2014 GROUNDWATER MONITORING PROGRAM
BULK FERTILIZER STORAGE FACILITY
TRANS-CANADA HIGHWAY
AUSTIN, MANITOBA

Submitted to:
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EXECUTIVE SUMMARY

Amec Foster Wheeler Environment & Infrastructure, was retained by Mr. Sean Cruz of Federated Co-operatives Limited (FCL) on behalf of Kevin Dales, General Manager of the Portage La Prairie Consumers Co-op Limited to conduct a groundwater monitoring program at the bulk fertilizer and chemical storage facility located north of the TransCanada Highway, east of Austin, Manitoba (Site). The purpose of the monitoring program was to confirm the groundwater conditions at the Site and to determine if historical impacts have changed. Since the 2011 monitoring event changes to the Site infrastructure includes the relocation of four chemical storage bins, the replacement of the office building with a new structure, the removal of the ammonia storage tank, and the construction of a chemical storage shed.

The groundwater monitoring program was conducted on 21 October 2014 and included the monitoring and sampling of four existing monitoring wells for nutrients. Several wells were damaged and needs to be restored or replaced in the future. Concentrations of nitrate and nitrite measured in TH14 were 1690 mg/L and 215 mg/L, respectively, which are above the maximum acceptable concentrations for drinking water guidelines (10 mg/L and 1 mg/L, respectively). The groundwater samples also had a number of exceedances of the aesthetic objectives (AO), which primarily address the appearance and palatability of potable water and are not related to adverse effects to human or environmental health.

A review of the cumulative groundwater results for the surficial groundwater samples indicates that nitrite concentrations at TH14 increased by almost 20 times and the nitrate concentration more than doubled since the 2011 monitoring program. However, the concentration of ammonia at TH14 has decreased by approximately one half over the same time period. The increases in nutrient concentrations noted at the Site are likely the result of product releases associated with the storage and handling of fertilizers at the Site. Considering the concentration of nutrients that were measured in the surficial groundwater during this event, it is likely that the surficial impacts have migrated off-site similar to what has been historically observed at the Site.

A review of the deep groundwater samples indicates that the nitrate, nitrite and ammonia concentrations have remained relatively unchanged since the 2011 monitoring event. Since the nutrient concentrations are relatively low in the deep groundwater samples when compared to the surficial groundwater samples, it appears that the groundwater in the underlying native soil has not been adversely affected by the Site activities. A Canadian Council of Ministers of the Environment (CCME) National Classification System for Contaminated Site (NCSCS) score of 48.3 was generated, classifying the Site as a Class 3 – Low Priority for Action.

Since there have been some significant changes to the Site since the 2011 monitoring event, which have damaged or destroyed the majority of the wells at the Site, a review of the monitoring well network should be completed to determine which wells need to be replace or relocated. Additionally, a review of the current fertilizer handling and storage practices should be undertaken to identify items that will potentially minimize fertilizer losses. As the groundwater results exceeded MCWS reporting standards, a copy of this report needs to be submitted to MCWS for review. Upon review, MCWS will likely request a remedial plan for the future management of nutrient impacts at the Site.

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1.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) was retained by Mr. Sean Cruz of Federated Co-operatives Limited (FCL) on behalf of Kevin Dales, General Manager of the Portage La Prairie Consumers Co-op Limited to conduct a groundwater monitoring program at the bulk fertilizer and chemical storage facility located north of the TransCanada Highway, east of Austin, Manitoba (Site). The purpose of the monitoring program was to confirm the groundwater conditions at the Site and to determine if historical impacts have changed. This information will be used to determine management options for the Site.

1.1 Background

A Phase II ESA completed by Amec Foster Wheeler in 2002 identified fertilizer (nitrate-N & ammonia) impacted soils and groundwater. Historically, the highest concentrations of the identified fertilizers in groundwater were in monitoring wells TH1, TH3, and TH5. These monitoring wells are located in the vicinity of the loading pads, ammonia tanks and unloading pads respectively. Concentrations above the applicable guideline were present across the southeastern portion of the Site.

In 2003, a High Pressure Nutrient Injection (HPNI) program was completed, however it was concluded that this process did not allow for continued management of potential rebound and reoccurring product releases. As such, in 2005 a groundwater recirculation and amendment system involving the use of horizontal wells was constructed. Since that time this system has been rendered non-operation due to plugging and/or damage to the horizontal wells. Interpretation of laboratory and field data for 2002-2007 indicated that seasonal precipitation resulted in an increase in dissolved nutrients. However, it appeared that the application of carbohydrates during the peak fertilizer season substantially reduced those concentrations by August.

A groundwater monitoring program was conducted in September 2011. The results indicated that six of the ten groundwater samples had concentrations of nitrate and nitrite that were above the maximum acceptable concentrations for drinking water. It was also determined that nitrate, nitrite, and ammonia concentrations appeared to be increasing across the Site when compared to previous monitoring results, and it was inferred that the increase was likely occurring from product releases associated with the loading and unloading activities of fertilizers at the Site.

1.2 Site and Surrounding Land Use

The subject property is located along TransCanada Highway, east of Austin, Manitoba and is currently occupied by the Portage La Prairie bulk fertilizer and chemical storage facility. The location of the Site with respect to the Town of Austin is shown on Figure 1 (Appendix A). The facility includes four chemical storage bins, which were relocated to the northeast corner of the Site from the central area of the Site between 2011 and 2014. The office building was replaced with a new building in the eastern portion of the Site. The ammonia aboveground storage tank (AST) was removed and a chemical storage shed was constructed in its place after the 2011 monitoring program.

The surrounding land use includes agricultural properties to the north and west. To the east is a gravel road and associated drainage ditches, followed by agricultural property. To the south is the TransCanada Highway and associated drainage ditches, followed by agricultural land. The surrounding land uses as observed at the time of the monitoring program are shown on Figure 1 (Appendix A) and summarized in Table 1 (Appendix B). Photographs taken during the Site visit are included in Appendix C.

2.0 SCOPE OF WORK

Amec Foster Wheeler provided FCL with the following scope of work, which was approved on 16 September 2014 and included the following:

- Complete a safety file and contact the local Co-op representative to confirm the scheduling of the groundwater monitoring/sampling program.
- Conduct a Site inspection to determine the condition of the monitoring wells. This will be conducted at the same time as the monitoring event.
- Conduct a monitoring program of 12 monitoring wells consisting of the following:
    - Determine groundwater levels;
    - Determine dissolved oxygen levels (DO), oxidation/reduction potential (ORP), electrical conductivity (EC), pH, temperature and total dissolved solids (TDS). Field measurements were taken and samples collected through a flow-through cell using low flow techniques.
    - Collect and submit groundwater samples for laboratory analysis of for the FCL nutrient package.
    - Conduct a horizontal survey of well tops to update and standardize elevation data.
    - Survey monitoring wells using survey grade global positioning system (GPS) equipment.
- Prepare a report summarizing the results of field and laboratory analysis, and the conclusions and recommendations. The summary report includes and update to the Canadian Council of Ministers of the Environment (CCME) National Classification System for Contaminated Site (NCSCS) checklist completed during previous monitoring events.

The deviations from the approved scope of work were as follows:

- Field measurements were not determined and samples were not collected from five monitoring wells (TH3, TH5, TH9, TH12, and TH13) because they were either destroyed or could not be located.
- Field measurements were not determined and samples were not collected from three monitoring wells (TH1, TH6 and TH20) because there was an insufficient volume of water in the wells, due to sediment infiltrating the wells.
- TDS was not measured since the available field meter did not have the appropriate sensor to record this parameter.
- Since the proposed scope of work included two days on-site, the GPS survey was scheduled for the second day to facilitate the availability of the survey equipment. However, since several of the monitoring wells were damaged or not located, the monitoring program was completed in one day. As a result the GPS survey was not completed during this monitoring program.

3.0 INVESTIGATIVE METHODOLOGY

3.1 Work Site Safety

Prior to the groundwater monitoring event, a pre-job safety meeting was conducted to outline the scope of work, identify chemical and physical hazards and the required personal protective equipment. Safety paperwork is included in Appendix D.

3.2 Surrounding Land Use

A visual survey of surrounding land uses was conducted as part of Amec Foster Wheeler's Site visit. The purpose of the survey was to identify specific land uses (i.e. agricultural, residential, commercial or industrial) adjacent to the Site to establish the applicable land and groundwater use criteria.

3.3 Monitoring Well Sampling

The groundwater monitoring program was conducted on 21 October 2014 and included the monitoring and sampling of the four existing monitoring wells (TH7, TH8, TH14,TH24) that could be located and contained sufficient groundwater to collect a sample for laboratory analysis. The locations of the monitoring wells are shown on Figure 2 (Appendix A). The sampled wells were located along the eastern and northern Site boundary.

The groundwater monitoring program included the following:

- Determination of groundwater levels;
- Monitoring of field parameters using low flow sampling procedures (dissolved oxygen levels (DO), oxidation/reduction potential (ORP), electrical conductivity (EC), pH and temperature);
- Collection of groundwater samples for laboratory analysis; and
- Completion of a monitoring well inspection checklist.

Groundwater levels were measured using an electronic interface probe. Groundwater parameters (DO, EC, ORP, temperature and pH) were measured with a YSI 556 MPS multi-parameter meter.

The low flow sampling methodology involves the continuous collection of groundwater from the central depth of the well screen via a peristaltic pump at a flow rate between 100 and 500 ml/min. The objective of this methodology is to access groundwater flow from the soils surrounding the well screen while isolating the overlying stagnant well casing water. The groundwater is pumped through a low flow cell, where the multi parameter meter is employed to continuously measure the above referenced parameters. The measurements continue until the readings stabilize, indicating that formation groundwater is being accessed.

The collected groundwater samples were placed in clean certified bottles provided by the laboratory, stored in an insulated cooler with ice while on-site and during transport to the laboratory. The field protocols and QA/QC procedures utilized by Amec Foster Wheeler during Site monitoring were in accordance with standard industry protocols.

The condition of the monitoring wells was noted as part of the groundwater monitoring program. The monitoring well inspection checklist is included in Appendix D.

3.4 Laboratory Analyses

Five groundwater samples, including one duplicate, were submitted for laboratory analysis at Amec Foster Wheeler's laboratory in Edmonton, Alberta. The samples were analyzed for general nutrient parameters to aid in the assessment of future soil/groundwater management planning. The Canadian Association Laboratory Accreditation Inc. (CALA) has accredited Amec Foster Wheeler's labs for testing including petroleum hydrocarbon parameters in accordance with the International Standard ISO/IEC 17025. The laboratory QA/QC is provided in Appendix E along with the certificates of analysis.

3.5 Site Classification

The CCME NCSCS checklist was updated from the 2011 checklist to qualitatively derive a ranking score to evaluate the potential human health risks due to residual fertilizer impacts in the subsurface soil and groundwater. The NCSCS uses a scoring system which is evaluated using existing or available information on the Sites characteristics, contaminants and location. The completion of the NCSCS was undertaken in compliance with CCME (2008). The results are summarized in Section 5.3 and Appendix F.

4.0 ASSESSMENT CRITERIA

4.1 General

Environmental assessment in Manitoba is based on the assessment criteria produced by CCME. The following documents produced by the CCME were selected as being applicable to the Site based on the contaminants of concern.

- CCME Canadian Environmental Quality Guidelines, 1999 (updates to 2013).
- Health Canada Guidelines for Canadian Drinking Water Quality. August 2012.

Based on Amec Foster Wheeler's review, the Site and neighbouring properties have a high sensitivity ranking for groundwater, considering the subsurface conditions and that near surface groundwater is used for domestic purposes. The Site is also located within a hazard area on the Provincial groundwater pollution hazard maps.

A water well survey was conducted of Manitoba Conservation's water well database (GW Drill) as part of the groundwater monitoring program conducted in 2011. The survey included an area within 500 m of the Site. A total of four shallow domestic wells were noted within this area. The water well records are included in Appendix G.

As such, Amec Foster Wheeler determined that CCME Protection of Community Water Supplies, which is an adaptation of the Health Canada Guidelines for Drinking Water Quality, is applicable to the Site.

The applicable guideline values are outlined in Table 2 (Appendix B).

4.2 Manitoba Conservation and Water Stewardship Contaminated/Impacted Site Reporting Requirements

As of 1 April 2014 the Contaminated Sites Remediation Act (CSRA) states “that the owner or occupier of a site must notify Manitoba Conservation and Water Stewardship (MCWS) in writing when he or she becomes aware of information that indicates that the site has been contaminated at a level that exceeds a standard established or adopted by regulation (CSRR)” (CSRA C205, 2014).

The Contaminated Site Remediation Regulation (CSRR) establishes reporting standards for when it is necessary to submit a site report to MCWS and is not necessarily equivalent to an assessment of exposure pathways as conducted in the previous sections. Since the potable and agricultural groundwater pathways are applicable to the Site the reporting standards for the Site will be based on Health Canada’s Guidelines for Canadian Drinking Water Quality and the Ontario Ministry of the Environment Soil, Groundwater and Sediment Standards from 15 April 2011, Table 2 (potable groundwater conditions).

The applicable reporting requirements are included in the remedial criteria assessment Table 2 (Appendix B) as well as in the groundwater analytical results Table 4 (Appendix B) for comparison purpose.

5.0 ASSESSMENT RESULTS

5.1 Site Conditions

There have been several changes to the Site since the previous groundwater monitoring event in 2011, and including the removal of the anhydrous ammonia storage tank, the removal or relocation of the bulk fertilizer storage bins located in the northwest corner of the Site and the southeast portion of the Site, the removal of the office building and associated weigh scale. A new office building was constructed in the eastern portion of the Site along with a new fertilizer storage shed constructed in the northwest portion of the Site. As a results of the changes to the Site, several of the monitoring wells were not located and are assumed to be either damaged or destroyed.

It should be noted that, to determine the groundwater quality of the near surface groundwater located primarily in the granular fill material from the underlying groundwater located in the native clay and sand layers, monitoring wells were constructed to collect groundwater sample from the two groundwater regimes. Of the groundwater samples that were collected during this monitoring program, monitoring wells TH1, TH6, TH14 and TH20 were installed to collect samples of the surficial groundwater, and monitoring wells TH7, TH8, and TH24 were installed to collect samples of groundwater from the underlying native clay/sand layers. As a result, the review of the groundwater field and laboratory dated will be divided into surficial groundwater and deep groundwater regimes.

5.2 Groundwater Conditions

5.2.1 Regional Hydrogeology

Local groundwater conditions were assessed using available maps and groundwater well records (*Groundwater Availability Map Series,* Manitoba Natural Resources, Water Resources Division, 1985; Manitoba Water Stewardship – Water Branch). Shallow sand deposits found between approximately 2.7 m and 4.6 m below ground level (bgl) are considered to be the dominant aquifer in the area. Bedrock is anticipated to be encountered at approximately 40 m or more below grade; however water well records do not show domestic, livestock or test wells extending to this depth.

5.2.2 Site Hydrogeology

The groundwater monitoring program was conducted on 21 August 2014. The results of the Site monitoring program are summarized in Table 3 (Appendix B).

Well Inspection

During the groundwater monitoring program the condition of the monitoring wells was reviewed and recorded on monitoring well condition summary checklist (Appendix D). As indicated on the checklist, several wells were damaged and either need to be restored (i.e. replacement of protective covers, repair damaged well casing and replace well caps, removal of sediment from the well casing, etc.) or replaced. In particular, it appears that monitoring wells TH3 and TH9 are located under the new fertilizer shed, and TH5 appears to be located under the new office building. It also appears that re-grading of the gravel at the Site had damaged monitoring wells TH12 and TH13 as they could not be located during the current monitoring event. It is also worth noting that monitoring wells TH1, TH6 and TH20 were located but not included in the monitoring program since the well casing was filled with sediment and gravel.

Groundwater Levels

Groundwater levels measured in the surficial monitoring wells ranged between approximately 1.42 m bgl (TH14) and 1.74 m bgl (TH6). It is worth noting that two surficial monitoring well (TH1 and TH20) did not contained a measurable volume of water in the wells and thus were not included in the analysis.

Groundwater levels measured in the deep monitoring wells ranged between approximately 2.13 m bgl (TH7) and 2.62 m bgl (TH24).

Of the seven monitoring wells that were located, two of the monitoring wells (TH1 and TH24) were dry, two monitoring wells (TH6 and TH24) were damaged so the groundwater elevation could not be determined, two monitoring wells (TH7 and TH8) were deep monitoring wells and one (TH14) was a surficial monitoring well. As a result, the groundwater flow direction could not be determined.

Field Parameters

During the monitoring program, only one surficial monitoring well (TH14) had a sufficient groundwater volume to collect field parameters, which were as follows:

- ORP level 148.8 mV.
- DO level 4.78 mg/L.
- EC value 15,060 mS /cm.
- pH value 6.58.

It is worth noting that, although monitoring well TH6 had a measurable volume of water to determine the depth to groundwater, the volume that was present was not adequate to collect field parameters or a sample for laboratory analysis.

