained		Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
	Commercial	Potable	0.005	0.06	0.14	0.09	2.2	1.1
		Non-Potable	900	258	76	9	---	---
		Vapour Inhalation	1.8	NGR	NGR	48	9.1	17
		Ecological Contact	350	200	110	120	11	3.1
		Aquatic Life	0.074	0.021	41	2.9	9.8	1.3
		Irrigation	---	---	---	INS	---	---
		Livestock Watering	---	---	---	INS	---	---

			Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
Land Use Commercial			0.005	0.021	0.14	0.09	2.2	1.1
Discovery Reporting Standards**			0.005	0.021	0.14	0.09	0.81	1.1
Sample ID	Date	OVC						
On Site								
MW3	14-Aug-1992	NM	8.8	22	2.1	14	57	130
	3-Jul-2014		<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15
MW4	14-Aug-1992	NM	8.8	22	2.1	14	57	130
	5-May-2016		0.5	2.1	0.5	2.3	2.1	2.1
	24-May-2017		0.83	4.1	0.86	4	5.4	2
	3-Jul-2021		0.066	0.38	0.31	1.4	3.3	1.3
MW5	20-May-1999	NM	0.773	1.88	0.822	4.36	NM	NM
	29-Aug-2002		0.156	0.151	0.136	1.28	NM	NM
	30-Aug-2005		0.069	0.293	0.202	1.26	0.8	0.1
	5-Oct-2005		0.07	0.308	0.188	1.09	0.3	0.81
	1-Aug-2007		0.4014	2.35	1.42	6.83	4	1.8
	2-Jun-2009		0.02	0.18	0.097	0.76	1.4	0.7
	13-Aug-2009		0.037	0.29	0.16	1.4	1	0.4
	3-Jul-2014		0.0048	0.015	0.022	0.072	<0.3	0.48
	2-Jun-2015		0.0038	0.32	0.26	0.84	0.69	2
	5-May-2016		0.0032	0.41	0.43	1.4	1.1	3.5
	24-May-2017		0.0012	0.15	0.21	0.57	0.71	0.52
	20-Oct-2018		0.0009	0.02	0.18	0.33	0.5	0.42
	19-Oct-2019		<0.0004	0.0082	0.11	0.21	0.34	0.36
	19-Oct-2019		<0.0004	0.0066	0.089	0.19	0.36	0.37
	22-Jun-2020		0.00042	0.0094	0.064	0.11	0.24	0.34
	3-Jul-2021		0.004	0.0064	0.12	0.12	0.37	0.51
D1	10-Jun-2004	NM	LN MPL = 1mm					
	25-Aug-2005		0.124	0.656	0.441	2.01	1.9	0.4
	13-Aug-2009		0.038	1.1	0.37	2.7	<0.1	1.2
	6-May-2010		0.0087	0.3	0.091	0.9	1.1	0.5
	28-Jun-2011		0.0051	0.39	0.17	1.3	1.1	1.2
	2-Jun-2015		0.0021	0.095	0.16	1.5	1.3	14
	6-Oct-2015		0.0012	0.03	0.12	0.85	0.98	1.3
	5-May-2016		<0.0004	0.01	0.093	0.41	0.76	1.3
	24-May-2017		0.00055	0.017	0.18	0.8	1.5	1.1
	20-Oct-2018		0.001	0.031	0.29	1.3	2	1.6
	19-Oct-2019		0.00061	0.016	0.22	0.93	1.3	1.1
	22-Jun-2020		<0.0004	0.022	0.22	1	2.2	1.9
	22-Jun-2020		<0.0004	0.024	0.23	1.1	2.5	2.1
	3-Jul-2021		<0.0004	0.0058	0.077	0.34	0.81	1.6
D2	10-Jul-2001	NM	0.0046	0.006	<0.0002	NM	NM	NM
	21-Jun-2005		<0.0004	<0.0004	<0.0004	0.0111	NM	NM
	25-Aug-2005		<0.0004	0.005	0.0008	0.028	<0.1	<0.1
	2-Jun-2009		<0.0004	<0.0004	<0.0004	0.0044	<0.1	<0.1
	13-Aug-2009		<0.0004	<0.0004	<0.0004	0.0032	<0.1	<0.1
	2-Jun-2015		<0.0004	0.0018	0.0012	0.011	< 0.10	< 0.10
	6-Oct-2015		<0.0004	0.0009	0.0015	0.014	< 0.10	< 0.10
	5-May-2016		<0.0004	0.0028	0.0045	0.033	0.1	<0.10
	24-May-2017		<0.0004	0.012	0.017	0.07	0.16	0.12
	20-Oct-2018		<0.0004	0.0048	0.031	0.094	0.19	0.14
	19-Oct-2019		<0.0004	0.0013	0.0067	0.037	<0.1	<0.10
	22-Jun-2020		<0.0004	<0.0004	0.0015	0.0086	<0.10	<0.10
	3-Jul-2021		<0.0004	0.0033	0.024	0.1	0.23	0.16
D4	16-Sep-1999	NM	5.4	20.2	2.13	17.7	NM	NM
	24-Sep-1999		4	15.8	2.2	15.6	NM	NM
	30-Aug-2000		0.703	0.0428	0.363	0.905	NM	NM
	10-Jul-2001		1.05	0.743	0.0018	1.17	NM	NM
	7-Nov-2001		0.233	0.476	0.412	1.41	NM	NM
	30-Aug-2005		1.09	1.21	0.663	2.6	2.2	<0.1
	23-Aug-2006		1.37	1.37	0.08	2.83	<0.1	2.7
	2-Jun-2009		1.1	1.5	0.53	3	1.8	1.2
	2-Jun-09 Dup		1.1	1.6	0.55	3.2	1.7	1.3
	13-Aug-2009		1.4	1.8	0.62	3.8	3	1.1
	6-May-2010		0.0016	0.0041	0.0005	0.016	<0.1	<0.1
	6-May-10 Dup		0.0019	0.0057	0.0007	0.018	<0.1	<0.1
	28-Jun-2011		0.47	0.65	0.21	1.4	0.7	1.2
	25-Jul-2012		0.23	0.059	0.047	0.27	0.21	0.47
	2-Oct-2014		0.36	0.41	0.25	1.2	0.95	1.1
	2-Jun-2015		0.14	0.3	0.12	0.72	0.67	0.38
	6-Oct-2015		0.24	0.14	0.021	0.38	0.48	0.4
D5	5-May-2016	NM	0.16	0.1	0.048	0.25	0.31	0.46
	24-May-2017		0.98	1.5	0.26	2.7	1.8	1.9
	16-Sep-1999		0.0659	0.21	1.01	10.2	NM	NM
	29-Aug-2002		0.0021	0.0147	0.0007	0.0697	NM	NM
	29-Aug-2002		0.0023	0.0146	0.0007	0.07	NM	NM
	11-Jun-2004		<0.0004	<0.0004	0.0006	0.0183	NM	NM
	30-Aug-2005		<0.0004	<0.0004	<0.0004	0.0138	0.1	<0.1
	30-Aug-2005		<0.0004	<0.0004	<0.0004	0.0176	0.2	<0.1
	2-Jun-2009	NM	<0.0004	<0.0004	<0.0004	0.0024	<0.1	0.1
	13-Aug-2009		<0.0004	<0.0004	<0.0004	0.0014	<0.1	<0.1
	3-Jul-2014		<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15



TABLE: 4

TITLE: GROUNDWATER ANMLYSES - PETROLEUM HYDROCARBONS (COMMERCIAL)

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

2017 EQG Tier 2*	Coarse Grained		Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
	Commercial	Potable	0.005	0.06	0.14	0.09	2.2	1.1
		Non-Potable	900	258	76	9	---	---
		Vapour Inhalation	1.8	NGR	NGR	48	9.1	17
		Ecological Contact	350	200	110	120	11	3.1
		Aquatic Life	0.074	0.021	41	2.9	9.8	1.3
		Irrigation	---	---	---	INS	---	---
		Livestock Watering	---	---	---	INS	---	---

			Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
Land Use Commercial			0.005	0.021	0.14	0.09	2.2	1.1
Discovery Reporting Standards**			0.005	0.021	0.14	0.09	0.81	1.1
Sample ID	Date	OVC						
BH10	20-May-2000		<0.0002	0.0005	0.0016	0.0022	NM	NM
	1-Dec-2000		<0.0002	0.0005	0.0016	0.0022	NM	NM
	7-Nov-2001		<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	29-Aug-2002		<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	3-Jul-2003		<0.0004	<0.0004	<0.0004	<0.0015	NM	NM
	11-Sep-2003		<0.006	0.21	0.055	2.78	NM	NM
	13-Nov-2003		<0.0004	0.0004	0.0013	0.0207	NM	NM
	11-Jun-2004		<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	26-Jul-2004		<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	5-Oct-2004		<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	21-Jun-2005		<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	30-Aug-2005		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	23-Aug-2006		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	1-Aug-2007		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
	8-Jul-2008		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	2-Jun-2009		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	13-Aug-2009		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	3-Jul-2014		<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15
	2-Jun-2015		<0.0004	<0.0004	<0.0004	<0.0008	< 0.10	< 0.10
	6-Oct-2015		<0.0004	<0.0004	<0.0004	<0.0008	< 0.10	< 0.10
	5-May-2016		<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	24-May-2017		<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	20-Oct-2018		<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
	19-Oct-2019		<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
	22-Jun-2020		<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
	3-Jul-2021		<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
BH11	1-Dec-2000		0.0245	2.17	0.793	11.3	NM	NM
	10-Jul-2001		0.0132	0.181	0	3	NM	NM
	7-Nov-2001		0.0044	0.0307	0.0191	0.0307	NM	NM
	29-Aug-2002		0.0033	0.0323	0.0171	0.882	NM	NM
	3-Jul-2003		<0.002	0.006	0.022	0.47	NM	NM
	11-Sep-2003		0.0007	0.0009	0.0045	0.0278	NM	NM
	13-Nov-2003		<0.002	0.009	0.024	0.674	NM	NM
	11-Jun-2004		<0.0009	0.0069	0.0052	0.359	NM	NM
	26-Jul-2004		<0.004	0.057	0.02	1.3	NM	NM
	5-Oct-2004		<0.009	0.127	0.019	2.19	NM	NM
	10-May-2005		<0.002	0.024	0.006	0.48	0.2	2.7
	25-Aug-2005		<0.0009	0.0321	0.0093	0.734	0.7	1.4
	5-Oct-2005		<0.002	0.024	0.008	0.498	0.2	2
	23-Aug-2006		<0.002	0.015	0.009	0.564	0.3	1.2
	1-Aug-2007		<0.002	0.012	0.021	0.839	0.8	2
	8-Jul-2008		<0.0004	0.0077	0.014	0.58	0.4	1.2
	16-Sep-2008		<0.0008	0.0051	0.01	0.44	0.7	0.9
	16-Sep-2008		<0.0008	0.0053	0.01	0.48	0.9	1.1
	2-Jun-2009		<0.0004	0.0042	0.0099	0.38	0.5	1.3
	13-Aug-2009		<0.0004	0.0032	0.0086	0.37	0.5	0.8
	6-May-2010		<0.0004	0.0025	0.0064	0.32	0.5	1.3
	28-Jun-2011		<0.0004	0.0014	0.0066	0.32	0.2	0.5
	25-Jul-2012		<0.00040	0.0039	0.34	0.94	0.5	1.8
	3-Jul-2014		0.0004	0.0028	0.058	1.3	0.5	1.4
	2-Jun-2015		<0.0004	0.0015	0.032	0.65	0.61	1.4
	6-Oct-2015		<0.0004	0.0013	0.044	0.76	0.9	1.6
	5-May-2016		<0.0004	0.00076	0.016	0.31	0.46	1
	24-May-2017		<0.0004	0.0012	0.023	0.39	0.58	1.1
BH12	29-Aug-2002		<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	30-Aug-2005		<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	1-Aug-2007		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
	3-Jul-2014		0.0075	0.11	0.024	0.14	0.31	0.15
	2-Jun-2015		<0.0004	<0.0004	<0.0004	<0.0008	< 0.10	< 0.10
	6-Oct-2015		<0.0004	<0.0004	<0.0004	<0.0008	< 0.10	< 0.10
	24-May-2017		<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	20-Oct-2018		<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
BH13	19-Oct-2019		<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
	22-Jun-2020		<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
	1-Dec-2000		<0.0002	0.0884	0.0186	0.365	NM	NM
	30-Aug-2005		<0.0004	<0.0004	0.0231	0.6	0.2	NM
	5-Oct-2005		<0.0004	<0.0004	0.0254	<0.1	0.92	NM
	23-Aug-2006		<0.0004	<0.0004	<0.0004	0.0331	0.2	0.13
	1-Aug-2007		<0.0004	<0.0004	<0.0004	0.0503	0.5	1.2
	2-Jun-2009		<0.0004	<0.0004	<0.0004	0.0041	0.3	0.7
	13-Aug-2009		<0.0004	<0.0004	<0.0004	0.0038	0.4	0.3
	6-May-2010		<0.0004	<0.0004	<0.0004	0.0032	0.3	0.2
	28-Jun-2011		<0.0004	<0.0004	<0.0004	0.015	0.7	0.6
	25-Jul-2012		<0.0004	<0.0004	<0.00040	0.0046	0.11	0.29
	2-Oct-2014		<0.0004	<0.0004	<0.0004	<0.0008	0.47	1.3



TABLE: 4

TITLE: GROUNDWATER ANMLYSES - PETROLEUM HYDROCARBONS (COMMERCIAL)

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

Coarse Grained			Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
2017 EQG Tier 2*	Commercial	Potable	0.005	0.06	0.14	0.09	2.2	1.1
		Non-Potable	900	258	76	9	---	---
		Vapour Inhalation	1.8	NGR	NGR	48	9.1	17
		Ecological Contact	350	200	110	120	11	3.1
		Aquatic Life	0.074	0.021	41	2.9	9.8	1.3
		Irrigation	---	---	---	INS	---	---
		Livestock Watering	---	---	---	INS	---	---

			Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
Land Use Commercial			0.005	0.021	0.14	0.09	2.2	1.1
Discovery Reporting Standards**			0.005	0.021	0.14	0.09	0.81	1.1
Sample ID	Date	OVC						
BH16	1-Dec-2000	NM	0.0124	0.0011	0.109	0.0058	NM	NM
	7-Nov-2001		0.0015	0.0006	0.0027	<0.0002	NM	NM
	29-Aug-2002		0.0123	0.0008	0.0235	0.0006	NM	NM
	19-Feb-2004		<0.0004	<0.0004	0.0059	<0.0008	NM	NM
	30-Aug-2005		0.0037	<0.0004	0.0389	0.0053	<0.1	<0.1
	1-Aug-2007		0.0009	<0.0004	<0.0004	<0.0008	<0.1	<0.12
	2-Jun-2009		0.0005	<0.0004	0.0012	0.0013	<0.1	<0.1
BH19	13-Aug-2009	NM	0.0041	<0.0004	0.0027	<0.0008	<0.1	<0.1
	29-Aug-2002		0.266	0.499	0.108	0.829	NM	NM
	3-Jul-2003		0.785	0.573	0.556	3.83	NM	NM
	11-Sep-2003		0.056	0.032	0.18	1.084	NM	NM
	13-Nov-2003		0.009	0.007	0.065	0.592	NM	NM
	11-Jun-2004		0.161	0.0165	0.114	0.69	NM	NM
	26-Jul-2004		0.117	0.011	0.189	0.962	NM	NM
	5-Oct-2004		0.026	0.004	0.095	0.426	NM	NM
	30-Aug-2005		0.296	0.064	0.545	2.64	1.4	0.5
	5-Oct-2005		0.069	0.034	0.169	0.664	0.3	0.7
	23-Aug-2006		0.0045	0.0048	0.0462	0.15	0.3	0.15
	1-Aug-2007		0.0011	0.0021	0.0148	0.0452	0.2	0.24
	1-Aug-2007		0.0012	0.0025	0.0184	0.0538	0.3	0.31
	8-Jul-2008		0.037	0.089	0.24	0.72	0.6	0.4
	2-Jun-2009		0.069	0.79	0.44	1.8	<0.1	1.2
	13-Aug-2009		0.094	0.69	0.46	1.7	2	1.1
	13-Aug-2009		0.12	0.91	0.61	2.2	3	1.1
	6-May-2010		0.0026	0.039	0.033	0.11	0.3	<0.1
	28-Jun-2011		0.0059	0.22	0.075	0.13	0.6	0.3
	25-Jul-2012		0.011	0.077	0.21	0.29	0.44	0.52
	2-Oct-2014		0.092	1.2	0.49	2	1.2	1.2
	2-Jun-2015		0.39	3.3	0.58	3.8	3.2	1.3
	6-Oct-2015		0.2	1.5	0.5	3	1.7	1.6
MW19-1	24-May-2017	NM	0.49	3.5	0.66	3.1	4.3	0.94
	22-Jun-2020		0.044	0.013	0.38	1.1	2.2	0.98
Off Site	3-Jul-2021	NM	0.044	0.004	0.29	0.43	0.91	0.55
MW6	30-Aug-2005	NM	0.148	0.032	0.31	0.91	1.1	<0.1
	8-Jul-2008		1.8	1.5	0.71	2.1	3	0.9
	8-Jul-2008		2	1.5	0.74	2.1	1	0.6
	2-Jun-2009		0.25	0.11	1.2	4.4	3	0.8
	2-Jun-2009		0.25	0.11	1.2	4.5	2	0.7
	13-Aug-2009		0.11	0.052	0.75	2.9	3	0.5
	13-Aug-2009		0.11	0.055	0.78	3	2	0.4
	2-Oct-2014		0.16	0.016	0.55	1.3	1.7	1.2
	2-Jun-2015		0.084	0.047	0.37	1.1	1.5	0.6
	6-Oct-2015		0.079	0.024	0.38	1	1.6	0.75
	24-May-2017		0.005	0.0041	0.23	0.42	1.1	0.6
	19-Oct-2019		0.0021	0.0014	0.064	0.048	0.2	0.35
	22-Jun-2020		0.013	0.00078	0.16	0.14	0.24	0.12
	3-Jul-2021		0.008	0.0013	0.11	<0.00089	0.4	0.37
	16-Sep-1999		0.393	0.994	0.383	1.8	NM	NM
D8	30-Aug-2000	NM	0.458	0.353	0.965	5	NM	NM
	29-Aug-2002		0.0425	0.0014	0.0117	0.0444	NM	NM
	30-Aug-2005		0.04	0.031	0.408	1.48	1.6	<0.1
	5-Oct-2005		0.033	0.019	0.231	1.05	0.4	1.1
	2-Jun-2009		0.029	0.012	0.22	0.84	1.3	0.5
	13-Aug-2009		0.024	0.008	0.18	0.69	1.1	0.4
	3-Jul-2014		<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15
	2-Jun-2015		0.0079	0.0088	0.22	0.45	0.98	0.67
	6-Oct-2015		0.00096	0.00071	0.026	0.04	0.11	0.19
	5-May-2016		0.0018	<0.0004	0.015	0.013	0.11	<0.10
	24-May-2017		0.0069	0.00067	0.2	0.23	0.65	0.5



TABLE: 4

TITLE: GROUNDWATER ANMLYSES - PETROLEUM HYDROCARBONS (COMMERCIAL)

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

2017 EQG Tier 2*	Coarse Grained		Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
	Commercial	Potable	0.005	0.06	0.14	0.09	2.2	1.1
		Non-Potable	900	258	76	9	---	---
		Vapour Inhalation	1.8	NGR	NGR	48	9.1	17
		Ecological Contact	350	200	110	120	11	3.1
		Aquatic Life	0.074	0.021	41	2.9	9.8	1.3
		Irrigation	---	---	---	INS	---	---
		Livestock Watering	---	---	---	INS	---	---

			Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
Land Use Commercial			0.005	0.021	0.14	0.09	2.2	1.1
Discovery Reporting Standards**			0.005	0.021	0.14	0.09	0.81	1.1
Sample ID	Date	OVC						
BH15	1-Dec-2000	NM	<0.0002	0.0005	0.0002	0.0012	NM	NM
	7-Nov-2001		<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	29-Aug-2002		<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	3-Jul-2003		0.0025	0.0021	0.0038	0.0136	NM	NM
	11-Sep-2003		0.0008	0.002	0.0033	0.0348	NM	NM
	13-Nov-2003		<0.0004	<0.0004	0.0009	0.0079	NM	NM
	26-Jul-2004		0.0005	<0.0004	<0.0004	<0.0008	NM	NM
	5-Oct-2004		0.0009	<0.0004	<0.0004	<0.0008	NM	NM
	30-Aug-2005		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	23-Aug-2006		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	8-Jul-2008		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	2-Jun-2009		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	13-Aug-2009		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	6-May-2010		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	14-Sep-2010		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	28-Jun-2011		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	28-Sep-2011		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	25-Jul-2012		<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	29-Oct-2012		<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	3-Jul-2014		<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15
BH17	2-Jun-2015	NM	<0.0004	<0.0004	<0.0004	<0.0008	< 0.10	< 0.10
	6-Oct-2015		<0.0004	<0.0004	<0.0004	<0.0008	< 0.10	< 0.10
	5-May-2016		<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	1-Dec-2000		0.428	0.0228	0.736	0.864	NM	NM
	10-Jul-2001		0.489	0.049	0.157	0.79	NM	NM
	7-Nov-2001		0.0657	0.0047	0.166	0.227	NM	NM
	29-Aug-2002		0.238	0.0357	0.188	0.192	NM	NM
	3-Jul-2003		0.125	0.007	0.201	0.266	NM	NM
	11-Sep-2003		0.493	0.023	0.364	0.711	NM	NM
	13-Nov-2003		0.26	0.038	0.15	0.292	NM	NM
	19-Feb-2004		0.132	0.0041	0.0725	0.069	NM	NM
	26-Jul-2004		0.488	0.087	0.249	0.564	NM	NM
	5-Oct-2004		0.898	0.105	0.281	0.57	NM	NM
	21-Jun-2005		2.37	0.14	0.48	0.75	NM	NM
	30-Aug-2005		1.13	0.171	0.435	0.71	0.3	0.3
	5-Oct-2005		0.601	0.035	0.442	0.73	0.5	0.71
	23-Aug-2006		0.66	0.013	0.161	0.24	0.3	0.23
	1-Aug-2007		0.162	0.0008	0.0832	0.0407	0.3	0.22
	1-Aug-07 Dup		0.195	0.0011	0.113	0.0573	0.5	0.19
	8-Jul-2008		0.54	0.0008	0.084	0.078	<0.1	0.1
	8-Jul-08 Dup		0.55	0.0008	0.085	0.08	0.2	0.1
	16-Sep-2008		0.23	0.043	0.15	0.23	0.3	0.1
	2-Jun-2009		0.27	0.0014	0.11	0.061	0.7	0.3
	2-Jun-09 Dup		0.37	0.0016	0.14	0.086	0.6	0.4
	13-Aug-2009		0.78	0.22	0.29	0.77	<1	0.2
	6-May-2010		0.72	0.17	0.48	1.3	1.4	0.5
	14-Sep-2010		0.28	0.021	0.13	0.27	<0.1	0.1
	14-Sep-2010		0.29	0.023	0.13	0.28	<0.1	0.1
	28-Sep-2011		0.31	0.087	0.14	0.2	0.1	0.3
	18-May-2012		0.19	0.00084	0.2	0.084	0.38	<0.10
	26-Jul-2012		0.24	0.0011	0.3	0.12	0.82	0.5
	29-Oct-2012		0.15	<0.00040	0.29	0.036	0.21	0.26
	2-Jun-2015		0.006	<0.0004	0.1	0.012	< 0.10	0.2
	6-Oct-2015		0.004	<0.0004	0.05	0.0058	0.11	0.16
BH29	29-Aug-2002	NM	0.4	0.0015	<0.0002	<0.0002	NM	NM
	3-Jul-2003		0.0647	0.0015	0.0028	0.0111	NM	NM
	11-Sep-2003		0.809	0.004	0.011	0.04	NM	NM
	13-Nov-2003		0.168	0.0022	0.0046	0.0147	NM	NM
	16-Feb-2004		0.0127	<0.0004	<0.0004	<0.0008	NM	NM
	26-Jul-2004		0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	21-Jun-2005		<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	30-Aug-2005		0.0112	<0.0004	<0.0004	<0.0008	<0.1	<0.1
BH30	23-Aug-2006	NM	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	1-Aug-2007		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
	15-Aug-2003		0.354	1	0.287	2.084	NM	NM
	30-Aug-2005		0.158	0.0139	0.15	0.669	0.6	<0.1
	30-Aug-2005		0.162	0.0145	0.146	0.652	0.5	<0.1
	5-Oct-2005		0.0746	0.0038	0.0652	0.147	0.2	0.23
	2-Jun-2009		0.04	0.0047	0.15	0.37	0.4	1.3
	13-Aug-2009		0.18	0.046	0.3	1.2	1.4	0.3
	6-May-2010		0.0045	0.0012	0.026	0.049	0.4	0.2
	6-May-2010		0.0047	0.0013	0.028	0.056	0.4	0.3
	14-Sep-2010		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	28-Jun-2011		0.083	0.043	0.11	0.25	0.2	0.1
	28-Sep-2011		0.09	0.086	0.25	1.1	0.4	0.4
	28-Sep-2011		0.094	0.085	0.24	1.1	0.9	0.4
	25-Jul-2012		0.019	0.0011	0.033	0.088	0.19	0.13
	25-Jul-2012		0.019	0.0011	0.034	0.09	0.21	0.17
	30-Oct-2012		0.28	0.47	0.34	1.8	0.75	0.35
	3-Jul-2014		0.2	0.051	0.078	0.37	<0.3	<0.15



TABLE: 4

TITLE: GROUNDWATER ANMLYSES - PETROLEUM HYDROCARBONS (COMMERCIAL)

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

2017 EQG Tier 2*	Coarse Grained		Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
	Commercial	Potable	0.005	0.06	0.14	0.09	2.2	1.1
		Non-Potable	900	258	76	9	---	---
		Vapour Inhalation	1.8	NGR	NGR	48	9.1	17
		Ecological Contact	350	200	110	120	11	3.1
		Aquatic Life	0.074	0.021	41	2.9	9.8	1.3
		Irrigation	---	---	---	INS	---	---
		Livestock Watering	---	---	---	INS	---	---

			Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
Land Use Commercial			0.005	0.021	0.14	0.09	2.2	1.1
Discovery Reporting Standards**			0.005	0.021	0.14	0.09	0.81	1.1
Sample ID	Date	OVC						
BH31	15-Aug-2003	NM	<0.0004	<0.0004	<0.0004	<0.0012	NM	NM
	11-Sep-2003		<0.0004	<0.0004	<0.0004	<0.00012	NM	NM
	13-Nov-2003		<0.0004	<0.0004	0.001	0.0084	NM	NM
	11-Jun-2004		<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	26-Jul-2004		<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	5-Oct-2004		<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	30-Aug-2005		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	8-Jul-2008		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	2-Jun-2009		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	13-Aug-2009		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	2-Jun-2015		<0.0004	<0.0004	<0.0004	<0.0008	< 0.10	< 0.10
	6-Oct-2015		<0.0004	<0.0004	<0.0004	<0.0008	< 0.10	< 0.10
	5-May-2016		<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
BH32	26-Jul-2000	NM	<0.0004	0.0009	0.0054	0.224	NM	NM
	21-Jun-2005		<0.0004	<0.0004	0.0006	0.0166	NM	NM
	30-Aug-2005		<0.0004	<0.0004	0.0007	0.0172	<0.1	0.3
	30-Aug-2006		<0.0004	<0.0004	<0.0004	0.005	<0.1	0.65
	1-Aug-2007		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	0.73
BH33	26-Jul-2004	NM	<0.0009	<0.0009	<0.0009	<0.002	NM	NM
	30-Aug-2005		<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
BH39	23-Aug-2006	NM	0.858	0.229	0.314	1.08	0.7	0.23
	28-Jun-2011		0.059	<0.0004	0.013	0.007	<0.1	<0.1
BH40	23-Aug-2006	NM	0.236	0.0042	<0.0004	0.0542	<0.1	<0.13
MW30A	22-Jun-2020	NM	2.8	5.4	1.4	6.9	5.5	2.3
	3-Jul-2021		2.8	4.2	0.75	4	2.5	1.8
	3-Jul-2021		2.9	4.3	0.76	4	2.7	1.5

BOLD	= Applicable Guideline Criteria
BOLD	= Parameter Exceeds Recommended Guideline Criteria
	= Most Recent Sampling Event

*Saskatchewan Environmental Quality Guidelines. July 2017.

**Saskatchewan Discharge and Discovery Reporting Standard. October 2017.

(All concentrations in mg/L = ppm, unless noted)

Fraction 1 = C₆ to C₁₀ (-BTEX)

Fraction 2 = > C₁₀ to C₁₆

INS = Insufficient Data

NGR = No guideline required; calculated guideline exceeds solubility limit.