Field parameters in the accessible deep monitoring wells measured during the groundwater monitoring event are summarized as follows:

- ORP levels ranged from -21.6 mV (TH24) to 10.8 mV (TH7).
- DO levels ranged from 2.12 mg/L (TH7) to 4.14 mg/L (TH24).
- EC values ranged from 0.897 mS /cm (TH7) to 3.612 mS /cm (TH24).
- pH values ranged from 6.85 (TH24) to 7.31 (TH8).

5.2.3 Laboratory Results

Five groundwater samples, which includes one duplicate sample, were submitted for analysis of FCL's nutrient package. The results of the nutrient analyses conducted on the groundwater samples are summarized on Figure 3 (Appendix A) and in Table 4 (Appendix B). Cumulative results are shown on Table 5 (Appendix B). Copies of the detailed analytical reports are provided in Appendix E.

Concentrations of nitrate and nitrite measured in TH14 were 1690 mg/L and 215 mg/L, respectively, which are above the maximum acceptable concentrations for drinking water guidelines (10 mg/L and 1 mg/L). The groundwater samples also had exceedances of the aesthetic objectives (AO), which primarily address the appearance and palatability of potable water and are not related to adverse effects to human or environmental health. The four samples that were collected had concentration of manganese ranging from 0.47 mg/L to 15.3 mg/L and TDS total dissolved solids concentrations ranging from 564 mg/L to 13,580 mg/L which exceeded the AO of <0.05 mg/L and <500 mg/L, respectively. Additionally, TH08, TH14, and TH24 had iron concentrations of 1.02 mg/L, 0.52 mg/L, and 5.96 mg/L, respectively, that were above the aesthetic objective of <0.3 mg/L. Groundwater samples TH08 and TH24 also had sulphate concentrations of 1,470 and 2,320 mg/L, respectively, which exceeded the AO of <500 mg/L, and sample TH08 had a chloride concentration of 809 mg/L, that exceeded AO of <250 mg/L. The remaining parameters complied with the drinking water guidelines.

Historical Comparison

The cumulative historical results are summarized in Table 5 (Appendix B). A review of the cumulative groundwater results for the surficial groundwater samples indicates that nitrite concentrations at TH14 increased by almost 20 times and the nitrate concentration more than doubled since the 2011 monitoring program. These concentrations represent the highest nitrate and nitrite concentrations measured at the Site. However, the concentration of ammonia at TH14 has decreased by approximately one half over the same time period. As indicated in the previous monitoring reports, the increases in nutrient concentrations noted at the Site are likely the result of product releases associated with the storage and handling of fertilizers at the Site.

A review of the deep groundwater samples indicates that the nitrate, nitrite and ammonia concentrations have remained relatively unchanged since the 2011 monitoring event. Since the nutrient concentration are relatively low in the deep groundwater samples when compared to the surficial groundwater samples, it appears that the groundwater in the underlying native soil has not been adversely affected by the Site activities.

5.3 Site Classification

An updated CCME NCSCS scoring was completed for this Site during the 2014 monitoring program as nutrient concentrations increased as compared to the 2011 assessment. A CCME NCSCS score of 49.3 (increased from 44.6 in 2011) was generated, classifying the Site as a Class 3 – Low Priority for Action. The results are summarized in Appendix F.

5.4 Quality Assurance

5.4.1 Accreditation

The analytical laboratory employed to perform the laboratory analyses (Amec Foster Wheeler Foster Wheeler located in Edmonton, Alberta) is certified with the CALA.

5.4.2 Data Validation

Laboratory QA/QC

The laboratory incorporates various QA/QC procedures to ensure the accuracy of the laboratory results and assess the possibility of false positives attributed to analytical equipment contributions and laboratory control samples. The laboratory QA/QC includes the completion of laboratory blanks, blank spikes and blank spike recovery. A summary of laboratory QA/QC findings is present below:

- The samples/sample extracts were analyzed within their applicable hold times using approved analytical methods;
- Agreement between the corresponding datasets for the reference material samples, where applicable, and recoveries reported for spiked samples/blanks, where applicable, were within acceptable range;
- Surrogate recoveries were within acceptable ranges;
- Agreement between the other corresponding datasets for the laboratory replicate samples is considered acceptable.

Field QA/QC

One blind duplicate groundwater sample was submitted for analysis of nutrient parameters as part of the environmental assessment and monitoring program.

The relative percent difference (RPD) approach can be used as a means of assessing the accuracy of the duplicate analytical results and verifying the reproducibility of the sample collection methodology. The RPD is calculated for specific parameters using the following equation:

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

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

The sample selected for duplicate analysis (TH7) had several parameters more than five times the laboratory detection limits so an RPD could be calculated. The RPD values had a range of 0.0% to 75.0%. The RPD values for the duplicate samples is within the acceptable limits of 80% for groundwater. As a result, the analytical test results appear to be valid.

The results of the laboratory's QA/QC analyses are detailed on the laboratory Certificates of Analyses presented in Appendix E.

Amec Foster Wheeler Review QA/QC

As part of the review process, Amec Foster Wheeler completed a reviewer's checklist to ensure all aspects of the reporting procedure were followed.

6.0 SUMMARY

The groundwater monitoring program was conducted on 21 October 2014 and included the monitoring and sampling of the four existing monitoring wells (TH7, TH8, TH14,TH24) that could be located and contained sufficient groundwater to collect a sample for laboratory analysis. The locations of the monitoring wells are shown on Figure 2 (Appendix A). The sampled wells were located along the eastern and northern Site boundary. Several wells were damaged and either need to be restored (i.e. replacement of protective covers, repair damaged well casing and replace well caps, removal of sediment from the well casing, etc.) or replaced. In particular, it appears that monitoring wells TH3 and TH9 are located under the new fertilizer shed, and TH5 appears to be located under the new office building. It also appears that re-grading of the gravel at the Site had damaged monitoring wells TH12 and TH13 as they could not be located during the current monitoring event. It is also worth noting that monitoring wells TH1, TH6 and TH20 were located but not included in the monitoring program since the well casing was filled with sediment and gravel.

Groundwater levels measured in the surficial monitoring wells ranged between approximately 1.42 m bgl (TH14) and 1.74 m bgl (TH6). The field parameter measure in the one surficial monitoring well (TH14) with an adequate volume include an ORP level of 148.8 mV, a DO level of 4.78 mg/L, an EC value of 15,060 mS /cm, and a pH value of 6.58.

Groundwater levels measured in the deep monitoring wells ranged between approximately 2.13 m bgl (TH7) and 2.62 m bgl (TH24), ORP levels ranged from -21.6 mV (TH24) to 10.8 mV (TH7), DO levels ranged from 2.12 mg/L (TH7) to 4.14 mg/L (TH24), EC values ranged from 0.897 mS /cm (TH7) to 3.612 mS /cm (TH24), and pH values ranged from 6.85 (TH24) to 7.31 (TH8).

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A review of the deep groundwater samples indicates that the nitrate, nitrite and ammonia concentrations have remained relatively unchanged since the 2011 monitoring event. Since the nutrient concentration are relatively low in the deep groundwater samples when compared to the surficial groundwater samples, it appears that the groundwater in the underlying native soil has not been adversely affected by the Site activities. A CCME NCSCS score of 48.3 was generated, classifying the Site as a Class 3 – Low Priority for Action.

7.0 CONCLUSIONS & RECOMMENDATIONS

Based on the field observations and laboratory results, nutrient impacts to the surficial groundwater are present at the Site as a result of the bulk fertilizer storage facility. Similar to historical observations, the surficial nutrient impacts have likely migrated off-site.

Since there have been some significant changes to the Site since the 2011 monitoring event, which has damaged or destroyed the majority of the wells at the Site, a review of the monitoring well network should be completed to determine which wells need to be replace or relocated.

Additionally, a review of the current fertilizer handling and storage practices should be undertaken to identify items that will potentially minimize fertilizer losses.

As the groundwater results exceeded MCWS reporting standards, a copy of this report needs to be submitted to MCWS for review. Upon review, MCWS will likely request a remedial plan for the future management of nutrient impacts at the Site.

8.0 CLOSURE

The American Society for Testing and Materials Standard of Practice notes that no environmental site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions in the connection with a property. Performance of a standardized environmental site assessment protocol is intended to reduce, but not eliminate, uncertainty regarding the potential for recognized environmental conditions in connection with the property, given reasonable limits of time and costs. The findings of this investigation are based on the interpretation of data from a limited number of test holes and analytical results pertaining to specific samples. The evaluation and interpretations do not preclude the existence of chemical substances other than those identified herein, or the possibility that contamination levels can vary between the areas of the investigation.

This report was prepared for the exclusive use of Portage La Prairie Consumers Co-operative Limited as well as Federated Co-operatives Limited for the noted Site at the time the work was completed. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from Amec Foster Wheeler will be required. With respect to third parties, Amec Foster Wheeler has no liability or responsibility for losses of any kind whatsoever, including direct or consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

The report is based on data and information collected during the groundwater monitoring program on the property conducted by Amec Foster Wheeler. It is based solely on the conditions of the Site encountered at the time of the Site visits on 21 October 2014. Except as otherwise may be specified, Amec Foster Wheeler disclaims any obligation to update this report for events taking place, or with respect to information that becomes available to Amec Foster Wheeler after the time during which Amec Foster Wheeler conducted the groundwater monitoring program.

In evaluating the property, Amec Foster Wheeler has relied in good faith on information provided by other individuals noted in this report. Amec Foster Wheeler has assumed that the information provided is factual and accurate. In addition, the findings in this report are based, to a large degree, upon information provided by the current owner/occupant. Amec Foster Wheeler accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

Amec Foster Wheeler makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel. This Report is also subject to the further General Conditions contained in Appendix H.

Amec Foster Wheeler trusts that this meets your present requirements. Please contact this office if you have any questions.

Respectively submitted,
Amec Foster Wheeler Environment & Infrastructure,
a division of Amec Foster Wheeler Americas Limited

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No. 555 Date: 12 Feb 2015

9.0 REFERENCES

AMEC. Revised 14 August 2002. “Phase II Environmental Site Assessment, Agricore-United Fertilizer Plant, SE33-11-11W, R.M. of North Norfolk, Manitoba”

Canadian Council of Ministers of the Environment (CCME) 1999 Updates to 2011. Canadian Environmental Quality Guidelines (EQG).

Canadian Council of Ministers of the Environment (CCME) 2001, Revised 2011. Canada-Wide Standards for Petroleum Hydrocarbons (CWS PHC) in soil

CCME Canadian Soil Quality Guidelines for the protection of Environmental and Human Health: Benzene, Toluene, Ethylbenzene and Xylenes (BTEX), 2001 (revised 2008);

CCME National Classification System for Contaminated Sites 2010 vs. 1.2

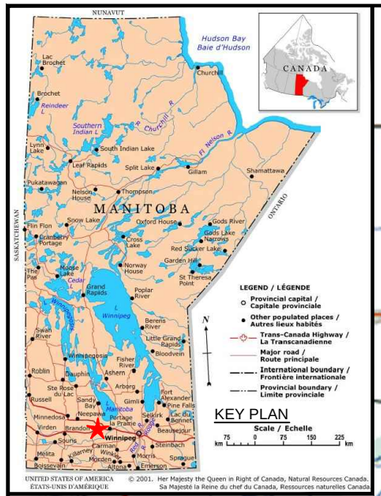
Health Canada Guidelines for Canadian Drinking Water Quality. August 2012

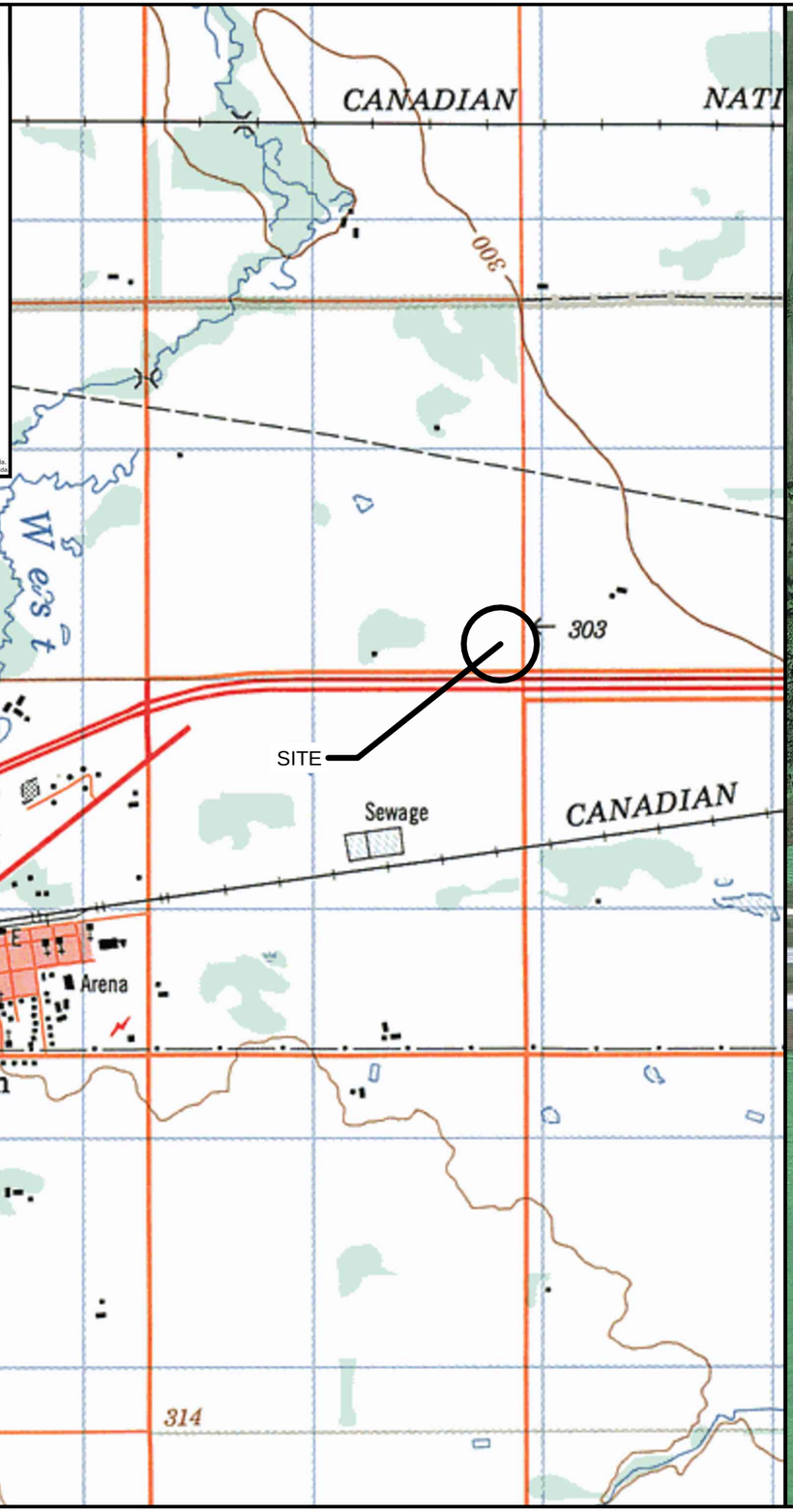
Manitoba Conservation and Water Stewardship Contaminated Sites Remediation Act (CSRA) C205 Updated 1 April 2014