NM = Not Measured

--- = No Value Provided in Guidelines

Fraction 3 = > C₁₆ to C₃₄

Fraction 3+ = C₃₅+



TABLE: 5

TITLE: GROUNDWATER ANMLYSES - PETROLEUM HYDROCARBONS (RESIDENTIAL)

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

2017 EQG Tier 2*	Residential	Coarse Grained	Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
		Potable	0.005	0.06	0.14	0.09	2.2	1.1
		Non-Potable	900	258	76	9	---	---
		Vapour Inhalation	0.14	74	16	3.9	0.81	---
		Ecological Contact	61	59	20	31	7.1	1.5
		Aquatic Life	0.074	0.021	41	2.9	9.8	1.8
		Irrigation	---	---	---	---	---	---
		Livestock Watering	---	---	---	---	---	---

		Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
Land Use	Residential	0.005	0.021	0.14	0.09	0.81	1.1
Discovery Reporting Standards**		0.005	0.021	0.14	0.09	0.81	1.1
Sample ID	Date						
On Site							
D6	7-Nov-2001	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	21-Jun-2005	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	29-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
BH18	29-Aug-2002	<0.0002	0.0028	<0.0002	<0.0002	NM	NM
	30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	8-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	2-Jun-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	3-Jul-2014	<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15
Off Site							
D9	29-Aug-2002	<0.0002	0.0167	0.0012	0.0609	NM	NM
	29-Aug-2002	<0.0002	0.0178	0.0011	0.0609	NM	NM
	3-Jul-2003	0.0018	0.0018	0.0026	0.056	NM	NM
	11-Sep-2003	0.001	0.008	0.0052	0.273	NM	NM
	13-Nov-2003	0.001	0.002	0.0016	0.1035	NM	NM
	26-Jul-2004	<0.0004	0.0037	0.0012	0.216	NM	NM
	5-Oct-2004	<0.0004	0.0016	0.0007	0.129	NM	NM
	21-Jun-2005	<0.0004	<0.0004	<0.0004	0.052	NM	NM
	30-Aug-2005	<0.0004	<0.0004	<0.0004	0.0103	<0.1	<0.1
	23-Aug-2006	<0.0004	<0.0004	0.0016	0.0059	<0.1	<0.13
	20-Jun-2009	<0.0004	<0.0004	0.0007	<0.0008	<0.1	<0.1
	13-Aug-2009	0.0006	<0.0004	0.0011	<0.0008	<0.1	<0.1
	6-May-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	14-Sep-2010	0.0068	<0.0004	0.0011	0.0046	<0.1	<0.1
	28-Jun-2011	0.016	0.0013	0.04	0.069	0.2	<0.1
	28-Jun-2011	0.016	0.0013	0.041	0.07	0.2	<0.1
	28-Sep-2011	0.0007	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	25-Jul-2012	0.03	0.00087	0.022	0.042	<0.10	0.2
	29-Oct-2012	0.00084	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	2-Jun-2015	<0.0004	<0.0004	0.0015	0.0094	< 0.10	3
	6-Oct-2015	<0.0004	<0.0004	0.00094	0.0032	< 0.10	1.5
	5-May-2016	<0.0004	<0.0004	0.0011	0.0022	0.11	130
	24-May-2017	<0.0004	<0.0004	<0.0006	<0.00095	<0.10	1.7
BH14	1-Dec-2000	0.0044	0.0032	0.0026	0.0113	NM	NM
	7-Nov-2001	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	1-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
	2-Jun-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	20-Oct-2018	<0.0004	<0.0004	<0.0004	<0.00089	<0.10	<0.10
BH20	29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
BH21	8-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	11-Sep-2003	0.001	0.001	0.0013	0.0077	NM	NM
	13-Nov-2003	<0.0004	<0.0004	<0.0004	<0.0012	NM	NM
	26-Jul-2000	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	5-Oct-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	21-Jun-2005	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	1-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
BH22	8-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	3-Jul-2014	<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15
	29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
BH23	23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	26-Jul-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	5-Oct-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	6-Oct-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	1-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
	8-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	2-Jun-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	6-May-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	14-Sep-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	28-Jun-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	28-Sep-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	25-Jul-2012	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	29-Oct-2012	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10



TABLE: 5

TITLE: GROUNDWATER ANMLYSES - PETROLEUM HYDROCARBONS (RESIDENTIAL)

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

2017 EQG Tier 2 *	Residential	Coarse Grained	Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
		Potable	0.005	0.06	0.14	0.09	2.2	1.1
		Non-Potable	900	258	76	9	---	---
		Vapour Inhalation	0.14	74	16	3.9	0.81	---
		Ecological Contact	61	59	20	31	7.1	1.5
		Aquatic Life	0.074	0.021	41	2.9	9.8	1.8
		Irrigation	---	---	---	---	---	---
		Livestock Watering	---	---	---	---	---	---

		Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
Land Use	Residential	0.005	0.021	0.14	0.09	0.81	1.1
Discovery Reporting Standards**		0.005	0.021	0.14	0.09	0.81	1.1
BH24	29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	3-Jul-2003	0.001	0.001	0.0015	0.0082	NM	NM
	11-Sep-2003	0.0012	0.0007	0.0014	0.0088	NM	NM
	13-Nov-2003	0.0037	0.0008	0.003	0.0102	NM	NM
	19-Feb-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	26-Jul-2004	<0.0009	<0.0009	<0.0009	<0.002	NM	NM
	5-Oct-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	21-Jun-2005	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	1-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
	2-Jun-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	6-May-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	14-Sep-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	28-Jun-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	28-Sep-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	18-May-2012	0.00056	0.0006	0.00046	0.0013	<0.10	<0.10
	26-Jul-2012	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
	30-Oct-2012	<0.00040	0.0044	<0.00040	<0.00080	<0.10	<0.10
BH25	29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	26-Jul-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	5-Oct-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	6-Oct-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	1-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
	8-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	16-Sep-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	2-Jun-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	6-May-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	14-Sep-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	28-Jun-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	28-Sep-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	25-Jul-2012	<0.00040	<0.00040	<0.00040	<0.00080	<0.10	<0.10
BH26	29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.1
	8-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	3-Jul-2014	<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15
	3-Jul-2014	<0.0004	<0.0004	<0.0004	<0.0008	<0.3	<0.15
BH27	29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	3-Jul-2003	<0.0004	<0.0004	<0.0004	<0.0012	NM	NM
	19-Feb-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	26-Jul-2004	<0.0004	<0.0004	<0.0004	<0.0008	NM	NM
	30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	23-Aug-2006	0.113	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	23-Aug-2006	0.124	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	1-Aug-2007	0.0948	<0.0004	<0.0004	<0.0008	<0.1	<0.12
	8-Jul-2008	0.025	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	2-Jun-2009	0.0026	0.0019	<0.0004	0.0016	<0.1	<0.1
	13-Aug-2009	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	6-May-2010	0.0015	0.0007	<0.0004	0.0013	<0.1	<0.1
	14-Sep-2010	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	28-Jun-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	28-Sep-2011	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	18-May-2012	0.028	0.0005	<0.00040	<0.00080	<0.10	<0.10
	18-May-2012	0.029	0.0016	0.0013	0.0041	<0.10	<0.10
	26-Jul-2012	0.19	0.0011	0.03	0.076	0.25	<0.10
	29-Oct-2012	0.57	0.00083	<0.00040	0.0051	<0.10	<0.10
	29-Oct-2012	0.57	0.00086	<0.00040	0.0049	<0.10	<0.10
	2-Jun-2015	0.074	0.0019	<0.0004	0.0012	< 0.10	< 0.10
	20-Oct-2019	0.23	<0.0004	<0.0004	0.004	<0.10	<0.10
	22-Jun-2020	0.35	0.0017	0.00073	0.0041	<0.10	<0.10
	3-Jul-2021	0.0022	<0.0004	<0.0004	<0.00089	<0.10	<0.10
BH28	29-Aug-2002	<0.0002	<0.0002	<0.0002	<0.0002	NM	NM
	30-Aug-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	5-Oct-2005	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	23-Aug-2006	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.13
	1-Aug-2007	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.12
	8-Jul-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1
	16-Sep-2008	<0.0004	<0.0004	<0.0004	<0.0008	<0.1	<0.1



2017 EQG Tier 2*	Coarse Grained		Benzene	Toluene	Ethylbenzene	Xylenes	Fraction 1	Fraction 2
	Residential	Potable	0.005	0.06	0.14	0.09	2.2	1.1
		Non-Potable	900	258	76	9	---	---
		Vapour Inhalation	0.14	74	16	3.9	0.81	---
		Ecological Contact	61	59	20	31	7.1	1.5
		Aquatic Life	0.074	0.021	41	2.9	9.8	1.8
		Irrigation	---	---	---	---	---	---
		Livestock Watering	---	---	---	---	---	---

BOLD	= Applicable Guideline Criteria
BOLD	= Parameter Exceeds Recommended Guideline Criteria
BOLD	= Parameter Exceeds Discovery Reporting Standards Only
	= Most Recent Sampling Event

Fraction 1 = C₆ to C₁₀ (-)
 Fraction 2 = > C₁₀ to C₁
 NM = Not Measured
 --- = No Value Provided in Guidelines



TABLE: 6
TITLE: MANN-KENDALL TREND ANALYSIS - SITE SUMMARY
PROJECT#: 22-129-EAG
CLIENT: EnviroAnalytics Group
PROJECT: Remediation Report, SSA, and RMP
SITE: 810 Railway Avenue East
LOCATION: Rosthern, Saskatchewan

Monitoring Well		Benzene	Toluene	Ethylbenzene	Xylenes	PHC F1	PHC F2
BH11	S	-64	-73	11	-16	1	-1
	CF	98%	100%	71%	77%	50%	50%
	Trend	Decreasing	Decreasing	No Trend	No Trend	No Trend	No Trend
BH13	S	0	0	-6	-11	4	-3
	CF	44%	44%	81%	97%	69%	64%
	Trend	No Trend	No Trend	No Trend	Decreasing	No Trend	No Trend
BH14	S	5	5	5	9	0	-2
	CF	77%	77%	77%	93%	41%	59%
	Trend	No Trend	No Trend	No Trend	Prob. Increasing	No Trend	No Trend
BH16	S	-4	-4	-2	-3	0	-1
	CF	76%	76%	59%	68%	38%	50%
	Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
BH17	S	-10	-25	-8	-28	4	1
	CF	71%	92%	67%	95%	64%	50%
	Trend	No Trend	Prob. Decreasing	No Trend	Decreasing	No Trend	No Trend
BH19	S	-18	18	14	-4	8	14
	CF	85%	85%	79%	57%	76%	91%
	Trend	No Trend	No Trend	No Trend	No Trend	No Trend	Prob. Increasing
BH27	S	33	36	28	36	4	-15
	CF	90%	78%	68%	85%	52%	63%
	Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
BH29	S	-14	-10	1	1	NS	NS
	CF	100%	95%	50%	50%		
	Trend	Decreasing	Decreasing	No Trend	No Trend		
BH30	S	-5	-3	-11	-12	-9	-3
	CF	77%	61%	97%	98%	93%	64%
	Trend	No Trend	No Trend	Decreasing	Decreasing	Prob. Decreasing	No Trend
BH34	S	4	-5	-7	7	0	-4
	CF	64%	68%	76%	76%	44%	69%
	Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
D1	S	-23	-20	-14	-18	4	11
	CF	100%	99%	46%	98%	64%	89%
	Trend	Decreasing	Decreasing	No Trend	Decreasing	No Trend	No Trend
D2	S	-7	-4	21	1	5	5
	CF	76%	64%	100%	50%	77%	77%
	Trend	No Trend	No Trend	Increasing	No Trend	No Trend	No Trend
D4	S	-8	2	-4	0	-5	-7
	CF	76%	54%	62%	46%	77%	86%
	Trend	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
D5	S	-5	-5	-9	-15	-1	1
	CF	77%	77%	93%	>99.9%	50%	50%
	Trend	No Trend	No Trend	Prob. Decreasing	Decreasing	No Trend	No Trend
D8	S	-19	-9	-8	-11	-8	4
	CF	>99.9%	93%	90%	97%	96%	76%
	Trend	Decreasing	Prob. Decreasing	No Trend	Decreasing	Decreasing	No Trend
D9	S	20	-18	13	-22	2	9
	CF	77%	74%	80%	94%	56%	93%
	Trend	No Trend	No Trend	No Trend	Prob. Decreasing	No Trend	Prob. Increasing
MW5	S	-35	-21	-15	-23	-14	2
	CF	100%	96%	89%	98%	46%	55%
	Trend	Decreasing	Decreasing	No Trend	Decreasing	No Trend	No Trend
MW6	S	-17	-11	-9	-9	-6	-2
	CF	>99.9%	97%	93%	93%	81%	56%
	Trend	Decreasing	Decreasing	Prob. Decreasing	Prob. Decreasing	No Trend	No Trend

= Prob. Increasing or Increasing Trend Noted
 = Analytical results are predominantly below analytical method detection limit
Linear trend analyses were performed based on the Mann-Kendall statistical method (Gilbert, 1987), (EPA, 2009), and (Connor et al., 2014)
CF = Confidence Factor
S = Mann-Kendall Statistic
NS = Not enough sampling events to run analysis.



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TABLE: 7

TITLE: PATHWAY/RECEPTOR ASSESSMENT AND EXPOSURE CONTROL MECHANISMS

PROJECT#: 22-129-EAG

CLIENT: EnviroAnalytics Group

PROJECT: Remediation Report, SSA, and RMP

SITE: 810 Railway Avenue East

LOCATION: Rosthern, Saskatchewan

Potential Receptors	Pathway	SOPCs Above Guidelines	Pathway Status	Status Rationale	Exposure Control Mechanism(s)	Contingency Plan
Human	Direct Soil Contact	xylenes, PHC Fraction 2	Risk Managed ²	soil management plan required	Restrictive Covenant	Soil management plan for ground disturbance. Fencing of Site otherwise required to restrict access. Zoning must remain commercial for Site.
	Soil Ingestion	PHC Fraction 2				
	Vapour Inhalation	benzene, xylenes, PHC Fraction 1 and/or 2	Risk Managed ²	soil vapour monitoring shows low risk		Slab-on-grade buildings only, zoning recommended to remain commercial.
	Potable Groundwater	benzene, toluene, ethylbenzene, xylenes, PHC Fractions 1 and/or 2	Risk Managed ²	groundwater not utilized as potable source		Identify on title that municipal services are required and installation of drinking water wells is prohibited. Require repair/decommissioning of groundwater monitoring wells that are damaged, no longer in use, or may be affected by Site development/road upgrades.
Ecological	Direct Soil Contact	toluene, ethylbenzene, xylenes, PHC Fraction 1, 2 and/or 3	Risk Managed ²	soil management plan required		Soil management plan for ground disturbance, recommended development considerations. Fencing of Site otherwise required to restrict access. Zoning must remain commercial for Site.
	Soil Ingestion: Livestock/Wildlife	None	No Risk ¹	pathway not applicable for land uses	N/A	N/A
	Freshwater Aquatic Life/ Livestock/Wildlife	benzene, toluene, xylenes, PHC Fractions 1 and/or 2	Risk Managed ²	nearest surface water 300 m southeast	Restrictive Covenant	Installation of irrigation and water features prohibited on the Site. Grading plans required to ensure surface runoff is appropriately governed for new developments.
Safety and Aesthetics	Management Limits	PHC Fraction 1, Fraction 2 and/or Fraction 3	Risk Managed ²	soil management plan required		Soil management plan for ground disturbance, review of construction materials for utility installations. Fencing of Site otherwise required to restrict access.

¹No Risk = Applies where there are no exceedances of the pathway guideline.

²Risk Managed = Pathway is potentially complete but exposure control has been put in place.

³Excluded = Pathway has been excluded using Tier 2 methodology. See referenced reports.

SOPC = Substances of Potential Concern

PHC = Petroleum Hydrocarbon

N/A = Not Applicable



Nichols Environmental (Canada) Ltd.

TABLE: 8
 TITLE: PROPOSED MONITORING WELLS FOR RMP
 PROJECT#: 22-129-EAG
 CLIENT: EnviroAnalytics Group
 PROJECT: Remediation Report, SSA, and RMP
 SITE: 810 Railway Avenue East
 LOCATION: Rosthern, Saskatchewan

	ID	Location	Rationale for Selection	Field Monitoring	Proposed Analyses	Well Installed By
Monitor	All available monitoring wells (Up to 50, reconnaissance required)			Well headspace, depth to groundwater, total depth	None	N/A
Sample	D1	Southwest side, former AST nest.	Source Area		BTEX & PHC Fraction 1 and 2	Wardrop
	D2					
	MW4	East of former AST nest.	Source Area/ In Situ Evaluation			
	MW5	Northeast of former AST nest.	Source Area/North Closure			
	MW6	East of Site and MW4.	In Situ Evaluation			
	MW19-1	Southeast of MW4.				
	MW30A	Southeast of Site.				
	BH13*	East-central on Site.	North Closure			Wardrop
	D9*	East of central portion of Site.	East Closure			
	BH17*	Southeast of Site across Railway Avenue East.	Southeast Closure			
	BH27					
	BH39*					
	BH40*					
	BH31*	South of MW30A.	South Closure			
	BH10	Southwest side in former AST nest.	Southwest Closure			
	BH11*	Northwest of former AST nest.	West Closure			

BTEX = Benzene, toluene, ethylbenzene, xylenes

PHC = Petroleum hydrocarbon

* = Status of monitoring well condition currently unknown. A reconnaissance will be completed to identify condition of available groundwater monitoring wells and sampling points may be adjusted accordingly or monitoring wells may be rehabilitated



Nichols Environmental (Canada) Ltd.

TABLE: 9
TITLE: PROPOSED SCHEDULE
PROJECT#: 22-129-EAG
CLIENT: EnviroAnalytics Group
PROJECT: Remediation Report, SSA, and RMP
SITE: 810 Railway Avenue East
LOCATION: Rosthern, Saskatchewan

Exposure Control	
2022	Discussion and finalization of RMP requirements.
Monitoring Program	
2023 - 2025	Groundwater monitoring/sampling and evaluation of the monitoring well network condition.
	Evaluation of plume stability. Mitigation measures will be triggered for plume expansion and/or if free-product is detected.
2025	Evaluate frequency of sampling, analyses and exposure controls.
Reporting	
2024 - 2026	Submission of monitoring report.

APPENDIX A

CCME National Classification System for Contaminated Sites (2008) version 1.3
Pre-Screening Checklist

Question	Response (yes / no)	Comment
1. Are Radioactive material, Bacterial contamination or Biological hazards likely to be present at the site?	No	If yes, do not proceed through the NCSCS. Contact applicable regulatory agency immediately.
2. Are there no contamination exceedances (known or suspected)? Determination of exceedances may be based on: 1) CCME environmental quality guidelines; 2) equivalent provincial guidelines/standards if no CCME guideline exists for a specific chemical in a relevant medium; or 3) toxicity benchmarks derived from the literature for chemicals not covered by CCME or provincial guidelines/standards; or 4) background concentration.	No	If yes (i.e., there are no exceedances), do not proceed through the NCSCS.
3. Have partial/incompleted or no environmental site investigations been conducted for the Site?	No	If yes, do not proceed through the NCSCS.
4. Is there direct and significant evidence of impacts to humans at the site, or off-site due to migration of contaminants from the site?	No	If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated.
5. Is there direct and significant evidence of impacts to ecological receptors at the site, or off-site due to migration of contaminants from the site?	No	Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are considered to be severe, the site may be categorized as Class 1, regardless of the numerical total NCSCS score. For the purpose of application of the NCSCS, 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.
6. Are there indicators of significant adverse effects in the exposure zone (i.e., the zone in which receptors may come into contact with contaminants)? Some examples are as follows: -Hydrocarbon sheen or NAPL in the exposure zone -Severely stressed biota or devoid of biota; -Presence of material at ground surface or sediment with suspected high concentration of contaminants such as ore tailings, sandblasting grit, slag, and coal tar.	No	To answer "yes", two scenarios should be satisfied; (1) there has to be a high probability that receptors will be exposed to the contaminant source in the near future, and (2) the predicted impacts to ecological receptors after exposure must be significant (see question 5). A low probability of exposure resulting in significant impacts, or a high probability of exposure but with only low to moderate effects expected should not result in a Class 1 designation, neither would a low probability of exposure resulting in low-to-moderate effects. If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated.
7. Do measured concentrations of volatiles or unexploded ordnances represent an explosion hazard ?	No	If yes, do not proceed through the NCSCS. Do not continue until the safety risks have been addressed. Consult your jurisdiction's occupational health and safety guidance or legislation on explosive hazards and measurement of lower explosive limits.

If none of the above applies, proceed with the NCSCS scoring.

CCME National Classification System for Contaminated Sites (2008) version 1.3
Summary of Site Conditions

Site:	Site will be identified by:	Civic Address
Civic Address: (or other description of location)	810 Railway Avenue, Rosthern, Saskatchewan	
Site Common Name: (if applicable)	Former Shell Bulk Petroleum Storage Facility	
Code identifier: (e.g., FCSI 8-digit identifier)	SK MOE 6090 (Former Operation ID: BU-391)	
Site Owner or Custodian: (Organization and Contact Person)	Site Owner: Saskatchewan Valley Producer Car Corporation Custodian: EnviroAnalytics Group, c/o Lucia Casabo (919-960-9311)	
Legal description or metes and bounds:	Lot 9; Block 99; Plan 96PA21314 Ext. 0	
Approximate Site area:	0.19 ha (0.46 acres)	
Parcel Identifier(s) [PID]: (or Parcel Identification Numbers [PIN] if untitled Crown land)	133-513-781	
Centre of site: (provide latitude/longitude or UTM coordinates)	Latitude: 52 degrees 39 min 51.19 secs N; Longitude: 106 degrees 19 min 45.89 secs W UTM Coordinate: 13U Northing 5835748.29 m Easting 410094.95 m	
Site Land Use:	Current:	Commercial; vacant & undeveloped parking lot.
	Proposed:	Commercial; parking lot with potential slab-on-grade structure.
Site Plan	To delineate the bounds of the Site a site plan MUST be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.	
Provide a brief description of the Site:	The Site is currently vacant and undeveloped. Present day land usage is comprised of surficial vehicle parking, storage of surplus inventory, and a grain auger (and support building) for loading rail carts. The Site was reportedly first developed in the 1960s for use as a bulk fuel storage facility. Historic onsite structures reportedly included 7 ASTs, a pump house, a lubricants storage warehouse, a storage shed, and an office building. Facility upgrades later included the installation of a pump island and 2 USTs in 1977. The Site was decommissioned in stages from 1991 to 1998.	

CCME National Classification System for Contaminated Sites (2008) version 1.3
Summary of Site Conditions

Affected media and Contaminants of Potential Concern (COPC):	Affected media: soil and groundwater. COPC: Benzene, Toluene, Ethylbenzene, Xylenes, PHC Fractions F1, F2, F3
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Please fill in the "letter" that best describes the level of information available for the site being assessed:

Site Letter Grade

B

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:	Tawnya Anderson, B.Sc., EP
Date Scoring Completed:	03-Jun-22

CCME National Classification System for Contaminated Sites (2008) version 1.3

User's Guide - Instructions

1) Please review the following overview of contents. The revised CCME National Classification System for Contaminated Sites (NCSCS) consists of a pre-screening checklist, summary of site conditions, summary score sheet, and three instruction/worksheet pages for the user to fill out: Contaminant Characteristics, Migration Potential and Exposure. For ease of printing, the method of evaluation for scoring each section of the worksheet is provided in a separate Instructions tab. Reference material is also provided to assist with the evaluation. A brief description of each sheet is as follows:

Pre-Screening Checklist - Used to determine if the Site can either be considered a Class 1 site (to be remediated immediately) or if more information must be collected before the Site can be classified, or other hazards exist at the Site that must be addressed first before the Site can be classified using the revised NCSCS.

Site Description Sheet - Summarizes Site information. It also indicates the level of information available (Site Letter Grade) for the site to conduct the NCSCS scoring evaluation. The known/potential contaminants of concern and affected media will also be summarized here.

Contaminant Characteristics Instructions & Worksheet - Prompts the user for information related to the contaminants of potential concern (COPC) found at the site.

Migration Potential Instructions & Worksheet - Prompts the user for information related to physical transport processes which may move contamination to neighboring sites or re-distribute contamination within a site. Migration potential includes many of the exposure pathways, but is not limited to exposure pathways. Migration potential does not require clearly defined receptors.

Exposure Instructions & Worksheet - Prompts the user for information related to exposure pathways and receptors which may be located on the site.

Summary Score Sheet - Generates a total site score by adding up the scores generated on each of the three worksheets and provides the corresponding Site Classification. It also provides an estimate of certainty in the score provided (Certainty Percentage).

Reference Material - Additional information which may be useful to refer to when conducting the evaluation.

- Contaminant Hazard Ranking
- Examples of Persistent Substances
- Examples of Substances in the Various Chemical Classes
- Chemical-specific Properties
- Range of Values of Hydraulic Conductivity and Permeability

The worksheet titles and sub headings are as follows.

I. Contaminant Characteristics

1. Residency Media
2. Chemical Hazard
3. Contaminant Exceedance Factor
4. Contaminant Quantity
5. Modifying Factors

II. Migration Potential

1. Groundwater Movement
2. Surface water Movement
3. Soil
4. Vapour
5. Sediment Movement
6. Modifying Factors

III. Exposure

1. Human Receptors
 - A. Known Impact
 - B. Potential
 - a. Land Use
 - b. Accessibility
 - c. Exposure Route
2. Human Modifying Factors
3. Ecological Receptors
 - A. Known Impact
 - B. Potential
 - a. Terrestrial
 - b. Aquatic
4. Ecological Modifying Factors
 - a. Species at Risk
 - b. Aesthetics
5. Other Receptors
 - a. Permafrost

CCME National Classification System for Contaminated Sites (2008) version 1.3

User's Guide - Instructions

2) This is an electronic form which will prompt the user for information. Based on the answers provided, a score is calculated for the contaminated site in question. In most cases, the user will be asked to select amongst two or more choices in a drop down checklist. To access the drop down checklist, move the mouse towards the right side of the "action box". If a drop down is available, an arrow will appear, which must be selected to access the drop down choices. An "action box" requires input from the user. All action boxes have an amber background.

action box

3) When assigning scores for each factor, it is highly recommended to give a rationale (a column has been provided for this purpose in Worksheets I, II and III). Information that would be useful in justifying the scores assigned may include: a statement of any assumptions, a description of site-specific information, and references for any data sources (e.g., site visit, personal interview, site assessment reports, or other documents consulted).

4) The Site Letter Grade is related to the level of information available for the Site (as defined by the User) and provides an indication of completeness of information based on the level of investigation and remediation work that has been carried out at the site. More detailed descriptions of the various categories are provided below.

Site Letter Grade: Detailed Descriptions:

- F **Pre Phase I ESA** – No environmental investigations have been conducted or there are only partial or incomplete Phase I ESA for the Site. It is not recommended to continue through the NCSCS when insufficient data are available. In these cases, it will generally be necessary to conduct a Phase I ESA or other site investigation tasks in order to complete the NCSCS scoring.
- E **Phase I ESA** – A preliminary desk-top type study has been conducted, involving non-intrusive data collection to determine whether there is a potential for the Site to be contaminated and to provide information to direct any intrusive investigations. Data collected may include a review of available information on current site conditions and history of the property, a site inspection and interviews with personnel familiar with the Site. [Note: This stage is similar to "Phase I: Site Information Assessment" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]
- D **Limited Phase II ESA** – An initial intrusive investigation and assessment of the property has been conducted, generally focusing on potential sources of contamination, to determine whether there is contamination present above the relevant screening guidelines or criteria, and to broadly define soil and groundwater conditions; samples have been collected and analyzed to identify, characterize and quantify contamination that may be present in air, soil, groundwater, surface water or building materials. [Note: This stage is similar to "Phase II: Reconnaissance Testing Program" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]
- C **Detailed Phase II ESA** – Further intrusive investigations have been conducted to characterize and delineate the contamination, to obtain detailed information on the soil and groundwater conditions, to identify the contaminant pathways, and to provide other information required to develop a remediation plan. [Note: This stage is similar to "Phase III: Detailed Testing Program" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]
- B **Risk Assessment with or without Remedial Plan or Risk Management Strategy** – A risk assessment has been completed, and if the risk was found to be unacceptable, a site-specific remedial action plan has been designed to mitigate environmental and health concerns associated with the Site, or a risk management strategy has been developed.
- A **Confirmation Sampling** – Remedial work, monitoring, and/or compliance testing have been conducted and confirmatory sampling demonstrates whether contamination has been removed or stabilized effectively and whether cleanup or risk management objectives have been attained.

5) A few terms are used throughout which require definition, they are as follows:

Known - refers to scores that are assigned based on documented scientific and/or technical observations

Potential - refers to scores that are assigned when something is not known, though it may be suspected

Allowed Potential - If, in a given category, known and potential scores are provided by the user, the checklist will typically default to the "known" score. If a "known" score is provided, the "allowed potential" score will equal zero. Exceptions can be found within the Modifying Factors categories in each worksheet where there are often several independent questions. Therefore, "known" and "potential" scores are allowed to contribute to the total modifying factor score.

Raw - refers to score totals which have not been adjusted down to the total maximum score for the given category. In most cases the possible total raw score is greater than the maximum allowed

CCME National Classification System for Contaminated Sites (2008) version 1.3

User's Guide - Instructions

Note: For some questions in the worksheets, the option selected will determine whether a "known" or "potential" score is assigned. In these cases, if "Do Not Know" is selected, a score will automatically be listed as "potential", whereas all of the other options in the list will provide a "known" score.

6) Certainty Percentage: The ratio of "Known" to "Potential" responses reflects the relative certainty, or confidence, of the resulting final score and the classification. The NCSCS system defines this ratio as the "Certainty Percentage". The Certainty Percentage is generated from the number of sections assigned scores based on "known" information divided by the total number of sections. A high percentage indicates that more is known about the Site, and therefore there is more confidence in the classification, whereas a low percentage suggests that the classification should be treated with caution.

7) Site Classification Categories: Sites should not be ranked relative to one another. Sites must be classified on their individual characteristics in order to determine the appropriate classification (Class 1, 2, 3, or N) according to their priority for action, or Class INS (Insufficient Information) for sites that require further information before they can be classified. The classification groupings are as follows:

Class 1 - High Priority for Action (Total NCSCS Score greater than 70)

The available information indicates that action (e.g., further site characterization, risk management, remediation, etc.) is required to address existing concerns. Typically, Class 1 sites indicate high concern for several factors, and measured or observed impacts have been documented.

Class 2 - Medium Priority for Action (Total NCSCS Score between 50 and 69.9)

The available information indicates that there is high potential for adverse impacts, although the threat to human health and the environment is generally not imminent. There will tend not to be indication of off-site contamination, however, the potential for this was rated high and therefore some action is likely required.

Class 3 - Low Priority for Action (Total NCSCS Score between 37 and 49.9)

The available information indicates that this site is currently not a high concern. However, additional investigation may be carried out to confirm the site classification, and some degree of action may be required.

Class N - Not a Priority for Action (Total NCSCS Score less than 37)

The available information indicates there is probably no significant environmental impact or human health threats. There is likely no need for action unless new information becomes available indicating greater concerns, in which case the site should be re-examined.

Class INS - Insufficient Information (≥15% of Responses are "Do Not Know", or a site letter grade of F has been assigned)

There is insufficient information to classify the site. In this event, additional information is required to address data gaps.

8) Additional Complementary Tools to the NCSCS

The CCME Soil Quality Index (SoQI) is a complementary tool that focuses more on evaluating the relative hazard, by comparing contaminant concentrations with their respective soil quality guidelines. The SoQI uses three factors for its calculations, namely: 1) scope (% of contaminants that do not meet their respective guidelines), 2) frequency (% of individual tests of contaminants that do not meet their respective guidelines), and 3) amplitude (the amount by which the contaminants do not meet their respective guidelines). The soil quality index can be used to compare different contaminated sites with similar types of contamination as well as to see if the jurisdictional requirements have been met after remediation of a particular site.