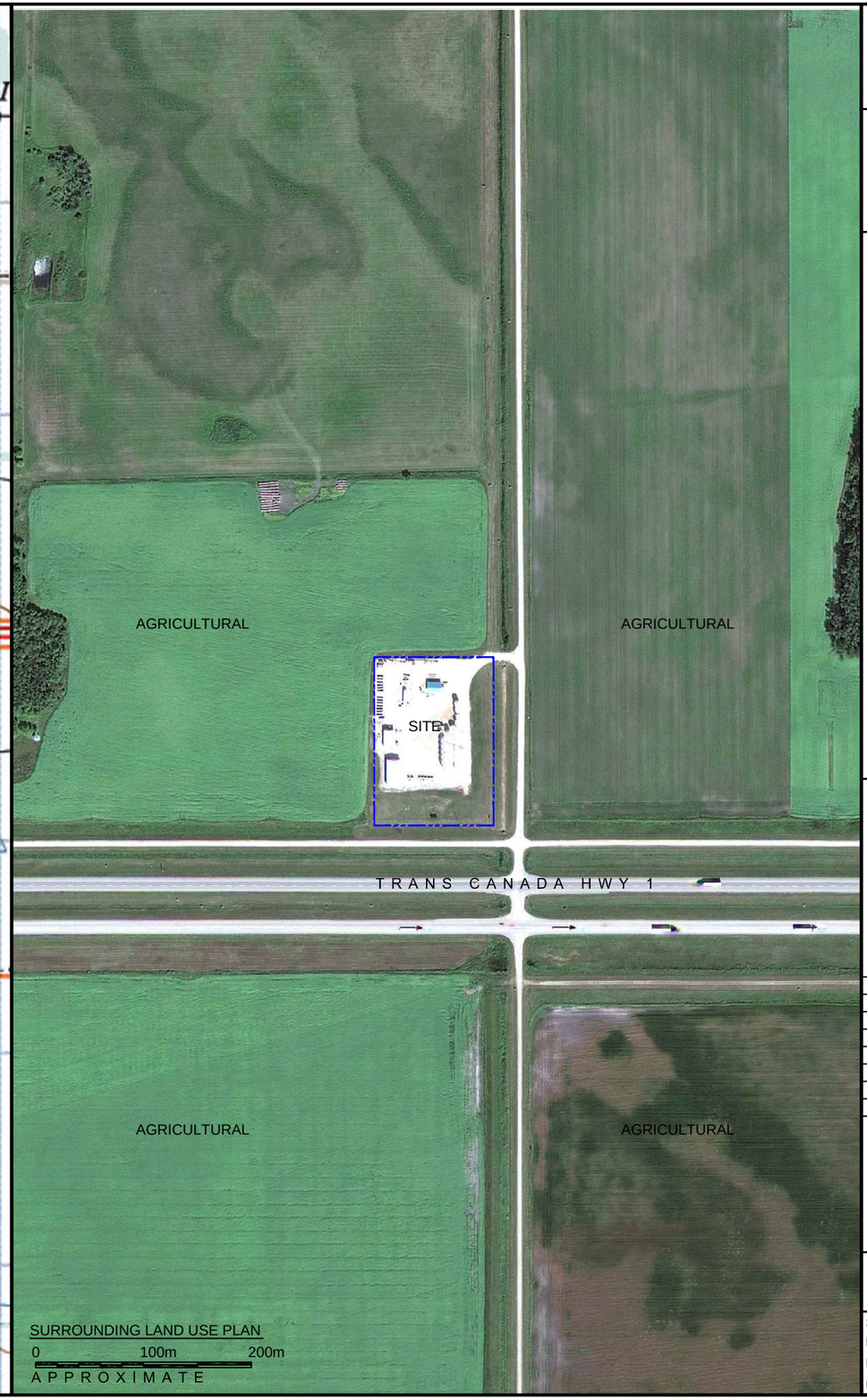
Ontario Ministry of the Environment Soil, Groundwater and Sediment Standards from 15 April 2011, Table 2

APPENDIX A

FIGURES







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CLIENT:

PORTAGE LA PRAIRIE CONSUMERS CO-OPERATIVE LIMITED

LEGEND:

APPROXIMATE PROPERTY LINE

NOTE:
- SITE FEATURE LOCATIONS ARE APPROXIMATE.
- IMAGES FROM GOOGLE EARTH PRO AND TOPO MAP.

NO.	REVISION	DATE	BY

GROUNDWATER MONITORING PROGRAM

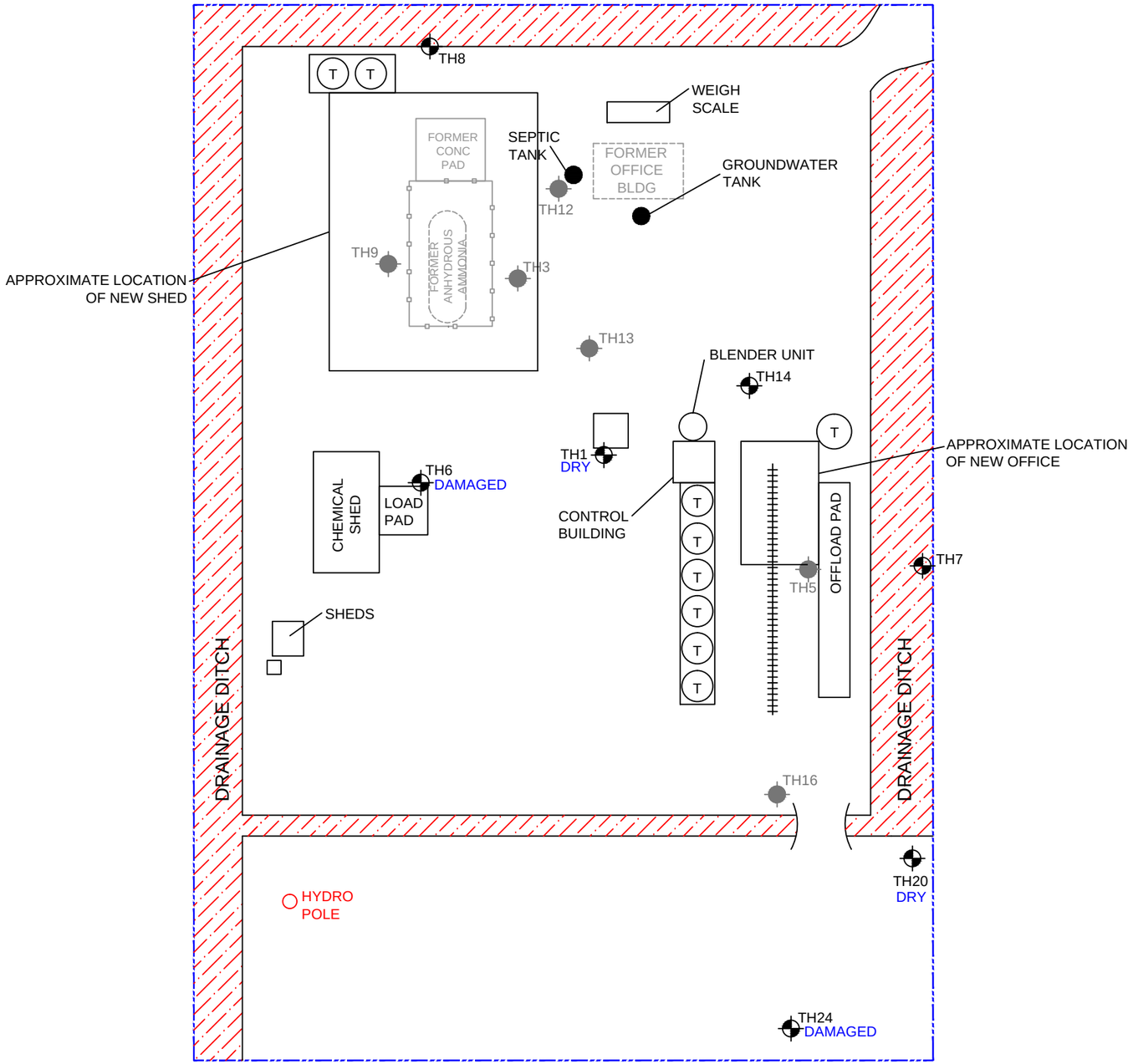
AUSTIN, MANITOBA

SITE AND SURROUNDING LAND USE PLAN

SCALE:	AS SHOWN
DATE:	JANUARY 2015
DRAWN BY:	MD
PROJECT NO.:	WX0547614

FIGURE 1

P:\JOBS\5000'S\5400'S\547614 2014 AUSTIN GW MONITORING\04 DRAWINGS\WX0547614.DWG



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CLIENT:

PORTAGE LA PRAIRIE CONSUMERS CO-OPERATIVE LIMITED

LEGEND:

- APPROXIMATE PROPERTY LINE
- MONITORING WELL
- DESTROYED MONITORING WELL

NOTE:
- SITE FEATURE LOCATIONS ARE APPROXIMATE.

NO.	REVISION	DATE	BY

GROUNDWATER MONITORING PROGRAM

AUSTIN, MANITOBA

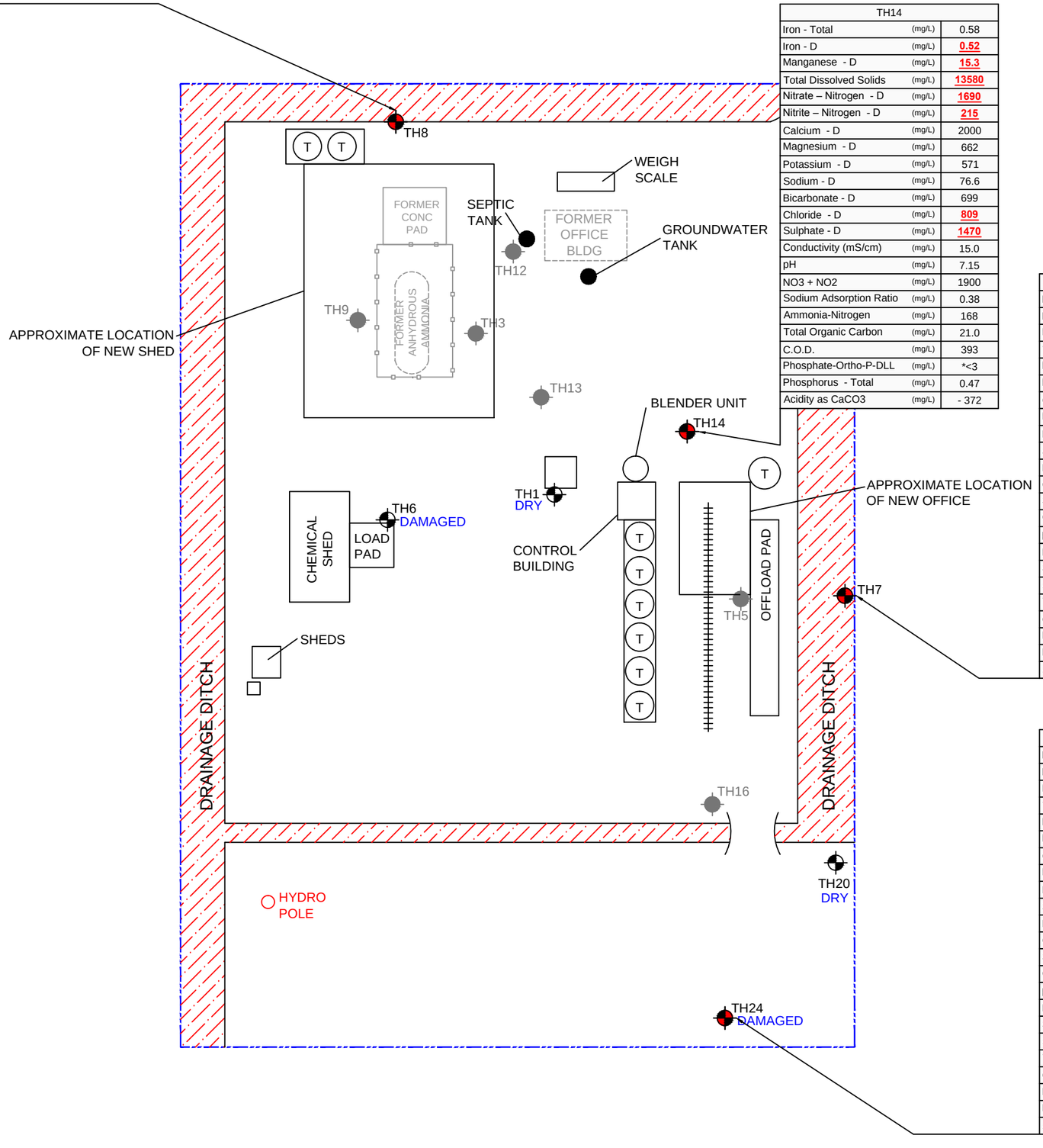
MONITORING WELL LOCATION PLAN

SCALE:	NOT TO SCALE
DATE:	JANUARY 2015
DRAWN BY:	MD
PROJECT NO.:	WX0547614

FIGURE 2

C:\USERS\CRAIG.BLAIR\DESKTOP\JOBS\2015\547614 2014 AUSTIN GW MONITORING\04 DRAWINGS\WX0547614.DWG

TH8		
Iron - Total	(mg/L)	1.72
Iron - D	(mg/L)	**1.02**
Manganese - D	(mg/L)	**0.56**
Total Dissolved Solids	(mg/L)	**596**
Nitrate – Nitrogen - D	(mg/L)	< 0.05
Nitrite – Nitrogen - D	(mg/L)	< 0.03
Calcium - D	(mg/L)	145
Magnesium - D	(mg/L)	40.1
Potassium - D	(mg/L)	6.4
Sodium - D	(mg/L)	18.9
Bicarbonate - D	(mg/L)	512
Chloride - D	(mg/L)	2.0
Sulphate - D	(mg/L)	133
Conductivity (mS/cm)	(mg/L)	0.961
pH	(mg/L)	7.65
NO3 + NO2	(mg/L)	< 0.05
Sodium Adsorption Ratio	(mg/L)	0.36
Ammonia-Nitrogen	(mg/L)	0.06
Total Organic Carbon	(mg/L)	3.0
C.O.D.	(mg/L)	30
Phosphate-Ortho-P-DLL	(mg/L)	< 0.03
Phosphorus - Total	(mg/L)	0.10
Acidity as CaCO3	(mg/L)	- 411



TH14		
Iron - Total	(mg/L)	0.58
Iron - D	(mg/L)	**0.52**
Manganese - D	(mg/L)	**15.3**
Total Dissolved Solids	(mg/L)	**13580**
Nitrate – Nitrogen - D	(mg/L)	**1690**
Nitrite – Nitrogen - D	(mg/L)	**215**
Calcium - D	(mg/L)	2000
Magnesium - D	(mg/L)	662
Potassium - D	(mg/L)	571
Sodium - D	(mg/L)	76.6
Bicarbonate - D	(mg/L)	699
Chloride - D	(mg/L)	**809**
Sulphate - D	(mg/L)	**1470**
Conductivity (mS/cm)	(mg/L)	15.0
pH	(mg/L)	7.15
NO3 + NO2	(mg/L)	1900
Sodium Adsorption Ratio	(mg/L)	0.38
Ammonia-Nitrogen	(mg/L)	168
Total Organic Carbon	(mg/L)	21.0
C.O.D.	(mg/L)	393
Phosphate-Ortho-P-DLL	(mg/L)	*<3
Phosphorus - Total	(mg/L)	0.47
Acidity as CaCO3	(mg/L)	- 372

TH7		
Iron - Total	(mg/L)	0.33
Iron - D	(mg/L)	0.09
Manganese - D	(mg/L)	**0.49**
Total Dissolved Solids	(mg/L)	**564**
Nitrate – Nitrogen - D	(mg/L)	0.11
Nitrite – Nitrogen - D	(mg/L)	< 0.03
Calcium - D	(mg/L)	117
Magnesium - D	(mg/L)	49.0
Potassium - D	(mg/L)	5.9
Sodium - D	(mg/L)	14.4
Bicarbonate - D	(mg/L)	495
Chloride - D	(mg/L)	4.4
Sulphate - D	(mg/L)	104
Conductivity (mS/cm)	(mg/L)	0.895
pH	(mg/L)	7.60
NO3 + NO2	(mg/L)	0.11
Sodium Adsorption Ratio	(mg/L)	0.28
Ammonia-Nitrogen	(mg/L)	< 0.02
Total Organic Carbon	(mg/L)	2.2
C.O.D.	(mg/L)	25
Phosphate-Ortho-P-DLL	(mg/L)	< 0.03
Phosphorus - Total	(mg/L)	0.09
Acidity as CaCO3	(mg/L)	- 399

TH24		
Iron - Total	(mg/L)	6.32
Iron - D	(mg/L)	**5.96**
Manganese - D	(mg/L)	**1.46**
Total Dissolved Solids	(mg/L)	**3716**
Nitrate – Nitrogen - D	(mg/L)	0.32
Nitrite – Nitrogen - D	(mg/L)	< 0.03
Calcium - D	(mg/L)	515
Magnesium - D	(mg/L)	281
Potassium - D	(mg/L)	19.0
Sodium - D	(mg/L)	176
Bicarbonate - D	(mg/L)	532
Chloride - D	(mg/L)	2.9
Sulphate - D	(mg/L)	**2320**
Conductivity (mS/cm)	(mg/L)	3.68
pH	(mg/L)	7.42
NO3 + NO2	(mg/L)	0.32
Sodium Adsorption Ratio	(mg/L)	1.55
Ammonia-Nitrogen	(mg/L)	0.45
Total Organic Carbon	(mg/L)	4.0
C.O.D.	(mg/L)	32
Phosphate-Ortho-P-DLL	(mg/L)	< 0.03
Phosphorus - Total	(mg/L)	0.22
Acidity as CaCO3	(mg/L)	- 429

HEALTH CANADA		
Iron - Total	(mg/L)	NG
Iron - D	(mg/L)	<0.3 AO
Manganese - D	(mg/L)	<0.05 AO
Total Dissolved Solids	(mg/L)	<500 AO
Nitrate – Nitrogen - D	(mg/L)	10
Nitrite – Nitrogen - D	(mg/L)	1
Calcium - D	(mg/L)	NG
Magnesium - D	(mg/L)	NG
Potassium - D	(mg/L)	NG
Sodium - D	(mg/L)	<200 AO
Bicarbonate - D	(mg/L)	NG
Chloride - D	(mg/L)	<250 AO
Sulphate - D	(mg/L)	<500 AO
Conductivity (mS/cm)	(mg/L)	NG
pH	(mg/L)	6.5 - 8.5 AO
NO3 + NO2	(mg/L)	NG
Sodium Adsorption Ratio	(mg/L)	NG
Ammonia-Nitrogen	(mg/L)	NG
Total Organic Carbon	(mg/L)	NG
C.O.D.	(mg/L)	NG
Phosphate-Ortho-P-DLL	(mg/L)	NG
Phosphorus - Total	(mg/L)	NG
Acidity as CaCO3	(mg/L)	NG

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CLIENT:

PORTAGE LA PRAIRIE CONSUMERS CO-OPERATIVE LIMITED

LEGEND:

- APPROXIMATE PROPERTY LINE
- MONITORING WELL
- DESTROYED MONITORING WELL
- BELOW CRITERIA
- ABOVE CRITERIA

NOTE:
- SITE FEATURE LOCATIONS ARE APPROXIMATE.

NO.	REVISION	DATE	BY

GROUNDWATER MONITORING PROGRAM

AUSTIN, MANITOBA

GROUNDWATER ANALYTICAL RESULTS (NUTRIENTS)

SCALE:	NOT TO SCALE
DATE:	JANUARY 2015
DRAWN BY:	MD
PROJECT NO.:	WX0547614

FIGURE 3

C:\USERS\CRAIG.BLAIR\DESKTOP\JOBS\2015\547614 2014 AUSTIN GW MONITORING\04 DRAWING\SWX0547614.DWG

APPENDIX B

TABLES

TABLE 1: SITE AND SURROUNDING LAND USE		
Direction	Land Use	Approx. Distance (m)
Site	Active fertilizer facility - Austin Co-Op	
North	Agricultural land	Adjacent
East	Gravel road and associated drainage ditches followed by agricultural land	Adjacent
South	Trans-Canada Highway (# 1) and associated drainage ditches followed by agricultural land.	Adjacent
West	Agricultural land	Adjacent

Exposure Pathway	Table 2 - Groundwater Guidelines (Health Canada Drinking Water Guidelines)							
	Phosphate - Ortho - P - D (mg/L)	T-Dissolved Solids 180℃ (mg/L)	Calcium - D (mg/L)	Magnesium - D (mg/L)	Potassium - D (mg/L)	Sodium - D (mg/L)	Bicarbonate - D (mg/L)	Chloride - D (mg/L)
Potable Groundwater	NG	**< 500 (AO)**	NG	NG	NG	**< 200 (AO)**	NG	**< 250 (AO)**
MCWS Reporting Standard [1]	*NG*	*500*	*1000*	*NG*	*NG*	*200*	*NG*	*250*

Exposure Pathway	Sulphate - D (mg/L)	Conductivity @ 25℃ (mS/cm)	pH @ 25℃ (pH units)	Sodium Adsorption Ratio (SAR)	Nitrate – Nitrogen - D (mg/L)[1]	Nitrite – Nitrogen - D (mg/L)	Nitrate + Nitrite	Ammonia - Nitrogen (mg/L)
Potable Groundwater	**< 500 (AO)**	NG	**6.5 - 8.5 (AO)**	NG	**10**	**1**	NG	NG
MCWS Reporting Standard [1]	*500*	*NG*	*6.5 - 8.5*	*NG*	*10*	*1*	*100*	*NG*

Exposure Pathway	Carbon (Total Organic) (mg/L)	Chemical Oxygen Demand (mg/L)	Phosphorus - Total (mg/L)	Acidity as CaCO3 (mg/L)	Iron - Total (mg/L)	Iron - D (mg/L)	Manganese - D (mg/L)
Potable Groundwater	NG	NG	NG	NG	NG	**< 0.30 (AO)**	**< 0.05 (AO)**
MCWS Reporting Standard [1]	*NG*	*NG*	*NG*	*NG*	*NG*	*0.3*	*0.05*

Notes:

[1] As per the Contaminated Sites Remediation Act (CSRA) and the standards for reporting established by regulation (CSRR) . Standards are based on CCME standards unless otherwise noted

- mg/L - concentration in milligrams per litre
- **BOLD** – selected guideline
- *Italics* – MCWS Reporting Standard
- NA - not applicable, calculated value exceeds 1,000,000 mg/kg
- NC - not calculated
- NG - no guideline available
- Federal-Provincial-Territorial Committee on Drinking Water (CDW) Guidelines for Canadian Drinking Water Quality Published by Health Canada (updated October 2014)
- AO - Aesthetic Objective

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TABLE 3 : MONITORING WELL DATA

Monitor Well No.	Date Measured	Ground Elevation	Top of Pipe Elevation	Depth to Water	Full Depth of Well	LNAPL Thickness	Ground Water Elevation	Combustible Vapours Well Headspace	Combustible Vapours Groundwater Headspace	DO	EC	pH	pH (Laboratory Analysis)	ORP	Temp
		(m)	(m)	(m B.TOP)	(m B. TOP)	(mm)	(m)	ppm_v	ppm_v	(mg/L)	(mS/cm)			(mV)	(°C)
TH1	21-Oct-14	NM	NM	Dry	1.81	NA	NA	NA	NA	Not Measured (Dry)					
TH3	could not locate	NM	NM	-	-	-	-	-	-	-	-	-	-	-	-
TH5	could not locate	NM	NM	-	-	-	-	-	-	-	-	-	-	-	-
TH6	21-Oct-14	99.475	Damaged	1.69	1.94	ND	NM	NA	NA	Not Measured (Insufficient Water)					
TH7	21-Oct-14	100.000	99.080	2.13	10.09	ND	96.953	NA	NA	2.12	0.897	7.15		10.8	14.43
TH8	21-Oct-14	100.135	98.910	2.57	10.13	ND	96.341	NA	NA	3.40	1.017	7.31		-12.7	10.82
TH9	could not locate	NM	NM	-	-	-	-	-	-	-	-	-	-	-	-
TH12	could not locate	NM	NM	-	-	-	-	-	-	-	-	-	-	-	-
TH13	could not locate	NM	NM	-	-	-	-	-	-	-	-	-	-	-	-
TH14	21-Oct-14	99.155	99.200	1.37	1.91	ND	97.833	NA	NA	4.78	15.06	6.58		148.8	12.8
TH20	21-Oct-14	99.865	98.910	Dry	1.56	NA	NA	NA	NA	Not Measured (Dry)					
TH24	21-Oct-14	100.31	Damaged	2.62	10.13	ND	NM	NA	NA	4.14	3.612	6.85		-21.6	14.5

Notes:

- m - meters
- m B.TOP - meters below top of pipe
- ppm_v - parts per million organic vapour
- LNAPL - light non-aqueous phase liquids
- mm - millimeters
- DO - dissolved oxygen
- EC - electrical conductivity
- ORP - oxidation/reduction potential
- mg/L - milligrams per litre
- µS/cm - microSiemens per centimetre
- mV - millivolts
- ND - not detected
- NA - not applicable
- NM - not measured
- %LEL - percent lower explosive limit
- Ground and Top of Pipe elevations were measured in 2011

Portage La Prairie Consumers
Co-operative Limited
Groundwater Monitoring Sampling
January 2015

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TABLE 4 : GROUNDWATER ANALYTICAL RESULTS - NUTRIENTS							
Parameter	**TH7**	**TH8**	**TH14**	**TH17 (Duplicate of TH7)**	**TH24**	**Health Canada**	*MCWS Reporting Standard*
Iron (mg/L) - Total	0.33	1.72	0.58	0.15	6.32	**NG**	*NG*
Iron (mg/L) - D	0.09	**1.02**	**0.52**	0.11	**5.96**	**<0.3 AO**	*0.3*
Manganese (mg/L) - D	**0.49**	**0.56**	**15.3**	**0.47**	**1.46**	**<0.05 AO**	*0.05*
Total Dissolved Solids (mg/L)	**564**	**596**	**13580**	**596**	**3716**	**<500 AO**	*500*
Nitrate – Nitrogen (mg/L) - D	0.11	< 0.05	**1690**	0.12	0.32	**10**	*10*
Nitrite – Nitrogen (mg/L) - D	< 0.03	< 0.03	**215**	< 0.03	< 0.03	**1**	*1*
Calcium (mg/L) - D	117	145	2000	119	515	**NG**	*1000*
Magnesium (mg/L) - D	49	40.1	662	49.1	281	**NG**	*NG*
Potassium (mg/L) - D	5.9	6.4	571	5.9	19	**NG**	*NG*
Sodium (mg/L)- D	14.4	18.9	76.6	14.6	176	**<200 AO**	*200*
Bicarbonate (mg/L)- D	495	512	699	500	532	**NG**	*NG*
Chloride (mg/L) - D	4.4	2	**809**	3.9	2.9	**<250 AO**	*250*
Sulphate (mg/L)- D	104	133	**1470**	105	**2320**	**<500 AO**	*500*
Conductivity (mS/cm)	0.895	0.961	15	0.912	3.68	**NG**	*NG*
pH	7.6	7.65	7.15	7.73	7.42	**6.5 - 8.5 AO**	*6.5 - 8.5*
NO3 + NO2 (mg/L)	0.11	< 0.05	1900	0.12	0.32	**NG**	*100*
Sodium Adsorption Ratio	0.28	0.36	0.38	0.28	1.55	**NG**	*NG*
Ammonia-Nitrogen (mg/L)	< 0.02	0.06	168	0.64	0.45	**NG**	*NG*
Total Organic Carbon (mg/L)	2.2	3	21	2.3	4	**NG**	*NG*
C.O.D. (mg/L)	25	30	393	< 20	32	**NG**	*NG*
Phosphate-Ortho-P-DLL (mg/L)	< 0.03	< 0.03	*<3	< 0.03	< 0.03	**NG**	*NG*
Phosphorus (mg/L) - Total	0.09	0.1	0.47	0.08	0.22	**NG**	*NG*
Acidity as CaCO3 (mg/L)	-399	-411	-372	-411	-429	**NG**	*NG*

Notes:

- < - less than the method detection limit
- See laboratory report for detection limits, testing protocols and QA/QC procedures.
- **BOLD** - exceeds applicable guidelines
- Laboratory analysis was performed by AMEC Laboratory in Edmonton.
- Health Canada - Federal-Provincial-Territorial Committee on Drinking Water (CDW) Guidelines for Canadian Drinking Water Quality Published by Health Canada (updated December 2014)

Portage La Prairie Consumers
Co-operative Limited
Groundwater Monitoring Sampling
January 2015

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MONITOR WELL DATA

TABLE 5: CUMULATIVE GROUNDWATER ANALYTICAL RESULTS (NUTRIENTS)

Monitoring Well ID	Construction Information				Monitoring Date	Field Parameters										Laboratory Analytical Results														
	TOP Elev.	Ground Elev.	Depth of Well	Screen Interval		Groundwater Depth Below TOP	Groundwater Depth Below Grade	Ground water Elev.	DO (mg/L)	EC	pH	ORP	Temp.	Field Nitrate	Field Nitrite	Nitrate-N (NO3) Dissolved	Nitrite-N (NO2) Dissolved	Nitrate+ Nitrite-N Dissolved	Ammonia (NH3) Dissolved	Total Kjeldahl Nitrogen	Sulphate (SO4) Dissolved	Total Phosphorous	Potassium Total	Ortho Phosphorous Soluble as P	Biological Oxygen Demand (BOD)	Chemical Oxygen Demand (COD)	Total Organic Carbon	Total Suspended Solids	Total Dissolved Solids	Colour	Turbidity
	m	m	m	m	dd-mmm-yyyy	m	m	m	mg/L	mS		mV	°C	mg/L	Y/N	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	`	mg/L	Colour units	NTU
TH1	99.90	99.87	4.6	0.8 - 4.6	19 Jul 2002	4.18	4.15	95.72		1.56				0-10		1.73	0.08	1.81	0.32												
					17 Oct 2002	1.84	1.81	98.06		2.1				50-100		34.5	0.14	34.64	0.08												
					16 Jun 2003	1.28	1.25	98.62	1.94	6.1			3.7	250-500		688	13.3	701.3	5.1						2	122	13	22400	7380	20	10000
					22 Jul 2003	1.68	1.65	98.22	5.83				6.5	250-500		424	26.9	450.9	2.5						<2	84	12	1760	6210	25	830
					12 Nov 2003	1.98	1.95	97.92	1.1	6.44			8	250-500		402	2.61	404.61	45.5						9	247	46	19500	4660	25	120
					16 Jun 2005	0.573	0.54	99.33						>500	Y	824	39.7	863	136												
	99.81	99.93			02-Nov-05	1.77	1.89	98.16	0.67	5.8	7.2		9.7	>500	Y	418	28.4	447	81.5		1030	3.56	76.2	0.867		66	80					
					10-May-06	Unable to monitor - well blocked at approx. 1.2 m below grade																										
					03-Aug-06																										
					10-Aug-07	1.87	1.84	97.94	Not Monitored - well bent					>500	Y	506	94.8	600	88.1	53.7	1090	1.56	83.0	<2.00			15.2				
	99.53	99.56			07-Sep-11	2.02	2.05	97.51	10.2*	9.235	5.46	259.2	13.55			721	98.7	819	322		1700	0.45		<0.4		377	28.3		9712			
					21-Oct-14	1.81	1.81	NA	Not Monitored - well infilled (dry).																							
TH3	99.71	99.74	4.6	0.8 - 4.6	19-Jul-02	1.58	1.61	98.13		5.19				250-500		389	27.6	416.6	0.05												
					17 Oct 2002	1.75	1.78	97.96		4.9				>500																	
					16 Jun 2003	1.48	1.51	98.23	0.69	1.7			5.5			168	<0.05	168	0.4						2	17	7	344	2840	15	190
					22 Jul 2003	1.01	1.04	98.70	9.76				10.3	250-500		135	32.3	167.3	2						618	1090	322	893	4250	200	500
					03 Sep 2003	1.76	1.79	97.95						250-500		237	31.7	268.7							<2	66	17	180	3800	30	77
					12 Nov 2003	1.88	1.91	97.83	0.45	4.65			8.7	250-500		226	13.9	239.9	<0.1												
					16 Jun 2005	0.61	0.64	99.10						>500	Y	112	9.45	122	36.3												
	99.62	99.71			02-Nov-05	1.66	1.75	97.96	0.56	2.90	7.1		10.1	>500	Y	94.4	44	138	41.2		800	1.12	15	0.037		340	61					
					10-May-06	1.7	1.79	97.92			7.5	131	3.6	250-500	Y	23.4	13.8	37.2	44.2	49.8		0.326		<0.001		570	188					
					03-Aug-06	1.7	1.79	97.92																								
					10-Aug-07	1.58	1.67	98.04	1.65	1.77	6.7	91	9.0	>500	Y	62.6	0.87	63.5	10.7	9.7	541	0.47	9.6	<0.2			13.5				
	99.26	99.32			09-Sep-11	1.71	1.76	97.55	0.12	1.876	6.57	3.7	14.31			27.4	<0.05	27.4	17		164	0.08		<0.04		85	26.9		1636			
					21-Oct-14	Not Monitored - could not locate																										
TH5	99.40	99.60	6.1	0.8 - 4.6	19-Jul-02	1.41	1.61	97.99		2.38				50-100		56.8	0.02	56.82	0.03												
					17 Oct 2002	1.68	1.88	97.72		3				100-250		140	0.12	140.12													
					16 Jun 2003	0.9	1.10	98.50		1.8			5.4	50-100		99.69	<0.05	99.6	10.7						27	31	12	564	1770	30	360
					22 Jul 2003	1.85	2.05	97.55	6.46				7.8	250-500		172	0.16	172.46	9.4						<2	24	6	51	2480	20	28
					03 Sep 2003	1.65	1.85	97.75						250-500		173	1.01	174.01													
					12 Nov 2003	1.64	1.84	97.76	0.45	2.62			8.9	100-250		151	1.61	152.61	2.1						<2	17	4	292	2000	15	150
					16 Jun 2005	0.336	0.54	99.06						100-250	Y	56.5	57.3	0.82	0.06												
	99.88	99.85			02-Nov-05	1.53	1.50	98.35	1.45	2.5	7.4		9.2	50-100	N	124	0.38	124	0.1		657	0.339	5.1	0.032		48	101					
					10-May-06	1.3	1.27	98.58	4.11		7.5	148	4.0	250-500	Y	160	2.78	163	2.77	6.3		1.72		0.785		52	19					
					03-Aug-06	1.74	1.71	98.14																								
					10-Aug-07	1.73	1.70	98.15	2.4	2.65	7.0	76.2	8.5	>500	N	270	0.29	270	2.33	<0.2	408	1.41	9.6	<0.2			9.7				
	99.13	99.16			09-Sep-11	1.52	1.55	97.61	0.23	5.156	6.66	172.8	14.24			931	49.6	600	65.9		725	0.92		<0.4		109	22.5		5156			
					21-Oct-14	Not Monitored - could not locate																										
TH6	99.30	99.90	6.1	0.8 - 4.6	19-Jul-02	1.76	2.36	97.54		1.8				25-Oct		2.87	0.92	3.79	0.05												
					17 Oct 2002	1.89	2.49	97.41		2.1				0-10																	
					16 Jun 2003	1.94	2.54	97.36	0	1.1			3.7	50-100		112	<0.05	112	0.3						<2	27	10	193	1680	30	95
					22 Jul 2003	2.11	2.71	97.19	2.3				6.9	25-50		9.28	<0.05	9.28	0.1						<2	28	7	794	1600	5	300
					12 Nov 2003	2.13	2.73	97.17	0.4	1.79			7.8	25-Oct		8.32	<0.05	8.32	<0.1						<2	22	6	458	1510	10	180
					16 Jun 2005	0.888	1.49	98.41						0	Y																
	99.82	99.85			02-Nov-05	1.835	1.87	97.99	1.21	1.8	7.2		9.8	0	N	5.41	0.03	5.44	0.02			1.07	11.3	0.007		17	22					
					10-May-06	2.1	2.13	97.72	3.87		7.8	152	2.9	10-25	N	4.37	0.02	4.39	0.083	6.5		4.86		0.015		320	12					
					03-Aug-06																											
					10-Aug-07	1.85	1.88	97.97	2.24	1.40	7.2	87.4	7.9	10-25	N																	
	99.48	99.49			09-Sep-11	2.98	3.00	96.50	Insufficient water for stabilization																							
					21-Oct-14	1.69	1.69	97.79	Not Monitored - Insufficient Water																							
TH7	100.4	99.46	9.1	6.1 - 9.1	19-Jul-02																										
					17 Oct 2002	2.83	2.83	96.63		1.4				0-10		0.5	0.01	0.51	0.38												
					16 Jun 2003	2.75	2.75	96.71	0.9	0.6			5.5	0-10		0.06	<0.05	0.06	<0.1						2	10	3	13	760	5	6
					22 Jul 2003	3.15	3.15	96.31	0.56				6.8	0-10		0.06	<0.05	0.06	0.2						<2	11	3	12	676	5	8
					12 Nov 2003	3.62	3.62	95.84	0.5	0.9			8	0-10		0.12	<0.05	0.12	<0.1						<2	8	3	20	596	5	15
					16 Jun 2005	2.548	2.55	96.91						0	Y	0.05	0.05	<0.01	0.17												
	100.67	99.79			02-Nov-05	2.61	1.73	97.73	2.27	0.9	7.6		9.6	0	N	0.27	0.01	0.29	0.14			0.124	5.6	0.018		<8	14					
					10-May-06	2.5	1.62	97.84	0.68		7.5	162	6.5	ND	N	0.5	0.03	0.528	0.106	0.8		0.315		0.015		<8	8					
					03-Aug-06	3.01	2.13	97.33																								
					10-Aug-07	2.8	1.92	97.54	1.82	0.66	7.0	68.1	6.0	0	N																	
	100.00	99.08			09-Sep-11	2.81	1.89	97.19	0.88	0.714	6.93	116.7	11.56			0.13	<0.05	0.13	0.25		116	<0.02		<0.004		<20	2.8		616			
					21-Oct-14	2.127	1.17	97.87	2.12	0.897	7.15	10.8	14.43	ND	N	0.11	<0.03	0.11	<0.02		104	0.09	5.9	<0.03		25	2.2		564			
TH8	100.40	99.3	9.1	6.1 - 9.1	19-Jul-02																										
					17 Oct 2002	3.41	2.31	96.99		1				0-10																	
					16 Jun 2003	3.23	2.13	97.17	0.4	0.6			4	0-10		0.12	<0.05	0.12	<0.1												
					22 Jul 2003	3.38	2.28	97.02						0-10		0.1	<0.05	0.1	0.1						2	15	4	10	715	10	6
					12 Nov 2003	4.15	3.05	96.25	1.2	0.96			6.4	0-10		0.1	<0.05	0.1	<0.1						3	14	4	61	628	5	27
					16 Jun 2005	2.647	1.55	97.75						0	Y										<2	14	4	9	616	5	15
	100.58	99.72			02-Nov-05	2.98	2.12	97.60	1.14	0.9	6.8		10.4	0	N	0.23	0.02	0.25	0.23			0.835	12.7	0.002		31	14					
					10-May-06	2.7	1.84	97.88	0.54		7.5	81	6.1	ND	N	0.04	<0.01	0.04	0.241	1.3		0.879		<0.001		41	9					
					03-Aug-06	1.94	1.08	98.64																								
					10-Aug-07	2.99	2.13	97.59	2.86	0.63	7.1	56.4	6.3	0	N																	
	100.14	98.91			09-Sep-11	3.17	1.95	96.97	0.81	0.746	6.84	141.3	13.18			0.28	<0.05	0.28	0.2		129	0.05		<0.04		<20	3.9		620			
					21-Oct-14	2.569	1.20	97.57	3.4	1.017	7.31	-12.7	10.82	ND	N	<0.05	<0.03	<0.05	0.06		133	0.1		<0.03		30	3		596			