The NCSCS was not developed for and is not readily applicable for the assessment of sites with a significant marine or aquatic component. Environmental conditions at marine and aquatic sites are best measured in the bed sediments as they act as long-term reservoirs of chemicals to the aquatic environment and to organisms living in or having direct contact with sediments. The CCME Sediment Quality Index (SeQI) provides a convenient means of summarizing sediment quality data and can complement the NCSCS. The SeQI provides a mathematical framework for assessing sediment quality conditions by comparing contaminant concentrations with their respective sediment quality guidelines.

CCME National Classification System (2008) version 1.3

(I) Contaminant Characteristics

Site: 810 Railway Avenue, Rosthern, Saskatchewan

Site: 610 Railway Avenue, Rossmore, Saskatchewan				
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		See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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://st-ts.ccme.ca/ 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://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php	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			
Yes No Do Not Know				
B. Groundwater	Yes			
Yes No Do Not Know				
C. Surface water	No			
Yes No Do Not Know				
D. Sediment	No			
Yes No Do Not Know				
"Known" -score	4			
"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 Medium Low Do Not Know	High	PHCs present in soil and groundwater, see Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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. <i>See Attached Reference Material for Contaminant Hazard Rankings.</i>	Hazard as defined in the revised NCSCS 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.
"Known" -score	8			
"Potential" - score	---			

CCME National Classification System (2008) version 1.3

(I) Contaminant Characteristics

Site: 810 Railway Avenue, Rosthern, Saskatchewan

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
3. Contaminant Exceedance Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?	High (>100x)	See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022). PHC F2 in VW2 (2012) > 100 x CCME guidelines of 230 ppm.	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the <i>most conservative media-specific and land-use appropriate CCME</i> 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 NAPL (LNAPL or DNAPL) = Contaminant is a non-aqueous phase liquid (<i>i.e.</i> , 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>i.e.</i> , greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Any amount of NAPL should be scored, <i>i.e.</i> small amounts and sheens cannot be ignored. The presence of a NAPL (mobile or immobile or regardless of amount) may be considered unacceptable by some jurisdictions. If NAPL is present, consult jurisdiction on how to proceed with NCSCS. 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>i.e.</i> , 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.
NAPL (mobile or immobile) High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know				
"Known" -score	6			
"Potential" - score	---			
4. Contaminant Quantity (known or strongly suspected)				
What is the known or strongly suspected quantity of all contaminants?	<2 ha or 1000 m3	See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	Measure or estimate the area or quantity of total contamination (<i>i.e.</i> , 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.
>10 hectare (ha) or 5000 m³ 2 to 10 ha or 1000 to 5000 m³ <2 ha or 1000 m³ Do Not Know				
"Known" -score	2			
"Potential" - score	---			

CCME National Classification System (2008) version 1.3

(I) Contaminant Characteristics

Site: 810 Railway Avenue, Rosthern, Saskatchewan

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
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	See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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. Elements do not degrade, therefore treat any metal, metalloid, or halogen COPC as persistent.	<i>Examples of Persistent Substances are provided in attached Reference Materials</i>
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	See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	If answered Yes, in Rationale for Score column document the location and extent of the infrastructure that is/may be damaged, verify the mode of contact between contaminants of potential concern (COPCs) and infrastructure, list the specific COPCs that could cause damage, and note the expected effect on specific infrastructure.	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	two to four	See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022); volatile, light extractable, and heavy extractable PHCs	For the purposes of the revised NCSCS, 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.	<i>Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.</i>
"Known" - Score	4			
"Potential" - Score	---			

Contaminant Characteristic Total

Raw Total Score- "Known"	24
Raw Total Score- "Potential"	---
Raw Combined Total Score (Known + Potential)	24
Adjusted Total Score (Raw Combined / 40 * 33)	19.8

maximum 33

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

Site: 810 Railway Avenue, Rosthern, Saskatchewan

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
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. ii) Same as (i) except the information is not known but <u>strongly suspected</u> based on indirect observations. 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>i.e.</i> , 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).	12	Known contamination in groundwater. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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.	The 1992 NCS rationale evaluated the off-site migration as a regulatory issue. The exposure assessment and classification of hazards should be evaluated regardless of the property boundaries. Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a groundwater supply source 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 resources such as internet links. Note that for potable groundwater that also daylights into a nearby surface water body, the more stringent guidelines for both drinking water and protection of aquatic life should be considered. Selected References <u>Potable Environments</u> Guidelines for Canadian Drinking Water Quality: http://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php <u>Non-Potable Environments</u> CCME. 1999. Canadian Water Quality Guidelines for Protection of Aquatic Life. http://ceqg-rcqe.ccmec.ca/ Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada), report to Environment Canada, January 4, 2002.
	9			
	0			
	12			
Score	12			
NOTE: If a score is assigned here for Known COPC Exceedances, then you should skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)				
B. Potential for groundwater pathway.				
a. Relative mobility of contaminant High Moderate Low Insignificant Do Not Know			Organics Koc (L/kg) Koc < 500 (<i>i.e.</i> , log Koc < 2.7) Koc = 500 to 5000 (<i>i.e.</i> , log Koc = 2.7 to 3.7) Koc = 5,000 to 100,000 (<i>i.e.</i> , log Koc = 3.7 to 5) Koc > 100,000 (<i>i.e.</i> , log Koc > 5) Metals with higher mobility at acidic conditions pH < 5 pH = 5 to 6 pH > 6 Metals with higher mobility at alkaline conditions pH > 8.5 pH = 7.5 to 8.5 pH < 7.5 For PHC fractions; score F1 as Moderate, F2 as Low, and F3 and F4 as Insignificant.	Reference: US EPA Soil Screening Guidance (Part 5 - Table 39) If a score of zero is assigned for relative mobility, it is still recommended that the following sections on potential for groundwater pathway be evaluated and scored. Although the Koc of an individual contaminant may suggest that it will be relatively immobile, it is possible that, with complex mixtures, there could be enhanced mobility due to co-solvent effects. Therefore, the Koc cannot be relied on solely as a measure of mobility. An evaluation of other factors such as containment, thickness of confining layer, hydraulic conductivities and precipitation infiltration rate are still useful in predicting potential for groundwater migration, even if a contaminant is expected to have insignificant mobility based on its chemistry alone.
	Do Not Know			
	2			
b. Presence of engineered sub-surface containment? No containment Partial containment Full containment 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.	Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at 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, geotechnical reports or natural attenuation studies and other resources such as internet links. Selected Resources: United States Environmental Protection Agency (USEPA) 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128.
	Do Not Know			
	1.5			

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

Site: 810 Railway Avenue, Rosthern, Saskatchewan

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
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			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).	
	Do Not Know			
	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			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.	
	Do Not Know			
	Score 0.5			
B. Potential for groundwater pathway.				
e. Precipitation infiltration rate (Annual precipitation factor x surface soil relative permeability factor) High (infiltration score > 0.6) Moderate (0.4 < infiltration score ≤ 0.6) Low (0.2 < infiltration score ≤ 0.4) Very Low (0 < infiltration score ≤ 0.2) None (infiltration score = 0) Do Not Know			<u>Precipitation</u> Refer to Environment Canada precipitation records for relevant areas (30 year average preferred). Divide annual precipitation (rainfall + snowfall) by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). <u>Permeability</u> 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 (e.g., precipitation factor of 0.7 from above x 0.6 (sand) = 0.42 or "Moderate").	Selected Sources: Environment Canada web page link: http://climate.weather.gc.ca/climate_normals/index_e.html Snow to rainfall conversion apply ratio of 10(snow):1(water) https://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=108C6C74-1
	Do Not Know			
	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			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).	
	Do Not Know			
	Score 1			
Potential groundwater pathway total	5.9	Note: If a "known" score is provided, the "potential" score is disallowed.		
Allowed Potential score	---			
Groundwater pathway total	12			

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
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). ii) Same as (i) except the information is not known but <u>strongly suspected</u> based on indirect observations. iii) Meets CWQG or absence of surface water exposure pathway (e.g., Distance to nearest surface water is > 5 km.) Score	12	Nearest surface water 300 m southeast, groundwater modelling completed, and closure is present before water body. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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. Examples of indirect evidence may include observed staining of sediment and/or river banks, but surface water has not been tested.	General Notes: Someone experienced must provide a thorough description of the sources researched to classify the surface water body 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: CCME. 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life http://cegg-rcqe.ccme.ca/ CCME. 1999. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water) http://cegg-rcqe.ccme.ca/ Health and Welfare Canada. 1992. Guidelines for Canadian Recreational Water Quality. http://www.hc-sc.gc.ca/ewh-semt/water-eau/recreat/index-eng.php
	8			
	0			
	0			
	0			
NOTE: If a score is assigned here for Demonstrated Migration in Surface Water, then you should 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 Score			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.	
	Do Not Know			
	3			
b. Distance to Surface Water 0 to <100 m 100 - 300 m >300 m Do Not Know Score			Review available mapping and survey data to determine distance to nearest surface water bodies.	
	Do Not Know			
	2			
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 Score			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.).	
	Do Not Know			
	1			

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

Site: 810 Railway Avenue, Rosthern, Saskatchewan

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes	
d. Run-off potential High (run-off score > 0.6) Moderate (0.4 < run-off score ≤ 0.6) Low (0.2 < run-off score ≤ 0.4) Very Low (0 < run-off score ≤ 0.2) None (run-off score = 0) Do Not Know			<u>Precipitation</u> Refer to Environment Canada precipitation records for relevant areas (30 year average preferred). Divide precipitation (rainfall + snowfall) by 1000 and round to nearest tenth (e.g. , 667 mm = 0.7 score). <u>Permeability</u> For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the permeability (infiltration) factor with precipitation factor to obtain Run-off potential score (e.g. , precipitation factor of 0.7 from above x 0.6 (loam) = 0.42 or "Moderate").	Selected Sources: Environment Canada web page link: http://climate.weather.gc.ca/climate_normals/index_e.html Snow to rainfall conversion apply ratio of 10(snow):1(water) https://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=108C6C74-1	
	Do Not Know				
Score	0.4				
e. Flood potential 1 in 2 years 1 in 10 years 1 in 50 years not in floodplain Do Not Know			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.		
	Do Not Know				
Score	0.5				
Potential surface water pathway total	6.9	Note: If a "known" score is provided, the "potential" score is disallowed.			
Allowed Potential score	---				
Surface water pathway total	0				
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	See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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). Examples of strongly suspected exceedences of soil guidelines may include evidence of staining, odours, or significant debris infill materials.	Selected References: CCME. 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. http://ceqg-rcqe.ccme.ca/	
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				
	12				
Score	12				
NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you should 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			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.	The possibility of contaminants in blowing snow have not been included in the revised NCSCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.	
	Do Not Know				
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			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).		
	Do Not Know				
Score	3				
Potential surface soil pathway total	7				Note: If a "known" score is provided, the "potential" score is disallowed.
Allowed Potential score	---				
Soil pathway total	12				

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

Site: 810 Railway Avenue, Rosthern, Saskatchewan

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
4. Vapour				
A. Demonstrated COPCs in vapour.				
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	Consult previous investigations, including human health risk assessments, for reports of vapours detected. Due to the potential for significant spatial and temporal variation in soil vapour concentrations, limited vapour monitoring studies (e.g., single point in time "snap-shot") that do not detect vapour at sites where volatiles are suspected, does not necessarily mean that vapours are not an issue at the site. In this case, section B " Potential for COPCs in vapour" should be completed.	
Strongly suspected (based on observations and/or modelling)	9			
Vapour has not been measured (i.e. not detected) and volatile hydrocarbons have not been found in site soils or groundwater, or vapour has been measured (indoor or outdoor) in concentrations not exceeding risk based concentrations.	0			
	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you should 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			Reference: US EPA Soil Screening Guidance (Part 5 - Table 36) <i>Provided in Attached Reference Materials</i> For PHC fractions; score F1 as High, F2 as Moderate, and F3 and F4 as Not Volatile. Substance is considered Not Volatile (i.e. , pathway not a concern) if the product of the water solubility and unitless Henry's law constant does not exceed published or derived tolerable concentration or risk-specific concentration. If NAPL is present, see Appendix D of the CCME soil vapour quality guideline protocol (CCME 2014) for further guidance.	If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5. Selected References: CCME. 2014. A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours. Winnipeg, Manitoba. http://cegg-rcqe.ccme.ca
	Do Not Know			
Score	2.5			
b. What is the soil grain size? Fine Coarse Do Not Know			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).	
	Do Not Know			
Score	3			
c. Is the depth to the source less than 10m? Yes No Do Not Know			Review groundwater depths below grade for the site.	
	Do Not Know			
Score	1			
d. Are there any preferential pathways? Yes No Do Not Know			Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathways.	Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
	Do Not Know			
Score	1			
Potential vapour pathway total	7.5	Note: If a "known" score is provided, the "potential" score is disallowed.		
Allowed Potential score	---			
Vapour pathway total	0			

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

Site: 810 Railway Avenue, Rosthern, Saskatchewan

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
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	Nearest surface water 300 m southeast, groundwater modelling completed, and closure is present before water body. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	Review sediment assessment reports. Evidence of migration of contaminants in sediments must be reported by someone experienced in this area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.
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 Sediment meets CCME sediment quality guidelines 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			
Go to Potential				
Score	---			
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you should skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)				
B. Potential for sediment migration				
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")? Yes No Do Not Know	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.	
	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? Yes No Do Not Know	Do Not Know			
	2			
c. For rivers, are the contaminated sediments in an area prone to sediment scouring? Yes No Do Not Know	Do Not Know			
	2			
Potential sediment pathway total	6			
Allowed Potential score	6	Note: If a "known" score is provided, the "potential" score is disallowed.		
Sediment pathway total	6			
6. Modifying Factors				
Are there subsurface utility conduits in the area affected by contamination? Yes No Do Not Know	Yes	See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	
Known	4			
Potential	---			

Migration Potential Total		
Raw Total Score- "Known"	28	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.
Raw Total Score- "Potential"	6	
Raw Combined Total Score (Known + Potential)	34	
Adjusted Total Score (Raw Combined / 64 * 33)	17.5	maximum 33

CCME National Classification System (2008) version 1.3

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

Site: 810 Railway Avenue, Rosthern, Saskatchewan

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	See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	*Where adverse effects on humans are documented, the site should be automatically designated as a Class 1 site (<i>i.e.</i> , action required). Known impacts could include blood test results (<i>e.g.</i> , blood lead > 10 µg/dL) or results of other health based studies and tests. There is no need to proceed through the NCSCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired. A score of 22 can also be assigned when Hazard Quotients (or Hazard Index) >> 1.0 or incremental lifetime cancer risks considerably exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals. The category, "Strongly suspected", can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients (or Hazard Index) > 0.2 (excluding the Estimated Daily Intake) or > 1.0 with Estimated Daily Intake and/or incremental lifetime 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). The category, no exposure/impacts, can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients (or Hazard Index) of ≤ 0.2 (excluding the Estimated Daily Intake) or ≤ 1.0 with Estimated Daily Intake 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 Health Screening Level Risk Assessments, available at http://www.hc-sc.gc.ca/ewh-semt/pubs/contam/site/index-eng.php United States Environmental Protection Agency, Integrated Risk Information System (IRIS), available at http://toxnet.nlm.nih.gov
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10			
No quantified or suspected exposures/impacts in humans.	0			
	Go to Potential			
Score	---			
NOTE: If a score is assigned here for Known Exposure, then you should 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		In an area of mixed residential and commercial land use. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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 (<i>e.g.</i> , 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). Parkland includes campgrounds, but excludes wildlands such as national or provincial parks. 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 (<i>e.g.</i> , children).
	Res / Parkland			
Score	2			
b) Indicate the level of accessibility to the contaminated portion of the site (<i>e.g.</i> , 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		Contamination is below grade. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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.	
	Mod. access, covered			
Score	1			
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		Impacts present in top 1.5 m. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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.
	Yes			
Score	3			