Portage La Prairie Consumers
Co-operative Limited
Groundwater Monitoring Sampling
January 2015

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MONITOR WELL DATA

TABLE 5: CUMULATIVE GROUNDWATER ANALYTICAL RESULTS (NUTRIENTS)

Monitoring Well ID	Construction Information				Monitoring Date	Field Parameters										Laboratory Analytical Results															
	TOP Elev.	Ground Elev.	Depth of Well	Screen Interval		Groundwater Depth Below TOP	Groundwater Depth Below Grade	Ground water Elev.	DO (mg/L)	EC	pH	ORP	Temp.	Field Nitrate	Field Nitrite	Nitrate-N (NO3) Dissolved	Nitrite-N (NO2) Dissolved	Nitrate+ Nitrite-N Dissolved	Ammonia (NH3) Dissolved	Total Kjeldahl Nitrogen	Sulphate (SO4) Dissolved	Total Phosphorous	Potassium Total	Ortho Phosphorous Soluble as P	Biological Oxygen Demand (BOD)	Chemical Oxygen Demand (COD)	Total Organic Carbon	Total Suspended Solids	Total Dissolved Solids	Colour	Turbidity
	m	m	m	m	dd-mmm-yyyy	m	m	m	mg/L	mS		mV	°C	mg/L	Y/N	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	`	mg/L	Colour units	NTU
TH9	97.54	99.64	3.0	0.8 - 3.0	19-Jul-02																										
					17 Oct 2002	2.16	4.26	95.38		1.7				25-50		21.5	0.03	21.53														
					16 Jun 2003	1.25	3.35	96.29	0	0.8			4.3			16.8	0.14	16.94	<0.1						<2	26	8	93	1100	15	52
					22 Jul 2003	1.77	3.87	95.77	8.53				10.3	25-50		21.9	<0.05	21.9	<0.1						<2	47	9	589	1160	5	340
					12 Nov 2003	1.69	3.79	95.85	0.6	1.23			8.5	25-Oct		16.1	0.1	16.2	<0.1						4	84	8	691	896	15	840
					16 Jun 2005	0.674	2.77	96.87						10	Y																
	99.49	99.57			02-Nov-05	1.56	1.64	97.93	0.59	1.5	7.2		10.4			20	0.02	20.1	0.14		374	2.21	7	0.1		110	15					
					10-May-06	1.3	1.38	98.19	3.2		7.0	99	3.7	25-50	N	12.4	0.09	12.5	0.39	8.2		3.22		0.057		170	19					
					03-Aug-06	1.42	1.50	98.07																								
					10-Aug-07	1.48	1.56	98.01	1.72	1.64	7.0	103.2	12.5	100-250	Y																	
	99.15	99.21			09-Sep-11	1.66	1.73	97.49	0.42	2.161	6.7	188.2	14.66			59.6	0.11	59.7	0.06		881	0.09		<0.04		46	15.1		2340			
					21-Oct-14	Not Monitored - could not locate																										
TH12	99.71	99.83	3.0	0.8 - 3.0	19-Jul-02																										
					17 Oct 2002	1.78	1.9	97.93		1.7				25-50		18.2	0.02	18.22														
					16 Jun 2003	1.63	1.75	98.08	1.96	0.6			5.5			11.2	0.11	11.31	0.5						2	120	6	6740	770	5	6400
					22 Jul 2003	1.35	1.47	98.36						25-50		12.9	0.21	13.11	0.2						3	67	10	1450	796	10	3000
					12 Nov 2003	2.15	2.27	97.56	3.4	0.97			7.6	0-10		9.34	23.3	32.64	<0.1						3	249	5	6400	704	5	330
					16 Jun 2005	0.694	0.814	99.016						250-500	Y																
	99.69	99.75			02-Nov-05	1.74	1.8	97.95	1.21				10.5			18.2	0.01	18.2	0.04		401	2	12.2	0.008		38	11					
					10-May-06	1.5	1.56	98.19	3.18		7.25	108	2.5	50-100	N	20.9	0.27	21.2	0.025	1.1		0.385		<.001		13	9					
					03-Aug-06	1.75	1.81	97.94																								
					10-Aug-07	1.71	1.77	97.98	2.74	1.17	6.9	79.7	13.4	25-50	Y																	
	99.31	99.38			09-Sep-11	1.81	1.885	97.495	0.69	2.119	NM	151.3	17.77			9.76	0.25	10	0.59		759	0.2		0.06		25	6.7		2044			
					21-Oct-14	Not Monitored - could not locate																										
TH13	99.58	99.73	3.0	0.8 - 3.0	19-Jul-02																										
					17 Oct 2002	1.58	1.73	98.00		1.4				25-50		21.2	0.03	21.23	0.03													
					16 Jun 2003	1.37	1.52	98.21	3.75	0.8			6.5	0-10		9.99	0.13	10.12	<0.1						2	19	7	75	855	20	44
					22 Jul 2003	1.47	1.62	98.11	7.05				11	0-10		<0.05	<0.05	0	0.1						489	656	124	313	1450	400	220
					12 Nov 2003	1.76	1.91	97.82	1.5	2.18			8	0-10		<0.05	<0.05	0	<0.1						693	761	293	2100	1660	200	350
					16 Jun 2005	0.574	0.724	99.01						0	Y																
	99.62	99.75			02-Nov-05	1.64	1.77	97.98	0.79	2	6.9		9.8	0	N	0.04	0.03	0.07	0.93		44		9.6	0.005		720	48					
					10-May-06	1.4	1.53	98.22	1.23		7.8	111	2	ND	N	0.04	<0.01	0.04	0.003	4.4		0.537		<.001		76	14					
					03-Aug-06	1.74	1.87	97.88																								
					10-Aug-07	1.59	1.72	98.03	1.21	1.56	6.6	-130.0	11.6	0-10	N																	
	99.25	99.37			09-Sep-11	1.71	1.83	97.54	0.84	2.784	6.47	190.7	18.83			51	0.06	51.1	2.82		344	0.07		0.16		108	35.7		2636			
					21-Oct-14	Not Monitored - could not locate																										
TH14	99.60	99.69	3.0	0.8 - 3.0	19-Jul-02																										
					17 Oct 2002	1.72	1.81	97.88		5.9				250-500		376	55	431	33													
					16 Jun 2003	0.88	0.97	98.72	0.21	3.3			5.5	250-500		302	102	404	64.4						14	206	11	313	4450	25	360
					22 Jul 2003	1.61	1.7	97.99	7.71				10.9	250-500		481	176	657	44.9						9	272	12	1070	6000	30	750
					12 Nov 2003	1.84	1.93	97.76	7.2	4.99			8.8	250-500		209	25.9	234.9	10.1						14	283	25	3320	3600	35	750
					16 Jun 2005	0.375	0.465	99.23						500	Y																
	99.54	99.57			02-Nov-05	1.56	1.59	97.98	0.46				8.8			0.02	0.04	0.06	14.2		31		85.2	0.004		1000	70					
					10-May-06	1.3	1.33	98.24	1.76		7.5	180	1.9	250-500	Y	92.2	11.6	104	45.8	94.2		4.14		0.006		360	87					
					03-Aug-06	1.7	1.73	97.84																								
					10-Aug-07	1.61	1.64	97.93	Insufficient water					>500	Y	452	82.9	535				Insufficient water										
	99.16	99.20			07-Sep-11	1.59	1.635	97.565	Insufficient water for stabilization							760	10.9	771	334		1980	0.53		<0.4		614	146		10600			
					21-Oct-14	1.367	1.443	97.79	4.78	15.06	6.58	148.8	12.84	ND	N	1690	215	1900	168		1470	0.47		<3		393	21		13380			
TH16	99.35	99.46	3.0	0.8 - 3.0	19-Jul-02																										
					17 Oct 2002	2.15	2.26	97.2		1.2				10-25		8	<0.01	8	0.04													
					16 Jun 2003	0.81	0.92	98.54	1.43	1.1			6	50-100		30.1	<0.05	30.1	<0.1						3	20	8	79	1220	15	50
					22 Jul 2003	1.46	1.57	97.89	4.9				9.5	50-100		33.4	<0.05	33.4	0.3						3	38	9	359	1240	10	200
					12 Nov 2003	1.46	1.57	97.89	2.7	1.33			7.6	0-10		NS	NS		0.2						<2	28	5				
					16 Jun 2005	0.28	0.39	99.07						100-250	Y	21.9	23.4	1.46	3.11												
	99.65	99.74			02-Nov-05	1.37	1.46	98.28	0.84				9.2			4.32	0.01	4.33	0.05		412	1.71	77.7	0.018		480	12					
					10-May-06									100-250	Y	34.6	0.01	34.6	0.163	38.3		9.61		0.015		1000	11					
					03-Aug-06																											
					10-Aug-07	Well blocked at 0.73m																										
					09-Sep-11	Destroyed																										
					21-Oct-14	Destroyed																										
TH20	100.20	99.33	3.0	0.8 - 3.0	19-Jul-02																										
					17 Oct 2002	dry		dry																								
					16 Jun 2003	1.84	0.97	98.36	2.65	0.7			5.6	0-10		3.46	<0.05	3.46	<0.1						3	13	3	73	700	5	44
					22 Jul 2003	2.36	2.45	97.84						0-10		3.6	<0.05	3.6	0.2						<2	15	3	44	732	5	33
					12 Nov 2003	2.54	2.63	97.66	3.8	1.15			8.4	0-10		3.17	<0.05	3.17	<0.1						<2	10	3	96	812	5	63
					16 Jun 2005	2.48	2.56	97.73						0	Y																
	100.52	99.65			02-Nov-05	2.23	1.36	98.29	4.49	1.6	7.4		9.3	0	N	1.22	<0.01	1.22	0.03		417	0.204	3.9	0.013		<8	14					
					10-May-06	Well blocked with sand/silt at 1.8m. Material removed and well sampled once partially recovered.								10-25	N	0.35	<0.01	0.352	0.008	1.2		0.486		<.001		24	9					
					03-Aug-06	2.62	1.75	97.90																								
					10-Aug-07	2.39	1.52	98.13	Insufficient water					0	N																	
	99.87	98.91			09-Sep-11	Blocked at 1.62 m below grade																										
					21-Oct-14	Not Monitored - infilled to 1.56 (dry)																										

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MONITOR WELL DATA

TABLE 5: CUMULATIVE GROUNDWATER ANALYTICAL RESULTS (NUTRIENTS)

Monitoring Well ID	Construction Information				Monitoring Date	Field Parameters										Laboratory Analytical Results																
	TOP Elev.	Ground Elev.	Depth of Well	Screen Interval		Groundwater Depth Below TOP	Groundwater Depth Below Grade	Ground water Elev.	DO (mg/L)	EC	pH	ORP	Temp.	Field Nitrate	Field Nitrite	Nitrate-N (NO3) Dissolved	Nitrite-N (NO2) Dissolved	Nitrate+ Nitrite-N Dissolved	Ammonia (NH3) Dissolved	Total Kjeldahl Nitrogen	Sulphate (SO4) Dissolved	Total Phosphorous	Potassium Total	Ortho Phosphorous Soluble as P	Biological Oxygen Demand (BOD)	Chemical Oxygen Demand (COD)	Total Organic Carbon	Total Suspended Solids	Total Dissolved Solids	Colour	Turbidity
	m	m	m	m	dd-mmm-yyyy	m	m	m	mg/L	mS		mV	°C	mg/L	Y/N	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	`	mg/L	Colour units	NTU
TH24	100.30	99.22	9.1	6.1 - 9.1	19-Jul-02																											
					17 Oct 2002	2.54	1.46	97.76		3.1				0-10																		
					16 Jun 2003	2.38	1.30	97.92	5.47	1.9			6	0-10		0.18	<0.05	0.18	0.4						2	15	4	13	2540	10	7
					22 Jul 2003	2.59	1.51	97.71	0.76				6.7	0-10		0.1	<0.05	0.1	0.4						2	15	4	12	3340	5	22
					12 Nov 2003	3.43	2.35	96.87	0.95	3.35			8.2	0-10		0.34	<0.05	0.34	<0.1						<2	17	6	25	3460	5	30
					16 Jun 2005	2.00	0.92	98.30						0	Y																
	100.56	99.59			02-Nov-05	2.39	1.42	98.17	1.85	3.3	7.2		9.5	0	N	0.91	<0.01	0.91	0.05			0.18	14	0.03		<8	14					
					10-May-06	2.3	1.33	98.26	0.43		7.3	165	6.8	ND	N	0.25	0.02	0.264	0.339	1.1		0.319		<.001		14	10					
					03-Aug-06	2.8	1.83	97.76																								
					10-Aug-07	2.68	1.71	97.88	2.01	2.37	6.9	75.4	6.2	50-100	N																	
	100.31	98.82			07-Sep-11	3.01	1.52	97.30	0.33	2.686	6.6	26.4	10.02			<0.05	<0.05	<0.05	0.74		2180	<0.02		<0.004		35	4.9		3564		
					21-Oct-14	2.62	0.96	97.69	4.14	3.612	6.85	-21.6	14.49	ND	N	0.32	<0.03	0.32	0.45		2320	0.22		<0.03		32	4		3718		

Notes:

- TOP - Top of Pipe (well casing)
- Blank cells indicate parameter not measured or analysed.
- < - less than the analytical detection limit.
- **Bold and Underlined** text indicates analytical parameter equal to or exceeding applicable criteria
- Yellow highlighted text indicates most recent monitoring event
- See laboratory report for detection limits, testing protocols and QA/QC procedures. Laboratory analysis performed by AMEC's Edmonton Laboratory.