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

Site: 810 Railway Avenue, Rosthern, Saskatchewan

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
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 Score 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 Score inhalation total	Yes 3 Coarse 1 4	Potential off-site to southeast. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022) Impacts present in top 1.5 m. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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), <i>Potential for COPCs in Vapour</i> for a definition of volatility. 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.	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. http://cegg-rcqe.ccme.ca/ Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
B. Potential for human exposure				
iii) Ingestion (i.e., ingestion of food items, water and soils [for children]), including traditional foods. 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 No potential for aquifer contamination Do Not Know Score Is an alternative water supply readily available? Yes No Not Applicable Do Not Know Score Is human ingestion of contaminated soils possible? Yes No Do Not Know Score Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings? Yes No Do Not Know Score Ingestion total	0 to 100 m 3 Yes 0 Yes 3 Do Not Know 0.5 6.5	Private wells may be present in vicinity, though not belived to be utilized for potable consumption but for garden irrigation purposes. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022) Town of Rosthern provides drinking water. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022) Impacts present in top 1.5 m. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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. For aquifers, examples of "No drinking water present" includes municipal bylaws prohibiting water wells for potable water use and naturally non-potable (e.g., saline) shallow groundwater. Groundwater used for drinking water may not be at risk from contamination due to a lack of hydrological connection between contaminated soil or groundwater, or the drinking water is sufficiently up-gradient of the contamination source. Selection of "No potential for aquifer contamination" must be supported with sufficient documentation, e.g., lithological and contaminant properties, well capture zones (map drawn to scale), and capture zone delineation methodology. Answer Not Applicable if "No drinking water present" or "No potential for aquifer contamination" was selected in previous question. 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. 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.	Selected References: Guidelines for Canadian Drinking Water Quality: http://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php 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.
Human Health Total "Potential" Score	16.5	Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.		
Allowed "Potential" Score	16.5			

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

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes		
2. Human Exposure Modifying Factors						
a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.) in contaminated area.	No	Site is commercial in a town. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)				
Yes						
No						
Do Not Know						
Human Exposure Modifying Factors - "Known"	0					
Human Exposure Modifying Factors - "Potential"	---					
Raw Human "Known" total	0					
Raw Human "Potential" total	16.5					
Raw Combined Total Human Score	16.5					
Adjusted Total Human Score (max 22)	16.5					
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	See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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.	CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life. CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses. http://cegg-rcqe.ccme.ca/ Sensitive receptors- review: Canadian Council on Ecological Areas; www.ccea.org		
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	12				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.	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 <i>A Framework for Ecological Risk Assessment: General Guidance</i> (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.
No quantified or suspected exposures/impacts in terrestrial or aquatic organisms	0				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.	
Go to Potential						
Score	---					
NOTE: If a score is assigned here for Known Exposure, then you should skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)						
B. Potential for ecological exposure (for the contaminated portion of the site)						
a) Terrestrial i) Land use Agricultural (or Wild lands) Residential / Parkland Commercial Industrial Do Not Know		Site is commercial, but located in a mix of commercial/residential land use. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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). 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).			
Score	Residential / Parkland					
	2					
ii) Uptake potential		Impacts present in top 1.5 m. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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.			
Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site?	Yes					
Yes						
No						
Do Not Know						
Score	1					

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes	
iii) Ingestion (<i>i.e.</i> , wildlife or domestic animals ingesting contaminated food items, soils or water) Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know Score Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know Score Can the contamination identified bioaccumulate? Yes No Do Not Know Score Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know Score		No surfacewater present on-site. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022) PHC impacts. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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. Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates. Substances can be considered bioaccumulative if; • There is a Tissue Residue Guideline (TRG) or Soil Quality Guideline for Soil and Food Ingestion for the protection of secondary (SQG _{2c}) and/or tertiary consumers (SQG _{3c}). • Bioaccumulation factor (BAF) or bioconcentration factor (BCF) greater than 5000. • If BAF or BCF is not available, or reliable, the log Kow is equal to or greater than 5. If a literature review indicates that a substance biomagnifies, it should be treated as biomagnifying regardless of whether or not it meets the criteria above. It should also be noted that some substances with a log Kow greater than 5 do not biomagnify. If studies on a substance with a high Kow demonstrate a lack of biomagnification in upper trophic levels, then the substance can be considered not bioaccumulative. Petroleum hydrocarbons F1 to F4 are not considered bioaccumulative. 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	See attached Reference Material including log(Kow) Consult CEPA (1999) Persistence and Bioaccumulation Regulations for additional guidance; http://laws-lois.justice.gc.ca/eng/regulations/SOR-2000-107/page-1.html 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.	
	No				
	0				
	Do Not Know				
	0.5				
	No				
	0				
Raw Terrestrial "Potential" total	5	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.			
Allowed Terrestrial "Potential" total	5				
B. Potential for ecological exposure (for the contaminated portion of the site)					
b) Aquatic i) Classification of aquatic environment Sensitive Typical Not Applicable (no aquatic environment present) Do Not Know		Nearest waterbody is 300 m, and have closure prior to reaching this point. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	"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. "Typical aquatic environments" include those in areas other than those listed above.		
	Not Applicable				
Score	0				

CCME National Classification System (2008) version 1.3

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

Site: 810 Railway Avenue, Rosthern, Saskatchewan

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
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? Yes No (or Not Applicable) Do Not Know Score 0 No		Nearest waterbody is 300 m, and have closure prior to reaching this point. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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.	
Distance from the contaminated site to an important surface water resource 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know Score 2 300 m to 1 km		Nearest waterbody is 300 m, and have closure prior to reaching this point. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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.
Are aquatic species (<i>i.e.</i>, 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? Yes No Do Not Know Score 0 No		Nearest waterbody is 300 m, and have closure prior to reaching this point. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	Substances can be considered bioaccumulative if; • There is a Tissue Residue Guideline (TRG) • Bioaccumulation factor (BAF) or bioconcentration factor (BCF) greater than 5000. • If BAF or BCF is not available, or reliable, the log Kow is equal to or greater than 5. If a literature review indicates that a substance biomagnifies, it should be treated as biomagnifying regardless of whether or not it meets the criteria above. It should also be noted that some substances with a log Kow greater than 5 do not biomagnify. If studies on a substance with a high Kow demonstrate a lack of biomagnification in upper trophic levels, then the substance can be considered not bioaccumulative.	See attached Reference Material including log(Kow) Consult CEPA (1999) Persistence and Bioaccumulation Regulations for additional guidance; http://laws-lois.justice.gc.ca/eng/regulations/SOR-2000-107/page-1.html
Raw Aquatic "Potential" total	2	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
Allowed Aquatic "Potential" total	2			
4. Ecological Exposure Modifying Factors				
a) Known, or potential, occurrence of a species at risk. Is there a potential for a species at risk to be present at the site, or a known presence? Yes No Do Not Know Score 1 Do Not Know			Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as NatureServe Explorer (http://explorer.natureserve.org/). Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance. To assess the potential for a species at risk to be present, the site (or surroundings) should be located within range of a species at risk (using on-line resources and consultation with knowledgeable government departments or biologists, see above), and there should be an assessment of habitat suitability for any identified potential species at risk.	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, available at: 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://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk
b) Potential impact of aesthetics (e.g., enrichment of a lake or tainting of food flavour). Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know Score 0 No		Nearest waterbody is 300 m, and have closure prior to reaching this point. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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.
Is there evidence of olfactory impact (<i>i.e.</i>, unpleasant smell)? Yes No Do Not Know Score 0 No		Nearest waterbody is 300 m, and have closure prior to reaching this point. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.	
Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know Score 0 No		Nearest waterbody is 300 m, and have closure prior to reaching this point. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients <i>e.g.</i> , nitrogen or phosphorous releases to an aquatic body can act as a fertilizer.	
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know Score 0 No		Nearest waterbody is 300 m, and have closure prior to reaching this point. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	
Ecological Modifying Factors Total - Known	0			
Ecological Modifying Factors Total - Potential	1			
Raw Ecological "Known" total	0			
Raw Ecological "Potential" total	8			
Raw Combined Total Ecological Score	8			
Adjusted Total Ecological Score (Max 18)	8			

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
5. Other Potential Contaminant Receptors				
a) Exposure of permafrost (leading to erosion and structural concerns) Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity? Yes No Do Not Know Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know		Site located within an area of no permafrost. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)	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. 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.	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.
	No			
	0			

		Site located within an area of no permafrost. See Remediation Report, Site Sensitivity Analysis, and Risk Management Plan (2022)		
	No			
	0			

	Other Potential Receptors Total - Known	0		
Other Potential Receptors Total - Potential	---			
Exposure Total				
Raw Human Health + Ecological Total + Other Receptors - "Known"	0	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included. HH or Eco Total score has not yet been capped at 22 and 18, respectively.		
Raw Human Health + Ecological Total + Other Receptors - "Potential"	24.5			
Raw Total Exposure Score (not adjusted)	24.5			
Adjusted Total Score (Adjusted Total Exposure / 46 * 34)	18.1	maximum 34		

CCME National Classification System (2008) version 1.3 **Score Summary**

Site: 810 Railway Avenue, Rosthern, Saskatchewan

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

I. Contaminant Characteristics

	Known	Potential
1. Residency Media	4	---
2. Chemical Hazard	8	---
3. Contaminant Exceedance Factor	6	---
4. Contaminant Quantity	2	---
5. Modifying Factors	4	---

Raw Total Score 24 ---

Raw Combined Total Score (Known + Potential) 24

Adjusted Total Score (Raw Combined Total/40*33) **19.8** (max 33)

II. Migration Potential

	Known	Potential
1. Groundwater Movement	12	---
2. Surface Water Movement	0	---
3. Soil	12	---
4. Vapour	0	---
5. Sediment Movement	---	6
6. Modifying Factors	4	---

Raw Total Score 28 6

Raw Combined Total Score (Known + Potential) 34

Adjusted Total Score (Raw Combined Total/64*33) **17.5** (max 33)

III. Exposure

	Known	Potential
1. Human Receptors		
A. Known Impact	---	
B. Potential		
a. Land Use		2
b. Accessibility		1
c. Exposure Route		
i. Direct Contact		3
ii. Inhalation		4
iii. Ingestion		6.5
2. Human Receptors Modifying Factors	0	---
<u>Raw Total Human Score</u>	0	16.5

Raw Combined Total Human Score (Known + Potential) 16.5

Adjusted Total Human Score 16.5 (maximum 22)

3. Ecological Receptors		
A. Known Impact	---	
B. Potential		
a. Terrestrial		5
b. Aquatic		2
4. Ecological Receptors Modifying Factors	0	1
<u>Raw Total Ecological Score</u>	0	8

Raw Combined Total Ecological Score (Known + Potential) 8

Adjusted Total Ecological Score 8 (maximum 18)

5. Other Receptors	0	---
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Total Other Receptors Score (Known + Potential) 0

Total Exposure Score (Human + Ecological + Other) **24.5**

Adjusted Total Score (Total Exposure/46*34) **18.1** (maximum 34)

Site Score

Site Letter Grade
Certainty Percentage
% Responses that are "Do Not Know"

B
81%
12%

Total NCSCS Score for site
Site Classification Category

55.4
2

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", or
a site letter grade of F has been assigned)

* 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 B

GRANT OF RESTRICTIVE COVENANT

RUSTH & NW, SK

THIS INDENTURE made as of the 28th day of February, 2014**BETWEEN:**

UCANCO GENERAL PARTNERS INC.
203, 200 Barclay Parade SW
Calgary, Alberta
T2P 4R5

(hereinafter called the "**Grantor**")

OF THE FIRST PART

- and -

SHELL CANADA LIMITED
400 - 4th Avenue S.W.
P.O. Box 100, Station "M"
Calgary, Alberta
T2P 2H5

(hereinafter called the "**Grantee**")

OF THE SECOND PART**WITNESSES THAT WHEREAS:**

- A. The Grantor holds legal ownership or has applied to become the registered owner of the lands and premises described as:

LOT 9 BLK/PAR 99 PLAN NO 96PA21314 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 97PA00858

(herein called the "**Servient Lands**");

- B. The Grantee holds legal ownership or is entitled to be registered as the owner of the lands and premises described as:

LOT 23 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 24 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 25 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 26 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 27 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 28 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 29 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 30 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

BLK/PAR F PLAN NO 70S09495 EXTENSION 1
AS DESCRIBED ON CERTIFICATE OF TITLE 79S09259

(herein collectively, called the "**Dominant Lands**");

- C. It was a condition of the purchase and sale agreement whereby the Grantor's affiliate agreed to purchase the Servient Lands from the Grantee's affiliate, that the Grantor would enter into this instrument;

NOW THEREFORE, in consideration of the premises and the sum of one dollar (\$1.00) and other good and valuable consideration paid by the Grantee to the Grantor, the receipt whereof is acknowledged by the Grantor, the Grantor covenants and agrees with the Grantee for the benefit of the Dominant Lands that:

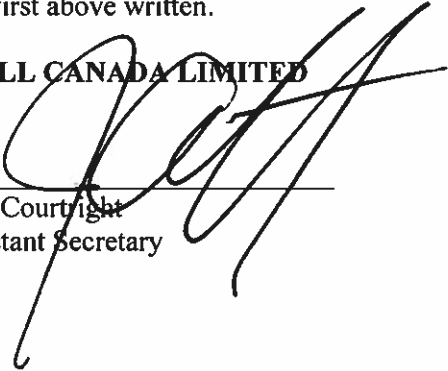
1. During the period commencing February 28, 2014 and ending February 27, 2024 there shall not be stored in bulk, or distributed or manufactured on or from the Servient Lands or any part thereof the following: gasoline, lubricants, diesel, oils, greases, antifreezes or other petroleum products for motor vehicles nor any other fuel or substance that may be developed in future for servicing or powering vehicles (collectively, "**Petroleum Products**"); provided that nothing herein contained shall prevent the Grantor or any tenant of the Servient Lands from storing, using, marketing and selling reasonable quantities of lubricants, greases and other lubricating petroleum products necessary for servicing automobiles and heavy duty equipment for industrial and trucking uses and from keeping or storing above-ground non-bulk Petroleum Products for its own private use.
2. The waiver by the Grantee of any breach of these covenants shall not constitute a continuing waiver of these covenants or affect any subsequent breach thereof.
3. The burden of these covenants will run with and bind the Servient Lands and the benefit of these covenants will be annexed to and run with the Dominant Lands.
4. These covenants shall enure to the benefit of the Grantee and the successors and assigns of the Grantee and shall be binding upon the Grantor and the successors of the Grantor and all future assigns of the Servient Lands or any part thereof or of any interest therein.
5. Where the Grantee is comprised of more than one person, then any one of the persons comprising the Grantee will be entitled to enforce and receive the benefit of the covenants and obligations on the part of the Grantor hereunder. The rights and interests of the Grantee under this instrument may be held by the Grantee on its own behalf and from time to time on behalf of an entity or entities (which may include a partnership) affiliated or associated with the Grantee, or both on the Grantee's behalf

in part and on behalf of such affiliated or associated entity or entities. The Grantor agrees that the rights and interests of the Grantee under this instrument will enure to the benefit of and will be enforceable by the Grantee and such affiliated or associated entity or entities. Upon the request from time to time of the Grantee, and, where the Grantee is comprised of more than one person, upon the request from time to time of any one of the persons comprising the Grantee, the Grantor will execute and deliver all such further documents and instruments and give all such further assurances (in registrable form if so requested and under seal as a deed if so requested) as may be necessary or desirable to give effect to this instrument and to confer the benefits of this instrument to the Grantee and all such persons comprising the Grantee and all such affiliated or associated entity or entities.

6. The invalidity of any particular provision of this instrument shall not affect any other provision hereof and this instrument shall be construed as if such invalid provision were omitted.

IN WITNESS WHEREOF the parties have executed this Grant of Restrictive Covenant as of the date first above written.

SHELL CANADA LIMITED



John Courtwright
Assistant Secretary

UCANCO GENERAL PARTNERS INC.



Name: **Thomas E. Roberts**
Title: **President & Treasurer**



Name: **Michael J. Roberts**
Title: **Vice President & Secretary**

GRANT OF RESTRICTIVE COVENANT

THIS INDENTURE made as of the 28th day of February, 2014

ROSTHERN, SK

BETWEEN:

UCANCO GENERAL PARTNERS INC.
203, 200 Barclay Parade SW
Calgary, Alberta T2P 4R5

(hereinafter called the "**Grantor**")

OF THE FIRST PART

- and -

SHELL CANADA LIMITED
400 - 4th Avenue S.W.
P.O. Box 100, Station "M"
Calgary, Alberta T2P 2H5

(hereinafter called the "**Grantee**")

OF THE SECOND PART**WITNESSES THAT WHEREAS:**

- A. The Grantor holds legal ownership or has applied to become the registered owner of the lands and premises described as:

LOT 9 BLK/PAR 99 PLAN NO 96PA21314 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 97PA00858

(herein called the "**Servient Lands**");

- B. The Grantee holds legal ownership or is entitled to be registered as the owner of the lands and premises described as:

LOT 23 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 24 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 25 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 26 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 27 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 28 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 29 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

LOT 30 BLK/PAR 10 PLAN NO G30 EXTENSION 0
AS DESCRIBED ON CERTIFICATE OF TITLE 65S01326K

BLK/PAR F PLAN NO 70S09495 EXTENSION 1
AS DESCRIBED ON CERTIFICATE OF TITLE 79S09259

(herein collectively, called the "**Dominant Lands**");

- C. It was a condition of the purchase and sale agreement whereby the Grantor's affiliate agreed to purchase the Servient Lands from the Grantee's affiliate, that the Grantor would enter into this instrument;

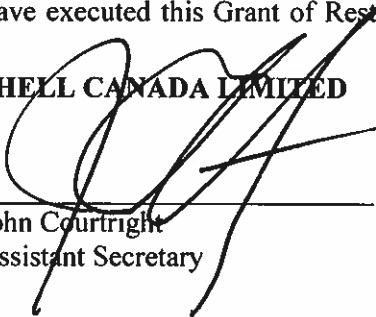
NOW THEREFORE, in consideration of the premises and the sum of one dollar (\$1.00) and other good and valuable consideration paid by the Grantee to the Grantor, the receipt whereof is acknowledged by the Grantor, the Grantor covenants and agrees with the Grantee for the benefit of the Dominant Lands that:

1. Until the Grantor provides to the Grantee an environmental assessment, prepared by an independent third party, confirming that the Servient Lands then meets the existing residential environmental standards or guidelines required for residential use as accepted by the applicable government authority (the "**Accepted Residential Remediation Standard**") the Grantor shall not use nor permit the Servient Lands to be used for any residential uses, nor any commercial uses which as an adjunct of the commercial use includes any at-grade or below-grade living accommodation nor any day cares or religious assemblies or any other uses (which other uses shall be determined by the applicable governmental authority) that require the Servient Lands to be remediated to the Accepted Residential Remediation Standard.
2. Until the Grantor provides to the Grantee an environmental assessment, prepared by an independent third party, confirming that the Servient Lands then meet the existing commercial environmental standards or guidelines accepted by the applicable government authority (the "**Accepted Remediation Standard**"):
 - (i) there shall not be constructed or installed in or on the Servient Lands, or any part thereof, any:
 - (A) subsurface structure, including, without limiting the generality thereof, any subsurface parking or basement structure, but excluding therefrom any underground utility conduits or subsurface footings. For clarity, to the extent any subsurface footings are required in respect of structural slab-on-grade construction on the Servient Lands, the restriction set out herein shall not extend to such footings, as it is the Grantee's intention that structural slab-on-grade construction shall not be restricted;
 - (B) potable or non-potable water wells; or
 - (C) deep-rooting trees and/or plants; and

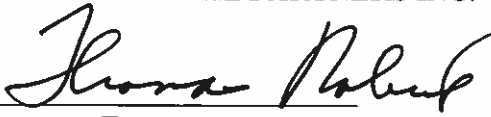
- (ii) deeper soils on the Servient Lands shall not be relocated to shallower depths on the Servient Lands.
3. The waiver by the Grantee of any breach of these covenants shall not constitute a continuing waiver of these covenants or affect any subsequent breach thereof.
 4. The burden of these covenants will run with and bind the Servient Lands and the benefit of these covenants will be annexed to and run with the Dominant Lands.
 5. These covenants shall enure to the benefit of the Grantee and the successors and assigns of the Grantee and shall be binding upon the Grantor and the successors of the Grantor and all future assigns of the Servient Lands or any part thereof or of any interest therein.
 6. Where the Grantee is comprised of more than one person, then any one of the persons comprising the Grantee will be entitled to enforce and receive the benefit of the covenants and obligations on the part of the Grantor hereunder. The rights and interests of the Grantee under this instrument may be held by the Grantee on its own behalf and from time to time on behalf of an entity or entities (which may include a partnership) affiliated or associated with the Grantee, or both on the Grantee's behalf in part and on behalf of such affiliated or associated entity or entities. The Grantor agrees that the rights and interests of the Grantee under this instrument will enure to the benefit of and will be enforceable by the Grantee and such affiliated or associated entity or entities. Upon the request from time to time of the Grantee, and, where the Grantee is comprised of more than one person, upon the request from time to time of any one of the persons comprising the Grantee, the Grantor will execute and deliver all such further documents and instruments and give all such further assurances (in registrable form if so requested and under seal as a deed if so requested) as may be necessary or desirable to give effect to this instrument and to confer the benefits of this instrument to the Grantee and all such persons comprising the Grantee and all such affiliated or associated entity or entities.
 7. The invalidity of any particular provision of this instrument shall not affect any other provision hereof and this instrument shall be construed as if such invalid provision were omitted.

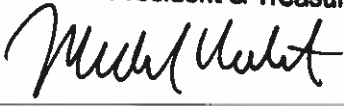
IN WITNESS WHEREOF the parties have executed this Grant of Restrictive Covenant as of the date first above written.

SHELL CANADA LIMITED


 John Courtright
 Assistant Secretary

UCANCO GENERAL PARTNERS INC.


 Name: **Thomas E. Roberts**
 Title: **President & Treasurer**


 Name: **Michael J. Roberts**
 Title: **Vice President & Secretary**

APPENDIX C



LIST OF KNOWN REPORTS

1. Wardrop Engineering Inc. October 1992. Environmental Site Assessment of Bulk Petroleum Storage Facility, Rosthern, Saskatchewan - Shell Location No. P00629. Project No. 921348-16-00.
2. Wardrop Engineering Inc. June 1996. Site Monitoring Report - Former Bulk Petroleum Plant, Rosthern, Saskatchewan - Shell Location No. P00629. Project No. 991348-38-00.
3. Wardrop Engineering Inc. December 1999. Hydrocarbon Delineation Program, Former Bulk Plant Facility, Rosthern, Saskatchewan - Shell Location No. P00629. Project No. 991348-38-01.
4. Wardrop Engineering Inc. December 1999. Preliminary Corrective Action Plan, Former Bulk Plant Facility, Rosthern, Saskatchewan - Shell Location No. P00629. Project No. 991348-38-01.
5. Wardrop Engineering Inc. November 2001. Petroleum Hydrocarbon Delineation - Former Bulk Plant Facility, Rosthern, Saskatchewan - Shell Location No. P00629. Project No. 991348-38-01.
6. Wardrop Engineering Inc. June 2003. Hydrocarbon Delineation Program, Former Shell Agency, Rosthern, Saskatchewan, Shell Location No. P00629. Project No. 9913483802-LRT-V0003-00.
7. Wardrop Engineering Inc. June 2004. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan, Shell Location No. P00629. Project No. 991348-38-04.
8. Wardrop Engineering Inc. July 2004. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan, Shell Location No. P00629. Project No. 9913483804-REP-V0002-00.
9. Wardrop Engineering Inc. December 2004. Monitoring Well Installation, Former Shell Agency, Rosthern, Saskatchewan, Shell Location No. P00629. Project No. 9913483804-LTR-V0003-00.
10. Wardrop Engineering Inc. December 2004. Groundwater Removal Program, Former Shell Agency, Rosthern, Saskatchewan, Shell Location No. P00629. Project No. 9913483804-LTR-V0004-00.
11. Wardrop Engineering Inc. June 2005. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan, Shell Location No. P00629. Project No. 9913483805-REP-V0001-00.



12. Wardrop Engineering Inc. August 2005. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan, Shell Location No. P00629. Project No. 9913483805-REP-V0002-00.
13. Wardrop Engineering Inc. October 2005. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan, Shell Location No. P00629. Project No. 9913483805-REP-V0003-00.
14. Wardrop Engineering Inc. October 2006. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan, Shell Location No. P00629. Project No. 9913483806-REP-V0003-00.
15. Wardrop Engineering Inc. November 2006. Hydrocarbon Delineation Drilling Program, Former Shell Agency, Rosthern, Saskatchewan, Shell Location No. P00629. Project No. 9913483806-LTR-V0003-00.
16. Wardrop Engineering Inc. November 2007. Summary of Environmental Activities, Town of Rosthern, Saskatchewan. Project No. 9913483807-LTR-V0003-00.
17. Wardrop Engineering Inc. December 2007. Environmental Site Assessment, Former Shell Agency, Rosthern, Saskatchewan. Project No. 9913483807-LTR-V0004-00.
18. Wardrop Engineering Inc. December 2007. Results of July 31 & August 1, 2007 Monitoring Event, Former Bulk Petroleum Storage Facility - Rosthern, SK, Shell Location No. P00629, SE Facility Code BU-391. Project No. 9913483807-REP-V0003-00.
19. Wardrop Engineering Inc. July 2008. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan, P00629, SMOE Facility Code BU-39. Project No. 9913483808-REP-V0001-00.
20. Wardrop Engineering Inc. September 2008. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan, P00629, SMOE Facility Code BU-39. Project No. 9913483808-REP-V0002-00.
21. Wardrop Engineering Inc. April 2009. Groundwater Contamination Plume Modeling, Shell Location No. P00629, Rosthern, Saskatchewan. Project No. 9913483808-LTR-V0001-00.
22. Wardrop Engineering Inc. April 2009. Risk Management Plan, Idle Shell Agency, Rosthern, Saskatchewan, Shell Location No. P00629, SMOE Facility Code BU-391. Project No. 9913483808-LTR-V0002-00.
23. Wardrop Engineering Inc. April 2009. Risk Management Plan, Property Adjacent to Idle Shell Agency, Rosthern, Saskatchewan. Project No. 9913483808-LTR-V0003-00.



24. Wardrop Engineering Inc. June 2009. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan. Project No. 9913483809-REP-V0002-00.
25. Wardrop Engineering Inc. June 2009. Site Monitoring Report, Adjacent to 810 Railway Avenue, Rosthern, Saskatchewan. Project No. 9913483809-REP-V0002-00.
26. Wardrop Engineering Inc. August 2009. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan. Project No. 9913483809-REP-V0003-00.
27. Wardrop Engineering Inc. August 2009. Site Monitoring Report, Adjacent to 810 Railway Avenue, Rosthern, Saskatchewan. Project No. 9913483809-REP-V0004-00.
28. Wardrop Engineering Inc. May 2010. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan. Project No. 9913483810-REP-V0001-00.
29. Wardrop Engineering Inc. May 2010. Site Monitoring Report, Adjacent to 810 Railway Avenue, Rosthern, Saskatchewan. Project No. 9913483810-REP-V0002-00.
30. Wardrop Engineering Inc. August 2010. Risk Management Plan, Idle Shell Agency, Rosthern, Saskatchewan. Shell Location No. P00629, SMOE Facility Code BU-391. Project No. 9913483810-LTR-V0001-00.
31. Wardrop Engineering Inc. August 2010. Risk Management Plan, Property Adjacent to Idle Shell Agency, Rosthern, Saskatchewan. Shell Location No. P00629, SMOE Facility Code BU-391. Project No. 9913483810-LTR-V0002-00.
32. Wardrop Engineering Inc. September 2010. Site Monitoring Report, Adjacent to 810 Railway Avenue, Rosthern, Saskatchewan. Project No. 9913483810-REP-V0003-00.
33. Tetra Tech WEI Inc. November 2011. NCSCS Site Score, Idle Shell Agency, Rosthern, SK, Shell Location No. P00629, Operational ID No. BU-391. Project No. 9913483811-LTR-V0002-00.
34. Tetra Tech WEI Inc. June 2011. Site Monitoring Report, 810 Railway Avenue, Rosthern, Saskatchewan. Project No. 9913483811-REP-V0001-00.
35. Tetra Tech WEI Inc. June 2011. Site Monitoring Report, Adjacent to 810 Railway Avenue, Rosthern, Saskatchewan. Project No. 9913483811-REP-V0002-00.
36. Tetra Tech WEI Inc. September 2011. Site Monitoring Report, Adjacent to 810 Railway Avenue, Rosthern, Saskatchewan. Project No. 9913483811-REP-V0003-00.
37. Tetra Tech WEI Inc. March 2013. NCSCS Site Score, Idle Shell Agency, Rosthern, SK, Shell Location No. P00629, Operational ID No. BU-391. Project No. 9913483813-LTR-V-0001-00.



38. Tetra Tech WEI Inc. March 2013. Summary Environmental Site Assessment Report, Former Shell Agency, Rosthern, Saskatchewan, Shell Location No. P00629, SK MoE Facility Code No. BU-391. Project No. 9913483812-LTR-V0002-00.
39. Tetra Tech WEI Inc. March 2013. Summary Environmental Site Assessment Report, Adjacent to Former Shell Agency, Rosthern, Saskatchewan, Shell Location No. P00629, SK MoE Facility Code No. BU-391. Project No. 9913483812-LTR-V0003-00.
40. EAG Canada. February 2015. Revised Corrective Action Plan, Former Shell Bulk Terminal Facility, EAG-P00629-Rosthern, 810 Railway Avenue East, Saskatchewan.
41. Intrinsik Corp. September 2016. Development of Soil Vapour Remediation Guidelines Applicable in Saskatchewan for Residential and Commercial/Industrial Land Uses at Various Depths for Fine- and Coarse-Grained Soils. Project No. 10-11465.
42. EAG Canada. October 2019. Additional Remedial Activities and Status Report, Former Shell Agency Property (P00629), 810 Railway Avenue East, Rosthern, Saskatchewan.