APPENDIX C

SITE PHOTOGRAPH LOG

PHOTOGRAPH 1: Condition of monitoring well TH1.

PHOTOGRAPH 2: Fertilizer shed built since 2011 monitoring program.

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Environment & Infrastructure

Portage La Prairie Consumers Co-operative

PHOTOGRAPH LOG
2014 GROUNDWATER MONITORING PROGRAM
BULK FERTILIZER STORAGE FACILITY
AUSTIN, MANITOBA

Drawn: N/A	Scale: N/A	Date: JAN 15	Project No. WX0547614	Page 1

PHOTOGRAPH 3: Re-graded parking lot and new office building.

PHOTOGRAPH 4: Location of TH6.

PHOTOGRAPH 5: Condition of monitoring well TH6.

PHOTOGRAPH 6: Location of monitoring well TH14.

APPENDIX D

MONITORING WELL CONDITION CHECKLIST

Monitoring Well Inspection Checklist

Section A

Site: Coop Austin Fertilizer Site

Address: _____

Project Number: WY0547614

Section B

Monitoring Well	Onsite	Offsite	Well / Annulus Condition		Description of Well Condition	Repairs Completed
			Satisfactory	Unsatisfactory	(If unsatisfactory condition is observed)	(Initial)
TH1	✓			✓	in filled to 1.81m - no flush mount cover or cap - dry	
TH14	✓		✓		in filled to 1.91m - as in 2011	
TH6	✓			✓	in filled to 1.94m - no PVC cap / no flush mount case - dry	
TH8	✓					
TH24	✓			✓	frost heave has cause casing to lift above ground	
TH7	✓		✓			
TH13					could not locate	
TH12					"	
TH5					" under new office (?)	
TH3					" under new fertilizer shed (?)	
TH9					"	
TH20	✓			✓	in-filled to 1.56m - dry	

APPENDIX E

LABORATORY RESULTS

Final Analytical Report

Attention: Craig Blair

AMEC Environment & Infrastructure
440 Dovercourt Drive
Winnipeg, MB R3Y 1N4

Results for File: EC-68461

Project Number: WX0547614
Project Name: Austin Co-op Fertilizer Site

Date Received: 2014/10/24
Date of Report: 2014/10/31

Report reviewed by:

Jesse Dang, B.Sc.
Manager
Laboratory Services

Kristine Connor
Client Services Representative
Laboratory Services

** All samples will be disposed of after 30 days following analysis. Please contact the lab if you require additional sample storage time. (Samples deemed hazardous will be returned to the client at their own expense or disposal will be arranged.) **

Water Analysis

Project No. WX0547614

Final
File No. EC-68461

Analyst	Date of Analysis (yyyy/m/d)	Analytical Parameter	Units	Reference Method	Lab #: / Client ID: / Sample Date: / MDL	14-15786 TH7 2014/10/21 0:00	14-15786-D TH7 Lab Duplicate	14-15787 TH8 2014/10/21 0:00	14-15788 TH14 2014/10/21 0:00
EL	2014/10/24	Phosphate-Ortho-P-D	mg/L (ppm)	APHA 4110	0.03	< 0.03	< 0.03	< 0.03	*<3
JP	2014/10/31	Total Dissolved Solids180°C	mg/L (ppm)	APHA 2540 C	4	564	---	596	13580
LL	2014/10/24	Calcium -D	mg/L (ppm)	APHA 3120 B	0.5	117	116	145	2000
LL	2014/10/24	Magnesium -D	mg/L (ppm)	APHA 3120 B	0.5	49.0	48.9	40.1	662
LL	2014/10/24	Potassium -D	mg/L (ppm)	APHA 3120 B	0.5	5.9	5.9	6.4	571
LL	2014/10/24	Sodium -D	mg/L (ppm)	APHA 3120 B	0.5	14.4	14.4	18.9	76.6
AD	2014/10/24	Bicarbonate-D	mg/L (ppm)	APHA 2320	1	495	495	512	699
EL	2014/10/24	Chloride-D	mg/L (ppm)	APHA 4110	0.1	4.4	4.3	2.0	809
EL	2014/10/24	Sulphate-D	mg/L (ppm)	APHA 4110	0.5	104	103	133	1470
AD	2014/10/24	Conductivity @ 25°C	mS/cm	APHA 2510 B	0.001	0.895	0.896	0.961	15.0
AD	2014/10/24	pH @ 25°C	pH units	APHA 4500H	0.01	7.60	7.59	7.65	7.15
EL	2014/10/24	Nitrate-Nitrogen-D	mg/L (ppm)	APHA 4110	0.05	0.11	0.13	< 0.05	1690
EL	2014/10/24	Nitrite-Nitrogen-D	mg/L (ppm)	APHA 4110	0.03	< 0.03	< 0.03	< 0.03	215
EL	2014/10/24	Nitrate + Nitrite	mg/L (ppm)	Calculation	0.05	0.11	0.13	< 0.05	1900
AD	2014/10/24	Sodium Adsorption Ratio (SAR)		Calculation	0.10	0.28	0.28	0.36	0.38

Analyst	Date of Analysis (yyyy/m/d)	Analytical Parameter	Units	Reference Method	Lab #: / Client ID: / Sample Date: / MDL	14-15789 TH17 2014/10/21 0:00	14-15790 TH24 2014/10/21 0:00
EL	2014/10/24	Phosphate-Ortho-P-D	mg/L (ppm)	APHA 4110	0.03	< 0.03	< 0.03
JP	2014/10/31	Total Dissolved Solids180°C	mg/L (ppm)	APHA 2540 C	4	596	3716
LL	2014/10/24	Calcium -D	mg/L (ppm)	APHA 3120 B	0.5	119	515
LL	2014/10/24	Magnesium -D	mg/L (ppm)	APHA 3120 B	0.5	49.1	281
LL	2014/10/24	Potassium -D	mg/L (ppm)	APHA 3120 B	0.5	5.9	19.0
LL	2014/10/24	Sodium -D	mg/L (ppm)	APHA 3120 B	0.5	14.6	176
AD	2014/10/24	Bicarbonate-D	mg/L (ppm)	APHA 2320	1	500	532
EL	2014/10/24	Chloride-D	mg/L (ppm)	APHA 4110	0.1	3.9	2.9
EL	2014/10/24	Sulphate-D	mg/L (ppm)	APHA 4110	0.5	105	2320
AD	2014/10/24	Conductivity @ 25°C	mS/cm	APHA 2510 B	0.001	0.912	3.68
AD	2014/10/24	pH @ 25°C	pH units	APHA 4500H	0.01	7.73	7.42
EL	2014/10/24	Nitrate-Nitrogen-D	mg/L (ppm)	APHA 4110	0.05	0.12	0.32
EL	2014/10/24	Nitrite-Nitrogen-D	mg/L (ppm)	APHA 4110	0.03	< 0.03	< 0.03
EL	2014/10/24	Nitrate + Nitrite	mg/L (ppm)	Calculation	0.05	0.12	0.32
AD	2014/10/24	Sodium Adsorption Ratio (SAR)		Calculation	0.10	0.28	1.55

Water Analysis

Project No. WX0547614

Final
File No. EC-68461

Analyst	Date of Analysis (yyyy/m/d)	Analytical Parameter	Units	Reference Method	Lab #: / Client ID: / Sample Date: / MDL	14-15786 TH7 2014/10/21 0:00	14-15786-D TH7 Lab Duplicate	14-15787 TH8 2014/10/21 0:00	14-15788 TH14 2014/10/21 0:00
EL	2014/10/29	Ammonia - Nitrogen	mg/L (ppm)	APHA 4500NH3-G	0.02	< 0.02	< 0.02	0.06	168
EL	2014/10/27	Carbon (Total Organic)	mg/L (ppm)	APHA 5310 B	0.1	2.2	2.3	3.0	21.0
JP	2014/10/30	Chemical Oxygen Demand (COD)	mg/L (ppm)	APHA 5220-d	20	25	---	30	393
LL	2014/10/24	Phosphorus-T	mg/L (ppm)	APHA 3030 E/3120 B	0.02	0.09	0.10	0.10	0.47
AP	2014/10/24	Acidity as CaCO3	mg/L (ppm)	APHA 2310B	1	- 399	- 401	- 411	- 372
LL	2014/10/24	Iron-T	mg/L (ppm)	APHA 3030 E/3125 B	0.01	0.33	0.31	1.72	0.58
LL	2014/10/24	Iron-D	mg/L (ppm)	APHA 3125 B	0.01	0.09	0.09	1.02	0.52
LL	2014/10/24	Manganese-D	mg/L (ppm)	APHA 3125 B	0.01	0.49	0.49	0.56	15.3

Analyst	Date of Analysis (yyyy/m/d)	Analytical Parameter	Units	Reference Method	Lab #: / Client ID: / Sample Date: / MDL	14-15789 TH17 2014/10/21 0:00	14-15790 TH24 2014/10/21 0:00
EL	2014/10/29	Ammonia - Nitrogen	mg/L (ppm)	APHA 4500NH3-G	0.02	0.64	0.45
EL	2014/10/27	Carbon (Total Organic)	mg/L (ppm)	APHA 5310 B	0.1	2.3	4.0
JP	2014/10/30	Chemical Oxygen Demand (COD)	mg/L (ppm)	APHA 5220-d	20	< 20	32
LL	2014/10/24	Phosphorus-T	mg/L (ppm)	APHA 3030 E/3120 B	0.02	0.08	0.22
AP	2014/10/24	Acidity as CaCO3	mg/L (ppm)	APHA 2310B	1	- 411	- 429
LL	2014/10/24	Iron-T	mg/L (ppm)	APHA 3030 E/3125 B	0.01	0.15	6.32
LL	2014/10/24	Iron-D	mg/L (ppm)	APHA 3125 B	0.01	0.11	5.96
LL	2014/10/24	Manganese-D	mg/L (ppm)	APHA 3125 B	0.01	0.47	1.46

Quality Control Standard

Project No. WX0547614 File No. EC-68461

Water Analysis

Analyst	Date of Analysis (yyyy/m/d)	Analytical Parameter	Units	Reference Method	MDL	Analyzed Value	Advisory Range	Target Value	Reference No.
EL	2014/10/24	Phosphate-Ortho-P-D	mg/L (ppm)	APHA 4110	0.03	8.79	7-8.8	8.00	CC-Anion-132B
JP	2014/10/31	Total Dissolved Solids180°C	mg/L(ppm)	APHA 2540 C	4	200	144-234	189	QCP-SLD02010
LL	2014/10/24	Calcium -D	mg/L (ppm)	APHA 3120 B	0.5	39.0	33.8-41.3	37.5	QCP-QCS (CCV-Cats)
LL	2014/10/24	Magnesium -D	mg/L (ppm)	APHA 3120 B	0.5	39.7	33.8-41.3	37.5	QCP-QCS (CCV-Cats)
LL	2014/10/24	Potassium -D	mg/L (ppm)	APHA 3120 B	0.5	43.3	38.3-46.8	42.5	QCP-QCS (CCV-Cats)
LL	2014/10/24	Sodium -D	mg/L (ppm)	APHA 3120 B	0.5	37.3	33.8-41.3	37.5	QCP-QCS (CCV-Cats)
EL	2014/10/24	Chloride-D	mg/L (ppm)	APHA 4110	0.1	4.1	3.6-4.4	4.0	CC-Anion-132B
EL	2014/10/24	Sulphate-D	mg/L (ppm)	APHA 4110	0.5	28.6	25.2-30.8	28.0	CC-Anion-132B
AD	2014/10/24	Conductivity @ 25°C	mS/cm	APHA 2510B	0.001	2.77	2.54-2.94	2.790	CC-EC-0.02M-66
AD	2014/10/24	pH @ 25°C	pH units	APHA 4500H	0.01	6.01	5.94-6.06	6.00	QC-pH-19
EL	2014/10/24	Nitrate-Nitrogen-D	mg/L (ppm)	APHA 4110	0.05	1.65	1.44-1.76	1.60	CC-Anion-132B
EL	2014/10/24	Nitrite-Nitrogen-D	mg/L (ppm)	APHA 4110	0.03	0.60	0.54-0.66	0.60	CC-Anion-132B

Water Analysis

Analyst	Date of Analysis (yyyy/m/d)	Analytical Parameter	Units	Reference Method	MDL	Analyzed Value	Advisory Range	Target Value	Reference No.
EL	2014/10/29	Ammonia - Nitrogen	mg/L (ppm)	APHA 4500NH3-G	0.02	1.49	1.09-1.66	1.37	QC-F2NUT01117
EL	2014/10/27	Carbon (Total Organic)	mg/L (ppm)	APHA 5310-b	0.1	32.8	24-36	30.0	D05711-01-LOW
JP	2014/10/30	Chemical Oxygen Demand (COD)	mg/L (ppm)	APHA 5220-D	20	556	532-704	620	QC-HR_High- F2-DMD01075
LL	2014/10/24	Phosphorus-T	mg/L (ppm)	APHA 3120 B	0.01	5.24	4.50-5.50	5.00	QCP-QCS (CCV-Cats)
AP	2014/10/24	Acidity as CaCO3	mg/L (ppm)	APHA 2310B	1	972	800-1200	1000	0.02N H2SO4
LL	2014/10/24	Iron-T	mg/L (ppm)	APHA 3120 B	0.01	1.06	0.90-1.10	1.00	QCP-QCS (CCV-Cats)
LL	2014/10/24	Iron-D	mg/L (ppm)	APHA 3120 B	0.01	1.06	0.90-1.10	1.00	QCP-QCS (CCV-Cats)
LL	2014/10/24	Manganese-D	mg/L (ppm)	APHA 3125 B	0.01	0.98	0.90-1.10	1.00	QCP-QCS (CCV-Cats)

Analytical Comments

Project No. WX0547614 File No. EC-68461

* Phosphate-Ortho MDL(s) adjusted for sample(s) 14-15788 due to sample matrix interference.

Acidity - the absolute of a negative value should be equivalent to alkalinity value.

All Analytical results pertain to samples analyzed as received.

APHA: Standard Method for the Examination of Water and Wastewater, 2005. 21st Ed. American Public Health Association.

MDL - Method Detection Limit

amec EARTH & ENVIRONMENTAL

EC_68461
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Chain of Custody Record/Analysis Request

Tracking #:

ISSUING OFFICE:	Winnipeg		
Project Name:	Austin Coop Fertilizer Site	Job No.:	WX0547614
Project Manager:	Craig Blair	Phone No.:	1- 204 488 2997
Sampler:	Brad Kennedy		

ANALYSIS REQUIRED (Note preferred method)

QUOTED PRICE: ○ YES (Please attach a copy of the quote) ◉ NO

Quote #:

Client Sample ID	AMEC E & E Lab Sample ID (FOR LAB USE ONLY)	Date Collected (yyyy/mm/dd)	Matrix	1L Bottle	250 mL Jar	40 mL Vial	1L Polyethylene	100ml Poly	100ml Amber Bottle	Coop nutrient package	50% RUSH (Please Notify Lab!)	100% RUSH (Please Notify Lab!)
TH7	14-13786	2014/10/21	water			1	1	2	1	x		
TH8	7	2014/10/21	water			1	1	2	1	x		
TH14	8	2014/10/21	water			1	1	2	1	x		
TH17	9	2014/10/21	water			1	1	2	1	x		
TH24	90	2014/10/21	water			1	1	2	1	x		

Receiver's Comments: 7.7°

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:	Comments:
Signature:	Signature:	Signature:	Signature:	
Printed Name: Brad Kennedy	Printed Name:	Printed Name:	Printed Name:	
Firm: AMEC Winnipeg	Firm: ~~AMEC~~ EOM	Firm:	Firm:	
Date/Time: 23-Oct-14	Date/Time: 24 08 14 9.30	Date/Time:	Date/Time:	

APPENDIX F

NCSCS REPORT

CCME National Classification System for Contaminated Sites (2008, 2010 v 1.2)
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.	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 signficant 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 (e.g., for comparison with other Class 1 sites).
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	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 (e.g., for comparison with other Class 1 sites).
7. Do measured concentrations of volatiles or unexploded ordnances represent an **explosion hazard**?	No	If yes, automatically rate the site as Class 1, a priority for remediation or risk management, and do not continue until the safety risks have been addressed. Consult your jurisdiction's occupational health and safety guidance or legislation on exposive 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, 2010 v 1.2)
Summary of Site Conditions

Subject Site:	**Test Site**	
Civic Address: *(or other description of location)*	North side of Highway 1 near Austin, Mantioba.	
Site Common Name : *(if applicable)*	Austin Coop Bulk Fertilizer Facility	
Site Owner or Custodian: *(Organization and Contact Person)*	Portage la Prairie Consumers Cooperative Ltd.	
Legal description *or* metes and bounds:		
Approximate Site area:		
PID(s) : *(or Parcel Identification Numbers [PIN] if untitled Crown land)*		
Centre of site: *(provide latitude/longitude or UTM coordinates)*	Latitude: Longitude:	_____ degrees _____ min _____ secs _____ degrees _____ min _____ secs
	UTM Coordinate:	Northing _____ Easting _____
Site Land Use:	Current:	
	Proposed:	
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:		

CCME National Classification System for Contaminated Sites (2008, 2010 v 1.2)
Summary of Site Conditions

Affected media and Contaminants of Potential Concern (COPC):	Fertilizers and farming chemicals.

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

Site Letter Grade **A**

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:	
Date Scoring Completed:	

CCME National Classification System (2008, 2010 v 1.2)

(I) Contaminant Characteristics

Test Site

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		There are no surface water bodies located within 500 m of the Site.	The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline). Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at http://www.ccme.ca/publications/cegg_rcqe.html?category_id=124. For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guide-res_recom/index_e.html.	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	Yes			
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)?	Medium	Nitrite classified as a medium hazard ranking.	The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site. The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file. *See Attached Reference Material for Contaminant Hazard Rankings.*	Hazard as defined in the revised NCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
High / Medium / Low / Do Not Know				
"Known" -score	4			
"Potential" - score	---			
3. Contaminant Exceedence Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?	dium (10x to 10		Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the *most conservative media-specific and land-use appropriate CCME* environmental quality guidelines. **Ranking should be based on contaminant with greatest exceedance of CCME guidelines.** Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines Mobile NAPL = Contaminant is a non-aqueous phase liquid (i.e., due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (i.e., greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Other standards may include local background concentration or published toxicity benchmarks. Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria. Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (i.e., CEF=>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
Mobile NAPL / High (>100x) / Medium (10x to 100x) / Low (1x to 10x) / Do Not Know				
"Known" -score	4			
"Potential" - score	---			

CCME National Classification System (2008, 2010 v 1.2)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
4. Contaminant Quantity (known or strongly suspected)				
What is the known or strongly suspected quantity of all contaminants? >10 hectare (ha) or 5000 m^3 2 to 10 ha or 1000 to 5000 m^3 <2 ha or 1000 m^3 Do Not Know	<2 ha or 1000 m3		Measure or estimate the area or quantity of total contamination (i.e, all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.
"Known" -score	2			
"Potential" - score	---			
5. Modifying Factors				
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment? Yes No Do Not Know	Do Not Know		Persistent chemicals, e.g., PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics: (a) in air, (i) its half-life is equal to or greater than 2 days, or (ii) it is subject to atmospheric transport from its source to a remote area; (b) in water, its half-life is equal to or greater than 182 days; (c) in sediments, its half-life is equal to or greater than 365 days; or (d) in soil, its half-life is equal to or greater than 182 days. This list does not include metals or metalloids, which in their elemental form do not degrade. However metals and metalloids form chemical species in the environment, many of which are not readily bioavailable.	*Examples of Persistent Substances are provided in attached Reference Materials*
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location? Yes No Do Not Know	No			Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.
How many different contaminant classes have representative CCME guideline exceedances? one two to four five or more Do Not Know	one		For the purposes of the revised NCS ranking system, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, PAHs, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	*Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.*
"Known" - Score	0			
"Potential" - Score	1			

Contaminant Characteristic Total

Raw Total Scores- "Known"	14
Raw Total Scores- "Potential"	1
Raw Combined Total Scores	15
Total Score (Raw Combined / 40 * 33)	**12.4**

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

Test Site

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.	12		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** Potable Environments Guidelines for Canadian Drinking Water Quality: www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guide-res_recom/index_e.html Non-Potable Environments Canadian Water Quality Guidelines for Protection of Aquatic Life. CCME. 1999 www.ccme.ca Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada), report to Environment Canada, January 4, 2002.
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	9			
iii) Meets GCDWQ for **potable environments**; meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for **non-potable environments** **or** Absence of groundwater exposure pathway (i.e., there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).	0			
	12			
Score	12			
NOTE: If a score is assigned here for Known COPC Exceedances, then you can skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)				
B. Potential for groundwater pathway.				
a. Relative Mobility High Moderate Low Insignificant Do Not Know	Do Not Know		Organics Koc (L/kg) / Metals with higher mobility at acidic conditions / Metals with higher mobility at alkaline conditions Koc < 500 (i.e., log Koc < 2.7) — pH < 5 — pH > 8.5 Koc = 500 to 5000 (i.e., log Koc = 2.7 to 3.7) — pH = 5 to 6 — pH = 7.5 to 8.5 Koc = 5,000 to 100,000 (i.e., log Koc = 3.7 to 5) — pH > 6 — pH < 7.5 Koc > 100,000 (i.e., log Koc > 5)	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.
Score	2			
b. Presence of engineered sub-surface containment? No containment Partial containment Full containment Do Not Know	No containment		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. Environment Canada – Ontario Region – Natural Attenuation Technical Assistance Bulletins (TABS) Number 19 –21.
Score	3			
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	3 m or less		The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow. Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway. The evaluation of this category is based on: 1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or 2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (e.g., water table aquifer, first hydrostratigraphic unit or other groundwater pathway).	
Score	1			
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	10-4 to 10-6 cm/s		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.	
Score	0.5			

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

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for groundwater pathway.				
e. Precipitation infiltration rate (Annual precipitation factor x surface soil relative permeability factor) High Moderate Low Very Low None Do Not Know	Do Not Know		Precipitation Refer to Environment Canada precipitation records for relevant areas. Divide annual precipitation by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). Permeability For surface soil relative permeability (i.e., infiltration) assume: gravel (1), sand (0.6), loam (0.3) and pavement or clay (0). Multiply the surface soil relative permeability factor with precipitation factor to obtain the score for precipitation infiltration rate.	
Score	0.4			
f. Hydraulic conductivity of aquifer $>10^{-2}$ cm/s 10^{-2} to 10^{-4} cm/s $<10^{-4}$ cm/s Do Not Know	>10-2 cm/s		Determine the nature of geologic materials and estimate hydraulic conductivity of all aquifers of concern from published material (refer to "Range of Values of Hydraulic Conductivity and Permeability" in the Reference Material sheet).	
Score	2			
Potential groundwater pathway total	8.9			
Allowed Potential score	---	Note: If a "known" score is provided, the "potential" score is disallowed.		
Groundwater pathway total	**12**			
2. Surface Water Movement				
A. Demonstrated migration of COPC in surface water above background conditions				
Known concentrations of surface water: i) Concentrations exceed background concentrations and exceed CCME CWQG for protection of aquatic life, irrigation, livestock water, and/or recreation (whichever uses are applicable at the site) by >1 X; or There is known contact of contaminants with surface water based on site observations. or In the absence of CWQG, chemicals have been proven to be toxic based on site specific testing (e.g. toxicity testing; or other indicator testing of exposure).	12	There is no surface water located approximately 1,600 m from the Site.	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.	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 www.ccme.ca CCME. 1999. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water) www.ccme.ca Health and Welfare Canada. 1992. Guidelines for Canadian Recreational Water Quality.
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	8			
iii) Meets CWQG or absence of surface water exposure pathway (i.e., Distance to nearest surface water is > 5 km.)	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated Migration in Surface Water, then you can skip Part B (Potential for migration of COPCs in surface water) and go to Section 3 (Surface Soils)				
B. Potential for migration of COPCs in surface water				
a. Presence of containment No containment Partial containment Full containment Do Not Know	Do Not Know		Review the existing engineered systems and relate these structures to site conditions and proximity to surface water and determine if full containment is achieved: score low if there is full containment such as capping, berms, dikes; score medium if there is partial containment such as natural barriers, trees, ditches, sedimentation ponds; score high if there are no intervening barriers between the site and nearby surface water. Full containment must include containment of all chemicals.	
Score	3			
b. Distance to Surface Water 0 to <100 m 100 - 300 m >300 m Do Not Know	Do Not Know		Review available mapping and survey data to determine distance to nearest surface water bodies.	
Score	2			

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

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
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	Do Not Know		Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (e.g., trench, above ground, etc.).	
Score	1			
d. Run-off potential High (rainfall run-off score > 0.6) Moderate (0.4 < rainfall run-off score <0.6) Low (0.2 < rainfall run-off score <0.4) Very Low (0 < rainfall run-off score < 0.2) None (rainfall run-off score = 0) Do Not Know	Do Not Know		Rainfall Refer to Environment Canada precipitation records for relevant areas. Divide rainfall by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). The former definition of "annual rainfall" did not include the precipitation as snow. This minor adjustment has been made. The second modification was the inclusion of permeability of surface materials as an evaluation factor. Permeability For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the infiltration factor with precipitation factor to obtain rainfall run off score.	Selected Sources: Environment Canada web page link: www.msc.ec.gc.ca Snow to rainfall conversion apply ratio of 15 (snow):1(water)
Score	0.4			
e. Flood potential 1 in 2 years 1 in 10 years 1 in 50 years Not in floodplain Do Not Know	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.	
Score	0.5			
Potential surface water pathway total	6.9			
Allowed Potential score	---	Note: If a "known" score is provided, the "potential" score is disallowed.		
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		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).	Selected References: CCME. 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health www.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 can skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)				
B. Potential for a surface soils (top 1.5 m) migration pathway				
a. Are the soils in question covered? Exposed Vegetated Landscaped Paved Do Not Know	Do Not Know		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 NCS 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.
Score	4			
b. For what proportion of the year does the site remain covered by snow? 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know	Do Not Know		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).	
Score	3			
Potential surface soil pathway total	7			
Allowed Potential score	---	**Note: If a "known" score is provided, the "potential" score is disallowed.**		
Soil pathway total	**12**			

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

Test Site

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	Volatile hydrocarbons are not present at the Site.	Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9			
Vapour has not been measured and volatile hydrocarbons have not been found in site soils or groundwater.	0			
	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you can skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)				
B. Potential for COPCs in vapour				
a. Relative Volatility based on Henry's Law Constant, H' (dimensionless) High (H' > 1.0E-1) Moderate (H' = 1.0E-1 to 1.0E-3) Low (H' < 1.0E-3) Not Volatile Do Not Know			Reference: US EPA Soil Screening Guidance (Part 5 - Table 36) *Provided in Attached Reference Materials*	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.
	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 pathyways.	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			
Allowed Potential score	---	Note: If a "known" score is provided, the "potential" score is disallowed.		
Vapour pathway total	**0**			
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	The closest surface water body is located approximately 1,600 m from the Site.	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** 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 can skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)				

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

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for sediment migration				
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?	Do Not Know		Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.	
Yes				
No				
Do Not Know	2			
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?	No		Review existing sediment assessments. If the sediments present at the site are in a river, select "no" for this question.	
Yes				
No				
Do Not Know	0			
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?	Do Not Know		Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional may	
Yes				
No				
Do Not Know	2			
Potential sediment pathway total	4			
Allowed Potential score	4	Note: If a "known" score is provided, the "potential" score is disallowed.		
Sediment pathway total	**4**			
6. Modifying Factors				
Are there subsurface utility conduits in the area affected by contamination?	Do Not Know		Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	
Yes				
No				
Do Not Know				
Known	---			
Potential	2			

Migration Potential Total		
Raw "known" total	24	
Raw "potential" total	6.0	
Raw combined total	30.0	Note: If "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.
Total (max 33)	**15.5**	

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

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
1. Human				
A. Known exposure				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site*)	22		*Where adverse effects on humans are documented, the site should be automatically designated as a Class 1 site (i.e., action required). There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).	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.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1 for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this is typically either $>10^{-5}$ or $>10^{-6}$). Known impacts can also be evaluated based on blood testing (e.g. blood lead >10 ug/dL) or other health based testing.	**Selected References:** Health Canada – Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Heath Screening Level Risk Assessments (www.hc-sc.gc.ca/ewh-semt/pubs/contamsite/index_e.html) United States Environmental Protection Agency, Integrated Risk Information System (IRIS) – http://toxnet.nml.nih.gov
No quantified or suspected exposures/impacts in humans.	0		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 0.2 for non-carcinogenic chemicals and incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10^{-6} or 10^{-5}).	
	Go to Potential			
Score	---			
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)				
B. Potential for human exposure				
a) Land use (provides an indication of potential human exposure scenarios)			Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (e.g., children).
Agricultural Residential / Parkland Commercial Industrial Do Not Know				
	Agricultural			
Score	3			
b. Indicate the level of accessibility to the contaminated portion of the site (e.g., the potential for coming in contact with contamination)		There is not Site fencing an the impacts are at or near the surface.	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.	
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				
	Access, not covered			
Score	2			
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).		Impacts are located at the ground surface	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.
i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know				
	Yes			
Score	3			
ii) inhalation (i.e., inhalation of dust, vapour)		Volatile hydrocarbons are not present at the Site.		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.
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			If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances) relative to buildings. Refer to (II) Migration Potential worksheet, 4B.a), *Potential for COPCs in Vapour* for a definition of volatility.	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.
	No			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.
Score	0			
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		The Site is covered with gravel	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.	Selected References; Canadian Council of Ministers of the Environment (CCME). 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 1332. www.ccme.ca Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
	Coarse			
Score	1			
inhalation total	1			

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

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for human exposure				
iii) Ingestion (i.e., ingestion of food items, water and soils [for children]), including traditional foods.			Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (e.g., provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure. The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of flow and contaminant transport.	**Selected References:** Guidelines for Canadian Drinking Water Quality: www.hc-sc.gc.ca/hecs-sesc/water/publications/drinking_water_quality_guidelines/toc.htm Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable. Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.
Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future).				
0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present Do Not Know				
	100 to 300 m			
Score	2.5			
Is an alternative water supply readily available?				
Yes No Do Not Know	Do Not Know			
Score	0.5			
Is human ingestion of contaminated soils possible?		Impacts are located at the surface.	If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.	
Yes No Do Not Know	Yes			
Score	3			
Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings?		The Site is surrounded by agricultural land.	Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (e.g., large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.	
Yes No Do Not Know	Yes			
Score	1			
Ingestion total	7			
Human Health Total "Potential" Score	16	Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.		
Allowed "Potential" Score	16			
2. Human Exposure Modifying Factors				
a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.)	No			
Yes No Do Not Know				
Known	0			
Potential	---			
Raw Human "known" total	0			
Raw Human "potential" total	16			
Raw Human Exposure Total Score	16			
Human Health Total (max 22)	**16.0**			
3. Ecological				
A. Known exposure				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.	18		Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (i.e., a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).	CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life. www.ccme.ca CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses. www.ccme.ca Sensitive receptors- review: Canadian Council on Ecological Areas; www.ccea.org. Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in *A Framework for Ecological Risk Assessment: General Guidance* (CCME 1996). Notes: Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	12		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.	
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 can skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)				