APPENDIX D



Water Wells

Notes

Projection:

WGS_1984_Web_Mercator_Auxiliary_Sphere

Scale:

1: 18,056



Date

5-Jun-22

Copyright:

Map © 2022, Government of Saskatchewan

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Disclaimer:

WSA prepares maps with varying degrees of accuracy and completeness dependant on the circumstances and available data. WSA makes no representation that this map will be sufficient for all uses. The user is advised to confirm the information contained herein in the event that precision and currency of data are required.

Well Name: **BRANDT**

WWDR #: **202064**

Well Location

Land Location	NW-35-042 -03 -W3	Location of Well (in Quarter)
LSD	00	0 ft from N/S Boundary
Reserve		0 ft from E/W Boundary
RM:	403	
NTS Map:	73B09	Major Basin: 06
Elevation (ft)	1673	SubBasin: 30
Aquifer		

Well Information

Driller	WELLEN BORING LTD	Well Casings			
		Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date	2005.04.25	33	31	30	Fiberglass
Hole #	001	0	0	0	
Install Method	Bored	0	0	0	
Borehole Depth (ft)	31	Well Screens			
		Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Bit Dia (in)	42	20	30	30	70
Water Level	6	0	0	0	Fiberglass
Flowing Head	0	0	0	0	
Water Use	Domestic	Pump Test			
Well Use	Withdrawal	Draw Down	0 ft		
Completion Method	Perforated Casing	Duration	1 hrs		
E-Log	No	Pumping Rate	3 igpm		
		Temperature	0 deg. F		
		Rec. Pumping Rate	2 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
17	Sand	Brown	Silty
21	Sand	Grey	Silty
27	Silty Clay	Grey	Unknown
31	Clay	Grey	Soft



Well Name: **BAHNMAN**

WWDR #: **034801**

Well Location

Land Location	NE-35-042 -03 -W3	Location of Well (in Quarter)	
LSD	00	700 ft from N/S Boundary	N
Reserve		200 ft from E/W Boundary	W
RM:			
NTS Map:	73B00	Major Basin:	06
Elevation (ft)	1670	SubBasin:	30
Aquifer			

Well Information

Driller	PRAIRIE WATER LTD	Length (ft)	0	Btm (ft)	25	Dia (in)	36	Material	Porous Concrete
Completion Date	1968.09.12	0	0	0	0	0	0		
Hole #		0	0	0	0	0	0		
Install Method	Bored								
Borehole Depth (ft)	25								
Bit Dia (in)	36	0	0	0	0	0	0		
Water Level	0	0	0	0	0	0	0		
Flowing Head	0	0	0	0	0	0	0		
Water Use	Domestic								
Well Use	Withdrawal								
Completion Method	Curbed								
E-Log	No								

Lithology List

Depth (ft):	Material	Colour	Description
3	Clay	Brown	Unknown
14	Sand	Yellow	Silty
19	Silt	Brown	Sandy
25	Clay	Grey	Unknown



Well Name: **DAIRY AND POULTRY**

WWDR #: **034802**
Well Location

Land Location	NW-35-042 -03 -W3	Location of Well (in Quarter)
LSD	00	0 ft from N/S Boundary
Reserve		0 ft from E/W Boundary
RM:		
NTS Map:	73B00	Major Basin: 06
Elevation (ft)	1670	SubBasin: 30
Aquifer		

Well Information

Driller	CREELMAN & SONS DRILLING	Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date		0	0	6	Steel
Hole #		0	0	0	
Install Method	Drilled				
Borehole Depth (ft)	90				
Bit Dia (in)	0	0	0	0	
Water Level	50	0	0	0	
Flowing Head	0	0	0	0	
Water Use	Industrial				
Well Use	Withdrawal	Draw Down		0 ft	
Completion Method	Open Hole	Duration		0 hrs	
E-Log	No	Pumping Rate		0 igpm	
		Temperature		38 deg. F	
		Rec. Pumping Rate		10 igpm	

Lithology List

Depth (ft):	Material	Colour	Description
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Well Name: **FLATH**

WWDR #: 071631

Well Location

Land Location **-35-042 -03 -W3**

Location of Well (in Quarter)

LSD 00

0 ft from N/S Boundary

Reserve

0 ft from E/W Boundary

RM:

NTS Map: **73B00**Major Basin: **06**Elevation (ft) **1675**

SubBasin: 30

Aquifer

Well Information

Driller	PRAIRIE WATER LTD	Well Casings			
Completion Date	1982.05.17	Length (ft)	Btm (ft)	Dia (in)	Material
Hole #	001	42	41	36	Porous Concrete
Install Method	Bored	0	0	0	
Borehole Depth (ft)	41	Well Screens			
Bit Dia (in)	36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level	0	0	0	0	Material
Flowing Head	0	0	0	0	
Water Use	Domestic	Pump Test			
Well Use	Withdrawal	Draw Down	0 ft		
Completion Method	Curbed	Duration	0 hrs		
E-Log	No	Pumping Rate	0 igpm		
		Temperature	0 deg. F		
		Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
6	Clay	Brown	Unknown
18	Sand	Brown	Unknown
32	Sand	Grey	Unknown
41	Silt	Grey	Clay Streaks



Well Name: **FRIESEN**

WWDR #: **034795**
Well Location

Land Location	-35-042 -03 -W3	Location of Well (in Quarter)
LSD	00	0 ft from N/S Boundary
Reserve		0 ft from E/W Boundary
RM:		
NTS Map:	73B00	Major Basin: 06
Elevation (ft)	1670	SubBasin: 30
Aquifer	Glac	

Well Information

Driller	UNKNOWN	Well Casings			
		Length (ft)	Btm (ft)	Dia (in)	Material
		0	0	0	Steel
Completion Date	1951.01.01	0	0	0	
Hole #		0	0	0	
Install Method	Unknown	Well Screens			
Borehole Depth (ft)	20	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Bit Dia (in)	6	0	0	0	0
Water Level	18	0	0	0	0
Flowing Head	0	0	0	0	0
Water Use	Domestic	Pump Test			
Well Use	Withdrawal	Draw Down	0 ft		
Completion Method	Open Hole	Duration	0 hrs		
E-Log	No	Pumping Rate	0 igpm		
		Temperature	0 deg. F		
		Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
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Well Name: **FRIESEN**

WWDR #: **034796**
Well Location

Land Location	-35-042 -03 -W3	Location of Well (in Quarter)
LSD	00	0 ft from N/S Boundary
Reserve		0 ft from E/W Boundary
RM:		
NTS Map:	73B00	Major Basin: 06
Elevation (ft)	1670	SubBasin: 30
Aquifer	Glac	

Well Information

Driller	UNKNOWN	Well Casings			
		Length (ft)	Btm (ft)	Dia (in)	Material
		0	0	5.5	Steel
Completion Date	1944.09.01	0	0	0	
Hole #		0	0	0	
Install Method	Unknown	Well Screens			
Borehole Depth (ft)	175	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Bit Dia (in)	0	0	0	0	0
Water Level	22	0	0	0	0
Flowing Head	0	0	0	0	0
Water Use	Domestic	Pump Test			
Well Use	Withdrawal	Draw Down	0 ft		
Completion Method	Open Hole	Duration	0 hrs		
E-Log	No	Pumping Rate	0 igpm		
		Temperature	0 deg. F		
		Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
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Well Name: **SALAMON**

WWDR #: **034798**
Well Location

Land Location	-35-042 -03 -W3	Location of Well (in Quarter)
LSD	00	0 ft from N/S Boundary
Reserve		0 ft from E/W Boundary
RM:		
NTS Map:	73B00	Major Basin: 06
Elevation (ft)	1670	SubBasin: 30
Aquifer	Glac	

Well Information

Driller	UNKNOWN	Well Casings			
		Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date	1954.08.01	0	0	0	Wood
Hole #		0	0	0	
Install Method	Unknown	Well Screens			
Borehole Depth (ft)	24	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Bit Dia (in)	36	0	0	0	0
Water Level	19	0	0	0	0
Flowing Head	0	0	0	0	0
Water Use	Domestic	Pump Test			
Well Use	Withdrawal	Draw Down	0 ft		
Completion Method	Curbed	Duration	0 hrs		
E-Log	No	Pumping Rate	0 igpm		
		Temperature	0 deg. F		
		Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
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Well Name: **FRIESEN**

WWDR #: **034800**
Well Location

Land Location	-35-042 -03 -W3	Location of Well (in Quarter)
LSD	00	0 ft from N/S Boundary
Reserve		0 ft from E/W Boundary
RM:		
NTS Map:	73B00	Major Basin: 06
Elevation (ft)	1670	SubBasin: 30
Aquifer	Glac	

Well Information

Driller	UNKNOWN	Well Casings			
		Length (ft)	Btm (ft)	Dia (in)	Material
		0	0	5	Steel
Completion Date	1946.07.01	0	0	0	
Hole #		0	0	0	
Install Method	Unknown	Well Screens			
Borehole Depth (ft)	20	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Bit Dia (in)	0	0	0	0	0
Water Level	11	0	0	0	0
Flowing Head	0	0	0	0	0
Water Use	Domestic	Pump Test			
Well Use	Withdrawal	Draw Down	0 ft		
Completion Method	Open Hole	Duration	0 hrs		
E-Log	No	Pumping Rate	0 igpm		
		Temperature	0 deg. F		
		Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
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Well Name: **DYCK**

WWDR #: **034797**
Well Location

Land Location	-35-042 -03 -W3	Location of Well (in Quarter)
LSD	00	0 ft from N/S Boundary
Reserve		0 ft from E/W Boundary
RM:		
NTS Map:	73B00	Major Basin: 06
Elevation (ft)	1670	SubBasin: 30
Aquifer		

Well Information

Driller		Well Casings			
		Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date	1948.03.01	0	0	0	
Hole #		0	0	0	
Install Method	Drilled				
Borehole Depth (ft)	30	Well Screens			
		Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Bit Dia (in)	0	0	0	0	0
Water Level	20	0	0	0	0
Flowing Head	0	0	0	0	0
Water Use	Domestic	Pump Test			
Well Use	Water Test Hole	Draw Down	0 ft		
Completion Method		Duration	0 hrs		
E-Log	No	Pumping Rate	0 igpm		
		Temperature	0 deg. F		
		Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
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Well Name: **ROSTHERN CREAMERY**

WWDR #: **034799**
Well Location

Land Location	-35-042 -03 -W3	Location of Well (in Quarter)
LSD	00	0 ft from N/S Boundary
Reserve		0 ft from E/W Boundary
RM:		
NTS Map:	73B00	Major Basin: 06
Elevation (ft)	1670	SubBasin: 30
Aquifer		

Well Information

Driller		Well Casings				
		Length (ft)	Btm (ft)	Dia (in)	Material	
		0	98	4.2	Steel	
Completion Date	1937.11.15	0	0	0		
Hole #		0	0	0		
Install Method	Drilled					
Borehole Depth (ft)	99	Well Screens				
		Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
Bit Dia (in)	4	0	0	0	0	
Water Level	10	0	0	0	0	
Flowing Head	0	0	0	0	0	
Water Use	Industrial	Pump Test				
Well Use	Withdrawal	Draw Down	0 ft			
Completion Method	Open Hole	Duration	0 hrs			
E-Log	No	Pumping Rate	0 igpm			
		Temperature	0 deg. F			
		Rec. Pumping Rate	0 igpm			

Lithology List

Depth (ft):	Material	Colour	Description
25	Clay	Yellow	Unknown
82	Clay	Blue	Unknown
99	Sand	Unknown	Fine



APPENDIX E

Linear Trend Analysis	Core Process	Environmental
	Document No.	SPE-021-LTA
	Effective Date	May 2015
	Revision Date	05 February 2018
	Revision No.	
	Page No.	1 of 2
	Content Owner	NECL
	Document Creator	
	Approval	R. Dickie

Linear Trend Analysis Using the Mann–Kendall Statistical Method

Linear trend analyses are performed based on the Mann-Kendall statistical method in accordance with Gilbert (1987) and EPA (2009) and with consideration to the methods presented by Connor et al. (2014). The results of the trend analyses are used to quantitatively determine if concentrations of an analyte within a monitoring well are increasing, decreasing, or exhibit no trend over time.

The Mann-Kendall method is based on the idea that if an increasing (or decreasing) trend exists, then a randomly selected groundwater sample should, on average, have a lower (or higher) concentration than a more recently collected sample. The Mann-Kendall method is performed by first calculating two parameters based on a dataset of four or more sample points: the Mann-Kendall Statistic (S) and the confidence factor (CF).

The value of S is determined by comparing all possible pairs of measurement in the dataset and assigning each pair a value of 1 if the earlier measurement has a lower magnitude than the later measurement, or a value of -1 if the earlier measurement has the higher magnitude. Pairs with equal magnitudes are assigned a value of 0. The sum of these values from each pair represents S. A positive value of S suggests an increasing trend, while a negative value suggests a decreasing trend. For a sample size (n) between 4 and 10, the CF is determined from the Mann-Kendall probabilities tables (Gilbert, 1987) using the absolute value of S and the number of sample points (n). For larger sample sizes, $n > 10$, the CF can be approximated under the Central Limit Theorem (CMT). Under the CMT, the CF, which can be considered the confidence in rejecting the null hypothesis that there is no trend, can be determined from the following equations:

$$(1) \quad CF = 1 - P\{Z\}$$

$$(2) \quad Z = \frac{(|S| - 1)}{SD\{S\}}$$

$$(3) \quad SD\{S\} = \sqrt{\frac{1}{18} \cdot \left(n \cdot (n-1)(2n+5) - \sum_{j=1}^g t_j \cdot (t_j-1)(2t_j+5) \right)}$$

Where: $P\{Z\}$ = CLT probability (1-tailed);

Z = CLT Z-statistic;

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 $SD\{S\}$ = Standard deviation of S ; g = number of ties within n ; and t_j = Number of ties within the j^{th} group of ties present within n .

The value of CF (%) represents the probability that a trend actually exists. When the CF is determined to be high (=95%) the overall trend is reported as either “Increasing” ($S > 0$) or “Decreasing” ($S < 0$). For a CF from 90% to 95%, the trends are reported as either “Probably Increasing” or “Probably Decreasing”. When the CF is low (<90%), the dataset is reported to have “No Trend.” The inclusion of “Probably Increasing” and “Probably Decreasing” represents a slight modification of the approach documented in Gilbert (1987) but is similar to the approach presented by Conner et al. (2014).

For datasets that include concentrations below the laboratory’s method detection limit (MDL), a value equivalent to one-half the datasets’ lowest MDL were substituted for each non-detectable result. For datasets where all or nearly all reported values were below the MDL, the dataset is determined to have “No Trend.” The five possible reporting outcomes are summarized in Table 1 below:

Table 1: Summary of Trend Analyses Outcomes

Mann-Kendall Statistic (S)	Confidence Factor (CF)	Trend Outcome
$S > 0$	$CF \geq 95\%$	Increasing
$S > 0$	$90\% \leq CF < 95\%$	Probably Increasing
$S < 0$	$CF \geq 95\%$	Decreasing
$S < 0$	$90\% \leq CF < 95\%$	Probably Decreasing
	$CF < 90\%$	No Trend

The above protocols were based on the following publications:

- Connor, J.A., S.K. Farhat, and M. Vanderford, 2014. GSI Mann-Kendall Toolkit for Quantitative Analysis of Plume Concentration Trends. Groundwater. doi: 10.1111/gwat.12277;
- EPA Unified Guidance 530-R-09-007, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities; and
- Gilbert, R.O., 1987. Statistical Methods for Environmental Pollution Monitoring. New York, van Nostrand Reinhold.