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

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for ecological exposure (for the contaminated portion of the site)				
a) Terrestrial i) Land use Agricultural (or Wild lands) Residential/Parkland Commercial Industrial Do Not Know			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).	
	Agricultural (or Wild lands			
	Score 3			
ii) Uptake potential Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site? Yes No Do Not Know	Yes		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.	
	Score 1			
iii) Ingestion (i.e., wildlife or domestic animals ingesting contaminated food items, soils or water) Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know	No	No significant surface water at the site.	Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.	
	Score 0			
Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know	Yes		Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.	
	Score 1			
Can the contamination identified bioaccumulate? Yes No Do Not Know	Do Not Know		Bioaccumulation of contaminants within food items is considered possible if: 1) The Log(Kow) of the contaminant is greater than 4 (as per the chemical characteristics work sheet) and concentrations in soils exceed the most conservative CCME soil quality guideline for the intended land use, or 2) The contaminant in collected tissue samples exceeds the Canadian Tissue Residue Guidelines.	
	Score 0.5			
Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know	Do Not Know		It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: www.ccea.org.	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
	Score 1.5			
Raw Terrestrial Total Potential	7	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
Allowed Terrestrial Total Potential	7			
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			"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 (no aquatic environme			
	Score 0			
ii) Uptake potential Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact? Yes No (or Not Applicable) Do Not Know	No	There is no suface water bodies located within 1,600 m of the Site.	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.	
	Score 0			
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	1 to 5 km		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.
	Score 1			
Are aquatic species (i.e., forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No Do Not Know	No	Contaminants are not included on the chemical characteristics worksheets.	Bioaccumulation of food items is possible if: 1) The Log(Kow) of the contaminant is greater than 4 (as per the chemical characteristics work sheet) and concentrations in sediments exceed the CCME ISQGs. 2) The contaminant in collected tissue samples exceeds the CCME tissue quality guidelines.	
	Score 0			
Raw Aquatic Total Potential	1	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
Allowed Aquatic Total Potential	1			

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

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
4. Ecological Exposure Modifying Factors				
a) Known occurrence of a species at risk. Is there a potential for a species at risk to be present at the site? Yes No Do Not Know	 Do Not Know		Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as Eco Explorer. Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act (http://www.sararegistry.gc.ca/species/schedules_e.cfm?id=1). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCMWLAP. 2005. Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists. Ministry of Sustainable Resource Management and Water, Land and Air Protection. http://srmwww.gov.bc.ca/atrisk/red-blue.htm
Score	--- 1			
b) Potential impact of aesthetics (e.g., enrichment of a lake or tainting of food flavor).		Unsure but highly unlikely as there are no nearby waterbodies.		
Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know	Do Not Know --- 1		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.e., unpleasant smell)? Yes No Do Not Know	Do Not Know --- 1		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	Do Not Know --- 1		A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients e.g., nitrogen or phosphorous releases to an aquatic body can act as a fertilizer.	
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	Do Not Know --- 1		Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	
Ecological Modifying Factors Total - Known	**---**			
Ecological Modifying Factors Total - Potential	**5**			
Raw Ecological Total - Known	0			
Raw Ecological Total - Potential	13			
Raw Ecological Total	13			
Ecological Total (Max 18)	**13.0**			
5. Other Potential Contaminant Receptors				
a) Exposure of permafrost (leading to erosion and structural concerns)		No permafrost in Austin area.		Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity? Yes No Do Not Know	No 0 ---		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.	
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know	No 0 ---		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.	
Other Potential Receptors Total - Known	**0**			
Other Potential Receptors Total - Potential	**0**			

Exposure Total		
Raw Human Health + Ecological Total - Known	0	
Raw Human Health + Ecological Total - Potential	29	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.
Raw Total	29	
Exposure Total (max 34)	**21.4**	

CCME National Classification System (2008, 2010 v 1.2)
Score Summary

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

I. Contaminant Characteristics	Known	Potential
1. Residency Media	4	---
2. Chemical Hazard	4	---
3. Contaminant Exceedance Factor	4	---
4. Contaminant Quantity	2	---
5. Modifying Factors	0	1
Raw Total Score	14	1
Raw Total Score (Known + Potential)	15	
Adjusted Total Score (Raw Total / 40 *33)	**12.4**	(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	---	4
6. Modifying Factors	---	2
Raw Total Score	24	6
Raw Total Score (Known + Potential)	30	
Adjusted Total Score (Raw Total / 64 * 33)	**15.5**	(max 33)

III. Exposure	Known	Potential
1. Human Receptors		
A. Known Impact	---	
B Potential		
a. Land Use		3
b. Accessibility		2
c. Exposure Route		
i. Direct Contact		3
ii. Inhalation		1
iii. Ingestion		7
2. Human Receptors Modifying Factors	0	---
Raw Total Human Score	0	16
Raw Total Human Score (Known + Potential)	16	
Adjusted Total Human Score	16.0	(maximum 22)
3. Ecological Receptors		
A. Known Impact	---	
B. Potential		
a. Terrestrial		7
b. Aquatic		1
4. Ecological Receptors Modifying Factors	---	5
Raw Total Ecological Score	0	13
Raw Total Ecological Score (Known + Potential)	13	
Adjusted Total Ecological Score	13.0	(maximum 18)
5. Other Receptors	0	0
Total Other Receptors Score (Known + Potential)	0	
Total Exposure Score (Human + Ecological + Other)	**29.0**	
Adjusted Total Exposure Score (Total Exposure / 46 * 34)	**21.4**	(max 34)

Site Score

Test Site

Site Letter Grade	**A**
Certainty Percentage	**69%**
% Responses that are "Do Not Know"	**14%**
Total NCSCS Score for site	**49.3**
Site Classification Category	**3**

Site Classification Categories*:

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

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

APPENDIX G

WATER WELL RECORDS

LOCATION: NW28-11-11W

Well_PID: 51081
Owner: GAWRYLUR AND SONS
Driller: Paddock Drilling Ltd.
Well Name:
Well Use: PRODUCTION
Water Use: Domestic
UTMX: 505657.649
UTMY: 5533811.58
Accuracy XY: UNKNOWN
UTMZ:
Accuracy Z:
Date Completed: 1984 Nov 07

WELL LOG

From (ft.)	To (ft.)	Log
0	3.5	SAND; FINE BROWN
3.5	5.0	CLAY; SANDY, BROWN
5.0	9.0	SAND; DIRTY, BROWN
9.0	15.0	SAND; FINE BROWN
15.0	20.0	SAND; FINE, CLAYEY, BROWN
20.0	20.5	CLAY; SOFT, STICKY
20.5	25.0	SAND AND GRAVEL; SOME CLAY, STONY NEAR BOTTOM, COARSE
25.0	39.0	SHALE; BLACK SOFT, SLIPPERY

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	39.0	casing	30.00			CORRUGATED	GALVANIZED
19.0	39.0	perforations				PERF. PIPE	
0	39.0	gravel pack					WASHED S.

Top of Casing: 1.0 ft. below ground

PUMPING TEST

Date: 1984 Nov 07
Pumping Rate: 8.0 Imp. gallons/minute
Water level before pumping: 21.0 ft. below ground
Pumping level at end of test: ?? ft. below ground
Test duration: 1 hours, minutes
Water temperature: ?? degrees F

LOCATION: NW33-11-11W

Well_PID: 135693
Owner: TOM LOWE
Driller: Paddock Drilling Ltd.
Well Name:
Well Use: PRODUCTION
Water Use: Domestic
UTMX: 505654.67
UTMY: 5535453.27
Accuracy XY:
UTMZ:
Accuracy Z:
Date Completed: 2005 Sep 14

WELL LOG

From (ft.)	To (ft.)	Log
0	0.5	TOPSOIL
0.5	17.0	SILTY BROWN CLAY
17.0	30.0	SILTY GREY CLAY
30.0	35.0	GREY SILTY SAND
35.0	40.0	SILTY GREY CLAY

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	8.0	CASING	30.00			CORRUGATED	FIBERGLASS
8.0	39.0	GRAVEL PACK	30.00		0.040	SAW CUT	FIBERGLASS
8.0	39.0	GRAVEL PACK					WASHED SAND
7.0	9.0	CASING GROUT					BENTONITE
0	7.0	GRAVEL PACK					WASHED SAND

Top of Casing: 1.0 ft. above ground

PUMPING TEST

Date: 2005 Sep 14
Pumping Rate: 1.0 Imp. gallons/minute
Water level before pumping: 9.0 ft. below ground
Pumping level at end of test: 37.0 ft. below ground
Test duration: 1 hours, minutes
Water temperature: ?? degrees F

REMARKS

PUMP TEST IS RECOVERY

LOCATION: NW33-11-11W

Well_PID: 24423
Owner: P KLASSEN
Driller: ASSINIBOINE DRILLING LTD.
Well Name:
Well Use: PRODUCTION
Water Use: Domestic,Livestock
UTMX: 505654.67
UTMY: 5535453.27
Accuracy XY: UNKNOWN
UTMZ:
Accuracy Z:
Date Completed: 1975 Nov 05

WELL LOG

From (ft.)	To (ft.)	Log
0	9.0	SAND
9.0	12.0	SANDY CLAY

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	12.0	casing grout	42.00	50.00			CONCRETE

Top of Casing: ft. below ground

No pump test data for this well.

LOCATION: SE33-11-11W

Well_PID: 38681
Owner: A DUNCAN
Driller: ASSINIBOINE DRILLING CO. LTD.
Well Name:
Well Use: PRODUCTION
Water Use: Domestic
UTMX: 506459.989
UTMY: 5534646.38
Accuracy XY: UNKNOWN
UTMZ:
Accuracy Z:
Date Completed: 1980 Apr 11

WELL LOG

From (ft.)	To (ft.)	Log
0	8.0	YELLOW CLAY
8.0	30.0	BLUE SILT WATER SATURATED

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	30.0	casing	42.00			CORRUGATED	GALVANIZED
12.0	30.0	gravel pack					

Top of Casing: 1.0 ft. below ground

No pump test data for this well.

APPENDIX H

STATEMENT GENERAL CONDTIONS

Amec Foster Wheeler Environment & Infrastructure,
A Division of Amec Foster Wheeler Americas Limited
STATEMENT OF GENERAL CONDITIONS - ENVIRONMENTAL SERVICES

1. STANDARD OF CARE - In the performance of professional services, Amec Foster Wheeler uses that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession practicing in the same or similar localities. No warranty, either express or implied, is made or intended by this Agreement or by furnishing oral or written reports of the findings. Amec Foster Wheeler is to be liable only for damage proximately caused by the negligence of Amec Foster Wheeler. The CLIENT recognizes that subsurface conditions may vary from those encountered at the location where borings, surveys or explorations are made by Amec Foster Wheeler and that the data, interpretations and recommendation of Amec Foster Wheeler are based solely on the information available to him. Amec Foster Wheeler will not be responsible for the interpretation by others of the information developed.

2. SITE INFORMATION - The CLIENT has agreed to make available to Amec Foster Wheeler all relevant information and documents under his control regarding past, present and proposed conditions of the site. The information shall include, but not be limited to, plot plans, topographic surveys, hydrologic data and previous soil and geologic data including borings, field or laboratory tests and written reports. The CLIENT shall immediately transmit to Amec Foster Wheeler any new information that becomes available or any change in plans. The CLIENT also ensured uninterrupted site access for Amec Foster Wheeler throughout performance of this Agreement.

Amec Foster Wheeler agrees to include a review of all historical information obtained by the CLIENT or provided by the Client to assist in the investigation of the Site unless and except to the extent that such a review is limited or excluded from the scope of work to be performed by Amec Foster Wheeler.

3. FULL DISCLOSURE - The CLIENT acknowledges that in order for Amec Foster Wheeler to properly advise and assist the CLIENT in respect of the investigation of the Site, Amec Foster Wheeler has relied upon full disclosure by the CLIENT of all matters pertinent to an investigation of the Site.

4. DELAYS AND INTERRUPTIONS - Should Amec Foster Wheeler have been delayed or interrupted by others in the performance of its services or be required to perform additional services as a result of any delay or interruption caused by others, Amec Foster Wheeler shall be equitably compensated by the CLIENT for all costs, charges and expenses which it may incur as a result of such delay or interruption and any such additional services to be performed and any and all consequences resulting from such delay or interruption.

5. USE OF WORK PRODUCT - Amec Foster Wheeler agrees to provide to the CLIENT interim reports outlining the progress of the investigation of the Site on a periodic basis and a final comprehensive report upon the completion of the investigation of the Site.

6. COMPLETE REPORT - This document being a part of the Report is of a summary nature and is not intended to stand alone without reference to the instructions given to Amec Foster Wheeler by the CLIENT, communications between Amec Foster Wheeler and the CLIENT, and to any other reports, writings or documents prepared by Amec Foster Wheeler for the CLIENT relative to the specific Site described herein, all of which constitute the Report. Wherever the word “Report” is used herein, it shall refer to any and all of the documents referred to herein.

In order to properly understand the suggestions, recommendations and opinions expressed herein, reference must be made to the whole of the Report. Amec Foster Wheeler cannot be responsible for use by any part of portions of the report without reference to the whole report.

7. LIMITATIONS ON SCOPE OF INVESTIGATION AND WARRANTY DISCLAIMER
There is no warranty, expressed or implied, by Amec Foster Wheeler that:
a) The investigation shall uncover all potential contaminants, including asbestos, on the Site; or
b) The Site will be entirely free of all Targeted Contaminants or other contaminants as a result of any cleanup work undertaken on the Site, since it is not possible, even with exhaustive sampling, testing and analysis, to document all potential contaminants on the Site.

Classification and identification of soils, rocks, geological units, contaminated materials and contaminant quantities have been based on commonly accepted practices in environmental consulting practice in this area.

The CLIENT acknowledges that:

a) The investigation findings are based solely on the information generated as a result of the specific scope of the investigation authorized by the CLIENT;
b) any assessment regarding the presence of contamination of the Site is based on the interpretation of conditions determined at specific sampling locations and depths and that conditions may vary between sampling locations;
c) there can be no assurance that isolated pockets of contaminants are not located on the Site;
d) any assessment is also dependent on and limited by the accuracy of the analytical data generated by the sample analyses;
e) any assessment is also limited by the scientific possibility of determining the presence of contaminants for which scientific analyses have been conducted; and
f) the analytical parameters selected are limited to those outlined in the CLIENT's authorized scope of investigation (in the absence of any evidence of potential contamination sources on the Site, which may warrant expanding the analytical parameters).

8. REMEDIATION COST ESTIMATES - Estimates of remediation costs can only be based on the specific information generated and the technical limitations of the investigation authorized by the CLIENT. Accordingly, estimated costs for remediation only represent the cost to clean up known contaminants that have been identified during the course of the investigation. As remediation of a Site is often an iterative exercise, estimated costs for remediation should only be interpreted to cover the first stage of any Site remediation until such time as verification samples indicate that the Site has been fully remediated and Amec Foster Wheeler shall therefore not be liable for the accuracy of any estimates of remediation costs provided.

9. CONTROL OF WORK AND JOBSITE SAFETY - Amec Foster Wheeler is only responsible for the activities of its employees on the jobsite. The presence of Amec Foster Wheeler personnel on the Site shall not be construed in any way to relieve the CLIENT or any contractors on Site from their responsibilities for Site safety. The CLIENT undertakes to inform Amec Foster Wheeler of all hazardous conditions, or possible hazardous conditions which are known to him. The CLIENT also recognizes that the activities of Amec Foster Wheeler may uncover previously unknown hazardous materials and that such a discovery may result in the necessity to undertake emergency procedures to protect Amec Foster Wheeler employees as well as the public at large and the environment in general. The CLIENT also acknowledges that in some cases the discovery of hazardous conditions and materials will require that certain regulatory bodies be informed and the CLIENT agrees that notification to such bodies by Amec Foster Wheeler will not be a cause of action or dispute.

10. LIMITATION OF RESPONSIBILITY

Limitation of Liability - The CLIENT has agrees that, notwithstanding any other provision negotiated as part of Amec Foster Wheeler's contract, the total liability of Amec Foster Wheeler, its officers, directors and employees for liabilities, claims, judgments, demands and causes of action arising under or related to this Agreement, whether based in contract or tort, shall be limited to the total compensation actually paid to Amec Foster Wheeler for the services hereunder or $50,000, whichever is less. All claims by the CLIENT shall be deemed relinquished unless filed within one (1) year after substantial completion of the services hereunder.

No Special or Consequential Damages - CLIENT and Amec Foster Wheeler agree that to the fullest extent permitted by law that Amec Foster Wheeler shall not be responsible for any consequential, incidental or indirect damages.

Indemnification - Because CLIENT owns and/or operates the site where work is being performed, CLIENT has and shall retain all responsibility and liability associated with the environmental conditions at the site. Unless specifically identified elsewhere, CLIENT'S responsibility and liability includes the handling and disposal of any samples or hazardous materials generated on the site as a result of Amec Foster Wheeler's performance hereunder. To the fullest extent permitted by law, the CLIENT agrees to defend, indemnify and hold Amec Foster Wheeler, its agents, subcontractors, and employees harmless from and against any and all claims, defense costs, including attorney's fees, damages, and other liabilities arising out of or in any way related to CONSULTANT's reports or recommendations concerning this Agreement, Amec Foster Wheeler 's presence on the project property, or the presence, release, or threatened release of asbestos, hazardous substances, or pollutants on or from the project property; provided that the CLIENT shall not indemnify Amec Foster Wheeler against liability for damages to the extent caused by the negligence or intentional misconduct of Amec Foster Wheeler, its agents, subcontractors, or employees.